CONVENIO ENTRE LA AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS, M.P. (CSIC), EL MINISTERIO DE CULTURA Y DEPORTE A TRAVÉS DEL INSTITUTO DEL PATRIMONIO CULTURAL DE ESPAÑA (IPCE) Y EL CONSORCIO «CENTRO NACIONAL DE INVESTIGACIÓN SOBRE LA EVOLUCIÓN HUMANA» (CENIEH) PARA EL DESARROLLO DE UN PROYECTO DE INVESTIGACIÓN EN EL MARCO DEL PROGRAMA MARCO DE INVESTIGACIÓN E INNOVACIÓN DE LA UNIÓN EUROPEA HORIZONTE 2020

REUNIDOS

De una parte, Dª Rosina López-Alonso Fandiño, en su condición de vicepresidenta de Organización y Relaciones Institucionales de la Agencia Estatal Consejo Superior de Investigaciones Científicas, M.P. (en adelante, CSIC), nombrada por Acuerdo del Consejo Rector del CSIC, en su reunión de 28 de noviembre de 2019 (BOE 18 de diciembre de 2019. Res. Presidencia CSIC de 13 de diciembre de 2019, por la que se resuelve convocatoria de libre designación), actuando en nombre y representación de esta Agencia Estatal en virtud de las competencias que tiene delegadas por resolución 21 de enero de 2021 de la Presidencia del CSIC (BOE de 28 de enero siguiente). Organismo con sede central en Madrid (CP 28006), domicilio institucional en calle de Serrano 117 y NIF Q-2818002-D.

De otra parte, D.ª María Dolores Jiménez-Blanco Carrillo de Albornoz, directora general de Bellas Artes, en nombre y representación del Ministerio de Cultura y de Deporte a través del Instituto del Patrimonio Cultural de España (IPCE), según Real Decreto 861/2020, de 22 de septiembre (BOE núm. 253, de 23 de septiembre de 2020), y de acuerdo con las atribuciones que le confiere la Orden CUD/990/2020, de 16 de octubre, sobre fijación de límites para la administración de determinados créditos para gastos y de delegación de competencias del Ministerio de Cultura y Deporte, siendo la citada Dirección General de la que depende orgánicamente la Subdirección General del Instituto del Patrimonio Cultural de España.

Y de otra, la Sra. D.ª María Martinón Torres, directora del Consorcio «Centro Nacional de Investigación sobre la Evolución Humana» (en adelante, CENIEH), con NIF S0900008D, entidad del sector público administrativo (artículo 3 LGP) adscrito al Ministerio de Ciencia e Innovación y domicilio a efectos de notificaciones en Paseo Sierra de Atapuerca 3, 09002 Burgos, en nombre y representación del mismo, de acuerdo con el artículo 15 de los Estatutos del Consorcio, publicados como Anexo I al Convenio entre el Ministerio de Ciencia e Innovación y la Comunidad de Castilla y León, para el equipamiento y explotación del Consorcio «Centro Nacional de Investigación sobre la Evolución Humana», Resolución de 20 de enero de 2010, publicada en el BOE de 11 de febrero de 2010 y modificados por Resolución de 6 de agosto de 2018 de la Secretaría General de Coordinación de Política Científica, publicados en el BOE de 9 de octubre de 2018, y en virtud de la autorización acordada por el Consejo Rector mediante acuerdo de fecha 14 de enero de 2020.

Las partes intervienen en nombre y representación de sus respectivas Instituciones, en ejercicio de las competencias que les están legalmente atribuidas, y se reconocen mutua y recíprocamente legitimidad y capacidad jurídica suficiente para obligarse mediante el presente Convenio, y a tal efecto,

MANIFIESTAN

Primero. Que el CSIC, de conformidad con el artículo 47 de la Ley 14/2011, de 1 de junio, de la Ciencia, la Tecnología y la Innovación ("Ley de la Ciencia"), es un organismo público de investigación (OPI) de la Administración General del Estado, adscrito al Ministerio de Ciencia e Innovación a través de la Secretaría General de Investigación, que tiene por objeto el fomento, la coordinación, el desarrollo y la difusión de la investigación científica y tecnológica, de carácter multidisciplinar, con el fin de contribuir al avance del conocimiento y al desarrollo económico, social y cultural, así como a la formación de personal y al asesoramiento a entidades públicas y privadas en estas materias.

El CSIC está constituido como agencia estatal y, en dicha condición, se rige por lo establecido en los artículos 108 bis a 108 sexies (introducidos por la Ley de Presupuestos Generales del Estado para 2021) de la Ley 40/2015, de 1 de octubre, de Régimen Jurídico del Sector Público, y por las disposiciones de su Estatuto, aprobado por Real Decreto 1730/2007, de 21 de diciembre.

Segundo. El IPCE es una subdirección de la Dirección General de Bellas Artes, dependiente de la Secretaria General del Ministerio de Cultura y Deporte. Sus funciones se desarrollan en Real Decreto 509/2020, de 5 de mayo, por el que se desarrolla la estructura orgánica básica del Ministerio de Cultura y Deporte, y son:

"n) La conservación preventiva y restauración de bienes integrantes del patrimonio histórico español adscritos al Ministerio y cuantos otros de cualquier titularidad se considere procedente así como la colaboración para estos fines con los centros nacionales e internacionales de investigación en materia de bienes culturales.

ñ) La elaboración de programas, planes e informes en materia de investigación, formación, conservación de bienes culturales y difusión de los métodos, técnicas, procedimientos y criterios en materia de conservación preventiva y restauración de los bienes culturales.

o) La propuesta y elevación al Consejo del Patrimonio Histórico de los Planes Nacionales de Información sobre el Patrimonio Histórico Español y la gestión y difusión de éstos.

p) La elaboración y ejecución de los planes para la conservación y restauración de los bienes muebles e inmuebles del patrimonio histórico y de los fondos que constituyen el patrimonio documental y bibliográfico así como la cooperación con otras administraciones públicas y entidades públicas o privadas para el desarrollo de dichos planes y su seguimiento.

q) El archivo y sistematización de los trabajos realizados y de la documentación disponible sobre patrimonio histórico y su coordinación con los demás registros y servicios de documentación del Departamento ministerial.

r) La investigación y estudio sobre criterios, métodos y técnicas para su conservación y restauración; la formación de técnicos y especialistas en conservación y restauración de los bienes inmuebles y muebles integrantes de dicho patrimonio.

s) La coordinación y establecimiento de redes de investigación nacionales e internacionales en materia de gestión y restauración de forma integrada de bienes culturales."

Que las funciones de investigación, coordinación y establecimiento de redes de investigación reconocen al IPCE como Agente de ejecución de acuerdo a la Ley 14/2011, de 1 de junio, de la Ciencia, la Tecnología y la Innovación.

Tercero. Que el CENIEH tiene carácter de agente de ejecución de la Administración General del Estado del Sistema Español de Ciencia, Tecnología e Innovación, de acuerdo a lo establecido en los artículos 3.4 y 46 y la disposición adicional vigesimoprimera de la Ley 14/2011, de 1 de junio, de la Ciencia, la Tecnología y la Innovación, y a lo estipulado en el artículo 5.3 de sus propios Estatutos. Consecuentemente, el CENIEH tiene entre sus fines la realización de investigaciones en el ámbito de la evolución humana durante el Plioceno y Pleistoceno, promoviendo la sensibilización y transferencia de conocimientos a la sociedad.

Cuarto. Que el CSIC es Beneficiario del Acuerdo Subvención nº 871034 relativo a un proyecto del Programa Marco de Investigación e Innovación 2020 de la Unión Europea cuyo título es: "Integrating Platforms for the European Research Infrastructure ON Heritage Science", acrónimo "IPERION HS" (en adelante, el Proyecto).

Quinto. Que el Ministerio de Cultura y Deporte, a través del Instituto de Patrimonio Cultural de España (en adelante IPCE), y el CENIEH participan en el Proyecto en calidad de tercera parte vinculada, figura prevista en el Articulo 14 del Acuerdo de Subvención ("Implementation of action tasks by linked third parties").

Sexto. Que IPCE y CENIEH intervendrán en el Proyecto en la forma que se describe en la Descripción de la Acción (Anexo 1 del Acuerdo de Subvención) y que se adjunta como Apéndice 1 al presente Convenio, especialmente en los Paquetes de Trabajo WP2, WP3, WP5 y WP7.

Séptimo. Que IPCE y CENIEH conocen el contenido de los documentos que reconocen su participación como tercera parte con vínculo legal con el beneficiario CSIC (especialmente el Anexo 1, Descripción de la Acción) que se adjunta como Apéndice 1 a este Convenio, así como otros artículos del Acuerdo de Subvención que le pueden ser aplicables en virtud del presente Convenio y que se incluyen en el Apéndice 2 del presente Convenio.

En consideración a todo ello, las partes acuerdan suscribir el presente Convenio que se regirá por las siguientes

CLÁUSULAS

PRIMERA.- Objeto del Convenio.

El objeto del presente Convenio es establecer los términos de la colaboración entre CSIC, IPCE y CENIEH respecto de las tareas y acciones relacionadas con el desarrollo del Proyecto tal y como figuran en la Descripción de la Acción (Apéndice 1).

SEGUNDA.- Obligaciones y responsabilidades de CSIC, IPCE y CENIEH.

1. IPCE y CENIEH se comprometen a:

a) Realizar las tareas y actividades detalladas en la Descripción de la Acción del Acuerdo de Subvención.

b) Suministrar al CSIC aquellos informes y entregables relativos a las tareas y actividades acordados en la Descripción de la Acción arriba indicados en los plazos solicitados por el CSIC.

2. IPCE y CENIEH deberán emplear todos los medios y esfuerzos razonables y toda su experiencia para alcanzar los resultados previstos en la Descripción de la Acción y, a estos efectos, deberá asimismo informar sin demora al CSIC de toda circunstancia susceptible de dilatar el calendario previsto o de afectar de cualquier forma a la ejecución de las tareas mencionadas.

3. IPCE y CENIEH reconocen y aceptan que la Comisión (o en su caso las Agencias Ejecutivas encargadas de la financiación), la Corte de Auditores Europea y la Oficina Europea Antifraude serán competentes para ejercitar sus atribuciones y derechos respecto de las actividades de IPCE y CENIEH previstas en el Acuerdo de Subvención y en este Convenio, de acuerdo con los Artículos 22 (controles, revisiones, auditorías e investigaciones) y 23 (evaluación del impacto de la acción) del Acuerdo de Subvención, artículos que se adjuntan a este Convenio dentro del Apéndice 2 del mismo.

4. CSIC, IPCE y CENIEH se comprometen a transmitirse mutuamente en tiempo y plazo toda la información necesaria para poder llevar a cabo las acciones previstas en el Proyecto de forma que puedan cumplirse las obligaciones contraídas por el CSIC, IPCE y CENIEH en el Acuerdo de Subvención.

5. Los responsables científicos de la ejecución de los trabajos y actividades científicas previstas en este Convenio serán:

- Por parte del CSIC: el/la responsable científico/a del Departamento de Ingeniería de Superficies, Corrosión y Durabilidad del Centro Nacional de Investigaciones Metalúrgicas (CENIM).

- Por parte de IPCE: el técnico responsable designado del Área de Investigación y Formación.

- Por parte de CENIEH: el/la Investigador posdoctoral designado/a del Área de Investigación Paleobiología de Homínidos.

6. Con respecto a la información o materiales que una parte suministre a la otra, la parte suministradora no asumirá con respecto a la parte receptora otra obligación o responsabilidad que los compromisos especificados en el presente Convenio ni garantizará su calidad o fiabilidad para ningún fin determinado. La parte receptora será enteramente responsable del uso de la citada información o materiales. Las partes realizarán los esfuerzos razonables para garantizar la propiedad intelectual de la información, citando la fuente en caso de que se use en cualquier actividad de difusión, formación o similar.

7. Ni CSIC, IPCE y CENIEH serán responsables respecto a las otras partes de los daños o perjuicios indirectos que se pudieran ocasionar derivados de la ejecución del objeto del presente documento.

TERCERA.- Financiación.

El Proyecto consta de un presupuesto máximo inicialmente concedido de quinientos veintidós mil setecientos sesenta y dos euros con cincuenta céntimos (522.762,50 €) para CSIC y las terceras partes asociadas (IPCE y CENIEH), comprometiéndose el CSIC, en su condición de partner o socio beneficiario de la ayuda, a la distribución y transferencia de los fondos necesarios para la ejecución del Proyecto entre las terceras partes participantes una vez recibidas las transferencias correspondientes por parte del coordinador del Proyecto, con los siguientes condicionantes:

1) IPCE y CENIEH remitirán al CSIC, en los plazos establecidos por el CSIC y de acuerdo con el Acuerdo de Subvención (artículo 20), los documentos que justifiquen los gastos derivados de la ejecución de las tareas descritas en la Descripción de la Acción dentro del Proyecto, así como cualquier otra documentación que pueda solicitar a este respecto la Comisión Europea (CE).

2) El IPCE y el CENIEH se comprometen a custodiar las facturas y otros documentos justificativos correspondientes a los costes reales soportados, de acuerdo con las tareas e importes estimados en el Apéndice 1.

Los Costes totales estimados inicialmente derivados de la participación de IPCE en el Proyecto ascienden a 106.860,00 € (50.000,00 € costes de personal, 35.488,00 € fungibles y otros costes directos, 21.372,00 € costes indirectos).

Los Costes totales estimados inicialmente derivados de la participación de CENIEH en el Proyecto ascienden a 147.875,00 € (35.880,00 € costes de personal, 82.420,00 € fungibles y otros costes directos, 29.575,00 € costes indirectos).

De acuerdo con lo anterior, el CSIC transferirá al IPCE y CENIEH la aportación económica correspondiente a su participación, de acuerdo a las reglas establecidas en el Artículo 21 del Acuerdo de Subvención, de la siguiente manera:

a) A la entrada en vigor del Convenio, y siempre que el CSIC haya recibido la pre-financiación de la Comisión Europea, se transferirá la parte proporcional de la misma respecto al presupuesto estimado de cada tercera parte vinculada.

b) Los demás gastos efectuados se abonarán según el CSIC vaya recibiendo las diferentes cantidades desde la Comisión Europea, una vez estos hayan sido verificados y aceptados por la Comisión Europea, sin dilaciones indebidas, salvo caso de fuerza mayor y siempre que el CSIC hubiera recibido efectivamente de la Comisión Europea las cantidades aceptadas. Los plazos previstos para la justificación financiera según el Artículo 20 del Acuerdo de Subvención: RP1 del mes 1 al mes 18 y RP2 del mes 19 al mes 30 y RP3 del mes 31 al mes 42. La CE, según el Artículo 21, una vez aprobados los gastos, transferirá al coordinador los fondos correspondientes a los 90 días de haber recibido la justificación. El coordinador transferirá la parte correspondiente al CSIC y éste procederá a transferir a IPCE y CENIEH la parte correspondiente.

2) El abono de las cantidades reembolsadas a IPCE y CENIEH por la Comisión Europea será efectuado por el CSIC mediante ingreso en las cuentas bancarias indicadas por IPCE y CENIEH según el certificado bancario expedido a tal efecto.

3) IPCE y CENIEH deberán proporcionar al CSIC los documentos necesarios para elaborar los informes técnicos y financieros previstos en el Artículo 20 del Acuerdo de Subvención con la antelación suficiente para que puedan cumplirse los plazos establecidos en dicho artículo para su envío a la Comisión Europea.

CUARTA.- Confidencialidad de la información y de los resultados.

1. Las partes se comprometen a mantener confidencialidad y a no divulgar ni revelar a terceros la información confidencial relativa al Proyecto (o perteneciente a otros socios beneficiarios del Acuerdo de Subvención), que le haya sido facilitada o puedan serles facilitados en el futuro, directa o indirectamente por cualquiera de las otras partes. La información confidencial se tratará de acuerdo a lo definido en la sección 10 del CA adjunto como apéndice 3 a este convenio.

2. CSIC, IPCE y CENIEH restringirán el acceso a la información confidencial proporcionada a sus propios empleados, a los cuales les suministrarán únicamente la información estrictamente necesaria para poder ejecutar las tareas objeto del presente Convenio.

3. CSIC, IPCE y CENIEH no utilizarán la información suministrada para fines distintos de los relacionados con el presente Convenio.

4. Los compromisos asumidos por CSIC, IPCE y CENIEH en virtud de esta cláusula, subsistirán durante los cinco (5) años siguientes a la fecha de finalización del Proyecto.

Sin perjuicio de lo dispuesto anteriormente, las Partes podrán usar o difundir información confidencial que:

a. Sea de conocimiento público o llegue al conocimiento público por medios diferentes a una infracción del presente Convenio por cualquiera de las Partes, o

b. Se haya generado, de forma independiente, por o para la Parte receptora de la información, sin ninguna conexión con la información confidencial, y siempre que dicha generación pueda ser documentada por petición de la Parte emisora de la información, o

c. Fuera conocida por la Parte receptora con anterioridad a la fecha en la que la recibió de la Parte emisora, siempre que la Parte receptora lo pueda demostrar documentalmente, o

d. La información recibida proceda de un tercero que no exija secreto, o

e. Deba ser comunicada por ley o por requerimiento judicial o administrativo. En este caso, la Parte receptora notificará inmediatamente a la Parte emisora de dicho requerimiento con el fin de que ésta pueda interponer las medidas cautelares oportunas, y no revelará más información confidencial que la que sea estrictamente requerida por la orden judicial o administrativa.

5. En caso de que IPCE y CENIEH quieran utilizar, en parte o en su totalidad, los resultados parciales o finales obtenidos por la realización de sus tareas en el Proyecto, sea para su publicación como artículo, o por su exposición a un curso o conferencia, o para otros fines, deberá solicitar por escrito permiso al resto de los miembros del Consorcio IPERION HS de acuerdo con lo establecido en el Acuerdo de Consorcio, adjunto como Apéndice 3 al presente Convenio.

QUINTA.- Propiedad de los Resultados y Derechos de Acceso sobre Background y Resultados.

Cada Parte seguirá siendo propietaria de los conocimientos previos aportados al Proyecto. No se entienden cedidos a la otra parte, en virtud del presente compromiso, ninguno de tales conocimientos.

Los resultados del Proyecto serán propiedad de la parte o las partes que lo hayan generado, considerándose resultado aquella información, equipo o material, protegido

o no, que provengan directamente de la realización de las tareas ejecutadas en el marco del presente proyecto.

Cuando las partes hayan generado de manera conjunta un Resultado del proyecto, sobre los cuales no sea posible determinar las contribuciones individuales de cada una de las partes, o cuando no sea posible separar tales Resultados conjuntos a efectos de solicitar, obtener o mantener títulos de propiedad intelectual o industrial, las partes tendrán propiedad conjunta sobre los citados Resultados.

En el caso de propiedad conjunta, las partes deberán formalizar en el menor plazo posible el oportuno Acuerdo de Cotitularidad, que deberá establecer los porcentajes de propiedad y las condiciones de explotación y protección de los Resultados, teniendo en cuenta la contribución financiera e intelectual cada parte a los Resultados conjuntos, así como el valor comercial potencial y las aplicaciones del mismo. Se distribuirán de igual manera los gastos en los que se pudiera incurrir con ocasión del reconocimiento y/o defensa de tales derechos frente a terceros. Hasta que dicho Acuerdo de Cotitularidad no sea alcanzado, ninguno de los Copropietarios podrá explotar directamente ni licenciar el Resultado conjunto, pudiendo únicamente utilizar el Resultado obtenido conjuntamente para fines internos de investigación.

Dependiendo de las tareas previstas en la Descripción de la Acción, y siempre que fuera aplicable a las partes de este Convenio, CSIC, IPCE y CENIEH se comprometen a concederse los derechos de acceso sobre su Background (conocimientos previos) y Resultados que sean necesarios para llevar a cabo las tareas y actividades previstas en la Descripción de la Acción a no ser que legalmente CSIC, IPCE y CENIEH o una de las partes no sean libres para concederse estos derechos de acceso. En este caso CSIC, IPCE y CENIEH negociarán de buena fe para buscar soluciones y poder cumplir con los objetivos de dichas tareas y actividades.

Los términos “derechos de acceso”, “conocimientos previos” (Background) y “Resultados” tienen el mismo significado que en el Acuerdo de Subvención.

Son de aplicación a IPCE y CENIEH los derechos de acceso que sean atribuidos en el Acuerdo de Consorcio a las filiales o terceras partes legalmente vinculadas. Dicho Acuerdo de Consorcio se adjunta como Apéndice 3 al presente Convenio.

CSIC, IPCE y CENIEH se comprometen a cumplir la legislación vigente en materia de propiedad intelectual y titularidad de los resultados que se puedan conseguir en ejecución de las actividades objeto de este Convenio.

SEXTA.- Medidas de seguimiento, vigilancia y control.

De conformidad con lo dispuesto en el artículo 49.f de la Ley 40/2015, de 1 de octubre, de Régimen Jurídico del Sector Público (LRJSP), se constituirá una Comisión Mixta de Seguimiento paritaria, en adelante Comisión Mixta, que actuará como mecanismo de

seguimiento, vigilancia y control de la ejecución del Convenio y de los compromisos adquiridos por las partes, la cual estará compuesta, al menos, por un representante de cada institución (CSIC, IPCE y CENIEH). Sus funciones serán resolver los problemas de interpretación y cumplimiento de este Convenio, así como realizar el control y seguimiento de las actividades que en su aplicación se acuerden.

La periodicidad de las reuniones será anual con carácter ordinario y cuando se considere necesario, a criterio de la Comisión Mixta, con carácter extraordinario. Los acuerdos se tomarán por consenso entre las partes.

El régimen jurídico de esta Comisión Mixta será el previsto para los órganos colegiados en el título preliminar, capítulo II, sección 3.ª, de la Ley 40/2015, de 1 de octubre, de Régimen Jurídico del Sector Público.

SÉPTIMA.- Vigencia y régimen de Modificación del Convenio.

El Convenio se perfeccionará con su firma y surtirá efectos según lo establecido en el artículo 48.8 de la Ley 40/2015, de 1 de octubre, de Régimen Jurídico del Sector Público una vez inscrito en el Registro Electrónico estatal de Órganos e Instrumentos de Cooperación del sector público estatal (REOICO), al que se refiere la disposición adicional séptima de la citada ley, debiendo publicarse a continuación en el «Boletín Oficial del Estado» (BOE).

El Convenio, por tanto, entrará en vigor tras su inscripción en REOICO y su vigencia coincidirá con la del Acuerdo de Subvención referido, finalizando al término de dicho Acuerdo. En todo caso, su duración no podrá exceder de los cuatro años, prorrogable por acuerdo unánime de los firmantes por un período adicional de hasta otros cuatro años mediante una adenda de prórroga al Convenio, manifestada con dos meses de antelación a la finalización del plazo de vigencia. Asimismo, el Convenio podrá revisarse en cualquier momento a requerimiento de alguna de las partes y, en su caso, modificarse por acuerdo expreso de las mismas mediante la suscripción de una adenda al efecto.

En este sentido, la modificación del contenido del Convenio requerirá acuerdo unánime de los firmantes y entrará en vigor en el momento de su inscripción en REOICO, sin perjuicio de su posterior publicación en BOE, y los documentos acreditativos de tales variaciones serán anexados a este Convenio como partes integrantes del mismo.

OCTAVA.- Extinción y causas de resolución.

De acuerdo con lo previsto en el artículo 51.1 de la LRJSP, el Convenio quedará extinguido por el cumplimiento de las actuaciones que constituyen su objeto o por incurrir en causa de resolución.

Son causas de resolución del presente Convenio:

a) El transcurso del plazo de vigencia del Convenio sin haberse acordado la prórroga del mismo.

b) El acuerdo unánime de las partes. La participación de IPCE y CENIEH en el Proyecto podrá terminarse por acuerdo entre las partes, bien porque consideren

los trabajos finalizados antes del periodo, o por cualquier otra causa siempre que esta causa sea consistente con las obligaciones del CSIC como Beneficiario del Acuerdo de Subvención. En este caso, IPCE y CENIEH estarán obligados a entregar al CSIC un informe de los resultados obtenidos hasta el momento de la finalización de su participación así como de los documentos, informes o entregables pendientes y debidos, en función del Acuerdo de Subvención o del presente Convenio. Por otra parte, el CSIC deberá abonar las cantidades que pudieran haberse devengado hasta el momento de la interrupción, siempre que se refieran a costes justificados y aceptados por la CE. En caso de variar las condiciones relativas a las tareas objeto de este Convenio tal como figuran en la Descripción de la Acción, CSIC, IPCE y CENIEH por mutuo acuerdo podrán denunciar o modificar el presente Convenio en cualquier momento a través de la suscripción del oportuno instrumento jurídico.

c) El incumplimiento de las obligaciones y compromisos asumidos por parte de alguno de los firmantes. En este caso, cualquiera de las partes podrá notificar a la parte incumplidora un requerimiento para que cumpla en un determinado plazo con las obligaciones o compromisos que se consideran incumplidos. Este requerimiento será comunicado a la Comisión Mixta de Seguimiento y a las otras partes. Si trascurrido el plazo indicado en el requerimiento persistiera el incumplimiento, la parte que lo dirigió notificará a las otras la concurrencia de la causa de resolución y se entenderá resuelto el Convenio. La resolución del Convenio por esta causa podrá conllevar la indemnización de los daños y perjuicios causados.

d) Por decisión judicial declaratoria de la nulidad del Convenio.

e) Por decisión unilateral de cualquiera de las partes firmantes, debida a causas excepcionales debidamente justificadas que obstaculicen o impidan el cumplimiento de los compromisos, previa comunicación escrita.

f) Por cualquier otra causa prevista en la legislación vigente que fuera de aplicación o la entrada en vigor de disposiciones legales o reglamentarias que impidan su cumplimiento.

El cumplimiento y la resolución del Convenio darán lugar a la liquidación del mismo, sin perjuicio de lo dispuesto en el artículo 52 de la LRJSP en relación con los efectos de la resolución de los Convenios, a lo que las partes firmantes quedan sometidas en lo que les sea de aplicación.

NOVENA.- Legislación aplicable y Jurisdicción competente.

Este Convenio tiene naturaleza administrativa. Queda sometido al régimen jurídico de convenios previsto en el Capítulo VI Título Preliminar de la Ley 40/2015, de 1 de octubre del Régimen Jurídico del Sector Publico.

Las cuestiones litigiosas que pudieran surgir entre las partes como consecuencia de la ejecución del Convenio, o por incumplimiento de las obligaciones y compromisos asumidos, deberán solventarse por mutuo acuerdo de las mismas en el seno de la

Comisión Mixta. Si no pudiera alcanzarse dicho acuerdo, serán de conocimiento y competencia del orden jurisdiccional de lo contencioso-administrativo.

DÉCIMA.- Normativa sobre protección de datos.

Las partes de común acuerdo establecen y se comprometen, en cuanto a los datos de carácter personal facilitados para la firma del presente documento o para la relación que surge del mismo, que la única finalidad de dichos datos será la de gestionar la relación surgida y la de facilitar el desarrollo del objeto del presente Convenio, no pudiéndose emplear los mismos para finalidad distinta de aquella para la que fueron proporcionados. El incumplimiento de lo estipulado en este apartado, dará lugar a la responsabilidad correspondiente de la parte incumplidora, sin perjuicio de la sanción a la que su actuación pudiese dar lugar.

La legitimación del tratamiento de los datos es la ejecución del presente Convenio y los datos proporcionados se conservarán durante el tiempo necesario para cumplir con las exigencias legales. No se cederán datos a terceros, salvo para la ejecución de este Convenio u obligación legal, y las partes tienen derecho a presentar reclamación ante la Agencia Española de Protección de Datos (www.aepd.es). Para el ejercicio de los derechos de acceso, rectificación o supresión, limitación de su tratamiento, portabilidad y/u oposición podrán dirigirse a los responsables del tratamiento (Delegado de Protección de Datos de CENIEH: protecciondedatos@cenieh.es, de CSIC: delegadoprotecciondatos@csic.es, de IPCE: dpd@cultura.gob.es).

UNDÉCIMA.- Apéndices.

Los Apéndices 1 (Descripción de la Acción), 2 (Acuerdo de Subvención) y 3 (Acuerdo de Consorcio) del presente Convenio forman parte integrante del mismo.

Y en prueba de conformidad, se firma el presente Convenio.

POR EL CENIEH

Firmado por 34995646L MARIA MARTINON (R: S0900008D) el día 05/05/2021 con un certificado emitido por AC Representación

LA DIRECTORA

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LA DIRECTORA GENERAL DE BELLAS ARTES

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Apéndice 1.- Descripción de la Acción- Anexo 1 del Acuerdo de Subvención

El IPCE y el CENIEH contribuyen en los siguientes paquetes de trabajo WP2, WP3, WP5 y WP7.

Annex 1 to the Grant Agreement (Description of the Action) IPERION HS

H2020
Research and Innovation Actions (RIA)

History of changes

Version	Date	Change	Page
1.0	25.09.2019	Table 4.2 has been removed from the section of beneficiaries and it has been created a separate table 4.2 for subcontracting and third parties 100-103 CNR 105 KIK-IRPA 114 ITAM 117-122 SPK 125-127 CSIC 129-136 CNRS 141 FORTH 144-147 Atomki 150-159 RCE 163-165 NCU 167-169 HERCULES 171-172 INOE 174-177 RAA 180-181 ZVKDS 184-188 UCL	
2.0	02.10.2019	Addition of a new Beneficiary: partner 24 UCPH (University of Copenhagen): - SECTION 3.3 “Consortium as a whole” has been integrated - SECTION 4.1 “participants” has been integrated	
3.0	06.11.2019	SECTION 3.4 “Resources to be committed” - Figures 3.4a – IPERION HS budget, - Tables 3.4.2 Other Direct Cost Items have been corrected according the budget shift due to the addition of beneficiary #24	
4.0	24.11	Access tables and providers: - TNAs cost tables have been updated with fix starting date Typos in ANNEX 2a have been fixed	
5.0	06.12	- TNAs tables: allocation of costs revised - annex 2.a: erroros fixed - WT8: typos fixed - section 4.2: explantion and costs of subcontracts for CNR, INOE and UCL added. Numbering fixed.	

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1 Excellence

The IPERION HS proposal addresses the topic "Integrating Activities for Advanced Communities" (INFRAIA-01-2018-2019) of the Call "Integrating and opening research infrastructures of European interest" (H2020-INFRAIA-2018-2020). The specific area addressed, in the domain of *Social Sciences and Humanities*, is "**European research infrastructures for cultural heritage restoration and conservation**". The proposal consortium is a highly multidisciplinary *advanced community* and its partners come from a significant number of scientific domains, synergetically involved in heritage science research.

Social Sciences and Humanities

☒ European research infrastructures for cultural heritage restoration and conservation.

☐ Contemporary European history: European Holocaust research infrastructure.

1.1 Objectives

1.1.1 Heritage science mission and general objectives of IPERION HS

Heritage science relies on a multidisciplinary combination of established domain approaches – both in natural sciences and humanities – and on the use of cutting edge scientific research infrastructures to solve complex research questions, supporting deeper understanding of the past and improved care for heritage. Although a young (first defined in 2006) and intensely cross-disciplinary discipline, its introduction in the ESFRI 2016 Roadmap testifies its strategic importance and its potential for sustainable development of Europe.

The core mission of the IPERION HS proposal is to further integrate and open European facilities for the study, restoration and conservation of cultural heritage, towards the establishment of the **European Research Infrastructure for Heritage Science** (E-RIHS, an ESFRI Project). IPERION HS will thus launch and operate an integrating activity to **support research in heritage science** in Europe and beyond.

1.1.2 Specific objectives and their relation to the proposed activities

To accomplish the mission of IPERION HS, **nine specific objectives** will be pursued, through a combination of project activities (detailed in Section 3):

1. **Share. Enable access to a world-class Trans-National Access catalogue of services.** Further integration of the most advanced European facilities for heritage science research in one coordinated system to offer TNA to diagnostic tools and methods integrating key fixed laboratories, mobile laboratories with a wide range of portable scientific instruments, and unique archives of scientific data (WP2, 3, 4 and 8);
2. **Research**. **Excellent JRAs with wide participation** to enhance access provision in quality and number of scientific tools available to the RI, advancing the methodologies and defining safe procedures (WP5);
3. **Open data in heritage science.** One community – one language. Advance digital awareness in the field of heritage science. Contribution to FAIR[1] heritage data. Connect heritage data and tools with the EOSC[2] (WP5);
4. **Interoperate.** Maintain and advance interoperable knowledge bases: datasets, procedures and reference materials to foster world-class research. Promote global interoperability through alignment of protocols and good practices and exchange of reference materials with key partners outside Europe (WP5, 6 and 8);

[1] The FAIR data principles (https://www.force11.org/group/fairgroup/fairprinciples).
[2] The European Open Science Cloud (https://www.eosc-portal.eu).

5. **Innovate.** Explore new paradigms to maximise the impact of heritage science research on sustainable development and economic growth centred around sustainable use of cultural heritage (WP6);
6. **Exploit**. Foster interoperability and reuse of datasets and reference collections, created or maintained by the project. Build on experience in the management and operation of IPERION HS to favour the establishment and the success of E-RIHS, a sustainable global research infrastructure for heritage science (WP6);
7. **Teach. Train heritage scientist for enhanced use of the RI.** Increase, through multidisciplinary training and education, the skills of both users and potential users – on the one side – and of the RI providers on the other side, to achieve optimal interaction (WP7);
8. **Outreach.** Engage new communities of heritage scientists to access to the RI. Widen the user base across countries and disciplines. Strengthen multi-disciplinary connections between physical sciences and humanities, helping the progress of heritage science (WP7 and 8);
9. **Grow. Put European heritage science at the centre of a strong international programme of cooperation**. Advocate joint research for global interoperability and mobility of heritage scientists. Connect key heritage institutions outside the EU into a global network of scientific collaborations, setting the basis for a future global distributed research infrastructure (WP8).

1.1.3 Heritage science vision and IPERION HS

The IPERION HS objectives are aligned with a general vision of heritage science, the pillars of which are:

- **Multi-disciplinarity: optimising research in teams with complementary cultures and practices.** IPERION HS will bridge disciplines to advance heritage science and to contribute to the development of new knowledge and new methodologies, by recognizing and supporting **teamwork** at all stages of its processes and by fostering the use of its services by multidisciplinary teams, promoting a culture of exchange and cooperation.
- **Inclusiveness: strengthening and widening the heritage science community.** IPERION HS will expand the boundaries of the *advanced community* of cultural heritage conservation and restoration to provide a higher level of **engagement**, as well as services for important research fields in heritage science, such as palaeontology and archaeology.
- **Co-creation of knowledge: the foundation of new approaches to cultural heritage research**. Instead of the binary provider/user relationship, IPERION HS will foster a culture of exchange and cooperation in which the contribution of each participant is recognized, combining expertise of the researchers accessing the facilities and the scientists operating them. A multidisciplinary approach, in which equal responsibilities are given to researchers accessing its facilities and those operating them, is the precondition to achieve effective **co-creation** of new knowledge.
- **Excellence: supporting outstanding projects with outstanding facilities.** IPERION HS will foster scientific excellence through high quality support for exceptional research. Trans-National Access provision will be based on a high-quality **catalogue of services** including the most advanced heritage science facilities in Europe. Excellence will also be ensured through quick, efficient and transparent proposal evaluation and selection process involving internationally leading experts and top users.
- **Global impact: collaboration and cooperation at the global level**. The challenges of heritage research projects and "*the global lead that the EU holds in this field, supported today by an unstable combination of national and EU measures*",[3] require a coordinated and resolute effort. While the establishment of E-RIHS will provide a level of much required stability, IPERION HS will provide the framework of continuity through the many **cooperative relationships** that the consortium has established with prominent international organizations and key scientific institutions outside Europe.
- **Innovation: the heritage science socio-economic impact.** While heritage science innovation impacts the high-tech and manufacturing industries, its core domain of impact is in conservation and sustainable use of heritage, e.g. in tourism. This involves enterprises at the creative end of the global market and cultural institutions in charge of heritage preservation and provision of access – with a huge number of "consumers". The main beneficiary of **extended heritage lifetimes** or solutions for their enhanced enjoyment, is the general public. Potential returns are in hundreds of billions, considering only the annual revenues of cultural tourism.
- **Engagement: the societal role of heritage science.** Cultural heritage is defined **by communities** and it is accessed through museums, galleries, libraries, archives, sites and monuments. Also, as indicated in

[3] From: ESFRI recommendations to E-RIHS, evaluation report for the 2016 Roadmap.

the report of 2015 *Getting cultural heritage to work for Europe*[4], the role of local communities in heritage preservation is crucial. Heritage science is, thus, a perfect playground for the development of an inclusive and effective citizen science. The IPERION HS consortium can here benefit from the public-facing role of its many heritage institutions.

- **Open science:** interoperability is key to development of heritage science at a global level. Interoperability of data, materials and procedures implies a wider adoption of the open science paradigm. For better preservation of the global heritage, which is one of the core missions of heritage science, researchers need to have **open access to knowledge**, in the form of heritage data, methodological procedures and results, instruments and reference materials.

1.2 Relation to the work programme

IPERION HS proposal is closely aligned with all the challenges and scopes listed in the work programme. A detailed examination of each of these is following, with the work programme points – (a) to (m) – enumerated in *italic*.

WP(a) Integrating Activities target research infrastructures […] needed to support the EU political priorities and address the Societal Challenges

IPERION HS operationally supports further integration in the field of heritage science, which is a domain prioritized by ESFRI since the Roadmap 2016. Heritage science is effective in addressing many societal challenges and connects well with the Sustainable Development Goals of the UN 2030 Agenda.

WP(b) The aim of this action is to bring together, integrate on European scale, and open up key national and regional research infrastructures to all European researchers, from both academia and industry, ensuring their optimal use and joint development

IPERION HS is committed to extending the current level of integration and to opening up more than twice as many national facilities with respect to the preceding integrating activity. The TNA provided by IPERION HS is open to all European researchers.

WP(c) 'Advanced Communities' are scientific communities whose research infrastructures show an advanced degree of coordination and networking at present, attained, in particular, through Integrating Activities awarded under FP7 or previous Horizon 2020 calls.

The IPERION HS consortium started its first integrated infrastructure initiative (I3) in 2004 during FP6 and has continuously operated access provision since then. The degree of coordination in its network of partners is very high.

WP(d) An Integrating Activity will mobilise a comprehensive consortium of several key research infrastructures in a given field as well as other stakeholders […] from different Member States, Associated Countries and other third countries

As the fourth consecutive integrating activity project, IPERION HS is now incorporating the best national facilities on a truly pan-European scale, operating in 18 Member States and 2 Associated Countries and 3 prominent third countries.

WP(e) an Integrating Activity shall combine, in a closely co-ordinated manner: Networking activities, […]; Trans-national access […]; Joint research activities […].

IPERION HS proposal addresses these three mandatory activities in a balanced and synergistic way. The culture of cooperation within the consortium is well established and already gave excellent results in the

[4] *Getting cultural heritage to work for Europe*. Doi:10.2777/745666 (2015).

preceding projects. The effectiveness of NA in the community has been demonstrated through – among other exceptional achievements – the dedicated participation of now 27 countries in the ESFRI Project E-RIHS. Any progress resulting from successful JRAs is consistently introduced in TNA provision, either as new instruments or new methods, demonstrating their validity *ex post*.

WP(f) Access should be provided only to key research infrastructures of European interest […]. Other national and regional infrastructures in Europe can be involved, in particular in the networking activities […].

The IPERION HS catalogue of TNA services has been developed by integrating key European RIs, according to quality criteria developed not only through the long-lasting experience of the consortium, but also through the shared quality guidelines currently under discussion in the framework of the preparatory project for E-RIHS ESFRI. This will ensure a high level of coherence of TNA provision, with the expected outcome being included in the catalogue of services of the future permanent RI.

WP(g) Proposals from advanced communities will have to clearly demonstrate the added value and the progress beyond current achievements in terms of integration and services, of a new grant. The strongest impact for advanced communities is expected typically to arise from focusing on innovation aspects and widening trans-national and virtual access provision, both in terms of wider and more advanced offer of scientific services, than in terms of number of users and domains served.

IPERION HS is an essential step towards the development of coherent access to the most advanced European instrumental facilities for the analysis, interpretation, preservation, documentation and management of heritage objects in the fields of art history, conservation, archaeology and palaeontology. IPERION HS consists of partners from 23 countries clustered around their national nodes. The number of countries is almost twice that of the preceding integrating activity (13). Apart from widening the dimension, the proposal also aims to better address the needs in specific heritage science fields, such as archaeology and palaeontology. TNA access provision grew from 19 providers in the last project to 54 providers in IPERION HS.

WP(h) Furthermore, in particular for communities supported in the past under three or more integrating activities, the creation of strategic roadmaps for future research infrastructure developments as well as the long-term sustainability of the integrated research infrastructure services provided at European level, need to be properly addressed. The latter requires the preparation of a sustainability plan beyond the grant lifecycle as well as, where appropriate, the involvement of funders.

The sustainability of IPERION HS is in a sense already guaranteed beyond the lifetime of the project. For long-term sustainability, the proposal relies on the outcomes of the E-RIHS preparatory phase negotiations, which will lead to the establishment of the E-RIHS ERIC at about the time of conclusion of IPERION HS.

WP(i) In line with the strategy for EU international cooperation in research and innovation (COM (2012)497), Integrating Activities should, whenever appropriate, pay due attention to any related international initiative (i.e. outside the EU) and foster the use and deployment of global standards.

The advanced community supporting the IPERION HS proposal developed in the recent past under the labels of IPERION CH and E-RIHS – is a solid network of relationships at both European and global levels. Special places are occupied by the intergovernmental organization ICCROM and by the JPI CH, both having strong relationships and defined programmes of cooperation. The consortium also has many global scientific relationships with research infrastructures outside EU: four of these RIs are directly involved in the proposal, representing groups in Brazil, Mexico and the USA. All of these have declared their interest in the development of global digital, procedural and material standards.

WP(j) Integrating Activities should also organise the efficient curation, preservation and provision of access to the data collected or produced under the project, defining a data management plan […]

proposals should build upon the state of the art in ICT and e-infrastructures for data, computing and networking, and ensure connection to the European Open Science Cloud.

IPERION HS will develop its data management plan inspired by the FAIR principles. Within the JRAs, particular effort is devoted to research activities linking the project with the SSHOC Cluster, where seven partner institutions of the IPERION HS consortium – therein representing E-RIHS – will develop research to connect heritage data with the Cloud. A bridge between the two initiatives will thus be created to secure rapid convergence in the EOSC.

WP(k) Integrating Activities should in particular contribute to fostering the potential for innovation, including social innovation, of research infrastructures

An entire WP (n.6) in IPERION HS is devoted to activities targeted to foster innovation and exploitation. Due to its unique aspect, as 'science of cultural heritage', and due to it specifically targeting conservation and restoration, heritage science can have a pronounced socio-economic impact on European sustainable development, helping 'cultural heritage to work for Europe'. The momentum created by the European Year of Cultural Heritage in 2018 will add to this potential for social innovation.

WP(l) Integrating Activities are expected to duly take into account all relevant ESFRI and other world-class research infrastructures to exploit synergies, to reflect on sustainability and to ensure complementarity and coherence with the existing European Infrastructures landscape.

IPERION HS, being an integrating activity under the wider umbrella of the ESFRI Project E-RIHS, has fully aligned its activities and communication to ensure maximum synergy. The consortium is in close contact with the ERICs CERIC and DARIAH, with the ESFRI projects DiSSCo and EHRI, as well as with the H2020 cluster projects PARTHENOS and SSHOC.

WP(m) Proposals should include clear indicators allowing the assessment of the progress towards the general and specific objectives, other than the access provision.

A quality control system to achieve oversight of the project flow, with specific performance indicators (KPIs) has been developed in the proposal specifically to respond to this requirement.

1.3 Concept and methodology

1.3.1 Concept

The interpretation and preservation of heritage are global challenges for science and the European society at large. Since 1999, the EC has continuously been funding access to advanced instrumental facilities and scientific data repositories for investigation of cultural heritage. This structured effort has led to the heritage science community being designated as an *advanced community*, which therefore proposed to the European Strategy Forum on Research Infrastructures to build a permanent European RI to serve the heritage science domain. This resulted in heritage science as one of six new projects included in the ESFRI Roadmap in 2016. The experience of this advanced community accumulated in four Framework Programmes, during close to 20 years of continuous service to this scientific domain. IPERION HS is a further step towards a unified approach to the most advanced European facilities for the analysis, interpretation, preservation, documentation and management of heritage objects in the fields of art history, conservation, archaeology and palaeontology.

The first project aiming at structuring the European landscape of heritage research, the network LabS-TECH,[5] was launched during FP5. Following this, Eu-ARTECH[6] in FP6 was the first Integrating Activity for the community, and it introduced the innovative MOLAB concept: access to a mobile laboratory where the facility moves to the user. It also introduced the AGLAE accelerator as the basis of the future FIXLAB. The

[5] FP5 – HPRI-2000-40029, EU contribution 0.6 MEuro
[6] FP6 – RII3-CT-2004-506171, EU contribution 4.36 MEuro

second IA that followed, CHARISMA[7] almost doubled the E-ARCHCH partners to 22 institutions across 11 EU Member States. Through a structured TNA programme, CHARISMA supported access for more than 500 users, exceeding 1300 days of access, including the new ARCHLAB platform enabling access to archives and collections. The third IA in succession, IPERION CH,[8] extended the integration to 24 partners in 13 countries, including the participation of the Getty Conservation Institute in the USA. The catalogue of services was extended to include 19 access providers, distributed in the above three platforms. These IAs supported research for advanced diagnostics, conservation and restoration of cultural heritage and provided all the access services expected of a world-class European RI for more than 15 years.

IPERION HS is the next evolutionary step in the long line of successful initiatives supported by the EC. It is a giant step, approaching the expected future dimension of the E-RIHS ERIC. The number of TNA providers more than doubled (from 19 to 54). More than 60 institutions from 23 countries, organised around their national nodes, engage in project activities. New heritage science communities are addressed, and new networking activities are targeting key issues in training, outreach, engagement, dissemination, exploitation of the project results towards industrial and social innovation. This exceptional growth was made possible through the long-term experience accumulated in the advanced community of IPERION HS partners as demonstrated through their invaluable knowledge and know-how.

IPERION HS will operate a truly pan-European distributed RI connecting national and regional RIs and facilities. It will be a powerful tool to address the complex questions of research and innovation, although it will also help to structure the heritage science ERA, one of the most challenging and multidisciplinary domains of all applied sciences. To this extent, IPERION HS is committed to becoming the enabling framework described by the Joint Programming Initiative on Cultural Heritage and Global Change (JPI-CH): a key tool to facilitate the delivery of the JPI CH Strategic Research Agenda. The high level of coordination existing among the IPERION HS distributed facilities will enable further integration and improvement of access services and the related JRA and networking activities, to enable better service for the heritage science community. The consortium partners are also working with other national and international initiatives and affiliated scientific communities, promoting joint research projects and participating in prominent cluster initiatives, such as the SSH research infrastructure clusters PARTHENOS[9] and SSHOC[10].

Global cooperation is also a priority on the IPERION HS agenda, supporting the global vision for this community as discussed at the GSO[11]. The self-funded participation of four transatlantic partners testifies of the growing interest in this initiative outside Europe. This participation will boost the strength of both the JRA and networking activities, allowing the cooperation to resonate and have impact on very important heritage science communities in the Americas, to be discussed in Los Angeles at the *Pan-American Workshop on Heritage Science* in 2021. Contact with the group of Chinese institutions, led by the Dunhuang Academy (Gansu Province), and aggregated in the *Alliance on Technological Innovations of Cultural Heritage along the Silk Road Forum* (ATICS), together with other contacts of IPERION HS partners with Chinese institutions, will be the foundation for cooperation with the far East, with organization of a bilateral event in 2022. Both events are under the scope of T8.5.

The ongoing development of national E-RIHS nodes will benefit IPERION HS synergistically. Among these activities are: co-funding of joint initiatives, support for regional dissemination and outreach, and development of services and tools for a future upgrade of the research infrastructure.

IPERION HS will help overall coordination at the European level. T6.2 will create an advisory board specifically devoted to support the sustainable development of the RI through better alignment between countries (as in the Smart Specialisation Strategy) and through a coordinated action to implement IPERION HS achievements in national programmes and agendas, While T7.2 will develop a user organisation to optimally align user expectations and structured user feedback with access provision within IPERION HS.

[7] FP7 – INFRA-2008-1.1.1, GA n. 228330, EU contribution 7.6 MEuro
[8] H2020-INFRAIA-2014, G.A. n. 654028, EU contribution 8 MEuro, (http://www.iperionch.eu)
[9] Pooling Activities, Resources and Tools for Heritage E-research Networking, Optimization & Synergies (http://www.parthenos-project.eu/).
[10] Social Sciences & Humanities Open Cloud (https://www.sshopencloud.eu).
[11] GSO Progress Report 2017: https://ec.europa.eu/research/infrastructures/pdf/gso_progress_report_2017.pdf

1.3.2 Methodology

This proposal is for a three-year project to benefit heritage science user communities, supporting RI operation through its transition from H2020 to Horizon Europe. Most of IPERION HS partners have been involved in both IPERION CH (completion October 2019) and in the preparatory phase of E-RIHS ERIC (completion January 2020). To maximise alignment, the proposal is to minimise divergences between the IPERION HS governing structures and the structures planned for the future E-RIHS. From this fundamental premise, the requirement emerges that only potential national nodes of the future ERIC could become beneficiaries of IPERION HS. This enables the national nodes to align their national partnerships with the future RI structure, which will minimise any organisational issues emerging at the start of operation once the sizeable distributed RI is set to start operating. Moreover, all partners appointed their E-RIHS national coordinators as members of the IPERION HS Governing Board. The governance body of the project will thus be shaped as a "national coordinators committee", and IPERION HS will thus provide a period of adjustment allowing these key national representatives to work together effectively. The three TNA platforms in IPERION HS are led by three individual WP leaders (i.e. Platform Coordinators), cooperating with WP8 to develop an integrated system of user services with a unique access point. WP8 will provide the framework for most of the activities developed by IPERION HS Central Office. These central support activities allow more efficient project operation, including keeping track of all the processes of monitoring of services, data management, communication, dissemination and generation of data, and thus useful for the assessment of KPIs for quality control. The WP focusing on joint research initiatives (WP5) and two networking WPs (WP6 and WP7) complete the proposal structure.

The thorough consultations preceding the development of this proposal resulted in a vision that is shared by the partners, with our aligned expectations enabling the development of this exciting, deeply multidisciplinary but nonetheless highly cohesive partnership.

The following sections outline the general approach and methodology of the main project activities, while the scientific and technical approach is detailed in Section 3.1.3.

Trans-national access (TNA)

The IPERION HS catalogue of world-class facilities that couple advanced scientific tools with cutting edge heritage science expertise, will be made available to academic and industry researchers through three Trans-National Access platforms, centrally managed to provide the highest degree of integration. Three WPs provide the required platform frameworks: ARCHLAB (WP2), FIXLAB (WP3) and MOLAB (WP4), the concepts of which have proven to be highly successful. The platform structures and titles have been preserved due to their proven functionality. They also represent *de facto* brands of heritage science TNA, ensuring continuity and clarity for past and future users:

- IPERION HS ARCHLAB: access to physical (and digital) data collections that constitute valuable research resources, such as objects, technical images, samples and reference materials, analytical data and conservation documentation, as stored in museums, galleries, conservation and research institutions, including related unique expertise;
- IPERION HS FIXLAB: key fixed facilities for heritage science research – e.g. particle accelerators, neutron and laser sources and other essentially non-transportable research facilities;
- IPERION HS MOLAB: access to a comprehensive selection of mobile analytical instrumentation for non-invasive measurements (ranging from point analysis, 2D/3D imaging, hyperspectral imaging and remote sensing) on objects, collections, buildings, and sites, allowing *in situ* investigations for complex multi-technique diagnostic projects.

The TNA provision consists of a high-quality catalogue of the most advanced European heritage science facilities with a substantial increase of the offer compared to IPERION CH. Excellence-driven access mode will be ensured through a quick, efficient and transparent proposal evaluation and selection process involving internationally leading experts and leading users.

The prominent innovation in IPERION HS TNA will include a new, integrated peer-review system operated through three Peer Review Panels - PRP (one per platform), supported by experts involved in the evaluation of the proposals according to their expertise (cf. Section 3.2.1.2). The experts will be selected from a database used by the PRP, populated with heritage science experts, preferentially with recent experience with RI access (expert users). Users will design proposals to apply for multi-instrument and multi-facility research projects, aligned with the complexity of their research questions.

The second key innovation benefitting users is the significantly wider range of tools and services included in the platforms, emerging from the more than doubled number of access providers, coming from a higher number of countries (16, compared to 11 previously). The IPERION HS Access Board will support users and access providers to facilitate the offer of integrated and multi-disciplinary TNA. This will result in significantly renewed access pipelines – including TNA data management procedures – and provide input for the platform PRPs (jointly managed in T8.1). Competitive TNA calls will be open to both academic and industrial research communities, ensuring full support both for excellent scholarly research projects and innovative enterprises. The detailed procedures for TNA access within the project are found in Section 3.1.3 and WP2-WP4.

The major innovations in the IPERION HS TNA platforms are highlighted below:

- ARCHLAB will now provide access to organized scientific information in largely unpublished datasets from 13 archives of prestigious European museums, galleries and research institutions. In total, IPERION HS has three more facilities than previously, thus enhancing the ARCHLAB services;
- More than 20 new instrumental facilities have been added to MOLAB, the distributed mobile laboratory for in situ non-invasive characterisation of valuable, fragile or immovable objects/collections, buildings and sites, which now totals 38 advanced mobile analytical instruments. The capacity of MOLAB has been specifically in relation to close-range hyperspectral imaging and ground/aerial remote sensing to meet the emerging needs of the HS research community. Most of the instruments are very recent updates through EU national and regional funds, while one new instrument was developed by the JRA of IPERION CH;
- A striking innovation in the FIXLAB access is the inclusion in the catalogue of 18 new providers, in stark contrast with the previous 4, bringing new diagnostic capabilities for high-level scientific investigation of samples or whole objects, and extending them to new fields such as palaeontology and preventive conservation (see WP4 for details).

The IPERION HS consortium proposes 1635 days of TNA to an estimated 759 users, who will be selected by external peer-reviewing procedures based on scientific quality criteria, developing research projects within 54 distributed facilities in 16 countries.

Joint research activities (JRA)

While IPERION HS is investing about half of its resources to support the extended catalogue of TNA services, the consortium proposes five JRAs which are key for the improvement of future access services. This will advance the knowledge and capacities of the consortium beyond the state-of-the-art, ensuring long-lasting relevance and competitiveness of the RI. Each JRA addresses the advancing of capacities and capabilities in all the three TNA platforms and particularly in the heritage science data management of IPERION HS, to provide improved access services to scientists and other professionals in heritage science across Europe.

IPERION HS will, through the JRAs (WP5), develop key interoperable methodologies to enable innovative studies of heritage assets in a unified process, enhancing the capacities of its distributed facilities. The proposed developments follow the most significant research questions and scientific challenges, identified in a process of wide consultation with the heritage science research community. The developed methods will be made available in the ARCHLAB, FIXLAB and MOLAB access platforms and in the future E-RIHS DIGILAB platform. This approach capitalizes on the results of JRAs in previous project, significantly progressing towards effective integration of access, enhancing comparability across platforms, and, most critically, enhancing the currently almost absent interoperability of physical and digital tools. This will lead to the development of a thoroughly integrated European RI.

The targeted JRA programme is comprised of five actions and takes advantage of the current opportunities in scientific and technological development. It addresses research needs in challenging areas of diagnostics, and in sharing, using and re-using of heritage data. The enhanced impact of the partners' joint effort will be achieved through collaboration on several jointly identified and agreed research targets and thus represent shared interests in our multi-disciplinary consortium, as well as research community needs.

The main goals of the five IPERION HS JRA actions are the following:

- Development of methods and optimised instruments to enable the RI to effectively address the needs of preventive conservation;

- Development of a cross-platform data infrastructure, accessible both in the field and in the lab, to innovate the integration of archaeological documentation, data and collections;
- Optimization and implementation of analytical monitoring strategies to prevent potential damage to objects when measured under intense beams;
- Enhancement of heritage science data skills of the platform access providers – description, accessibility, preservation, sharing, re-use – supporting the process of making heritage data FAIR and exploring the optimal uses of EOSC by the heritage science community;
- Development of methods and optimisation of RI instruments to bring new description strategies to paleontological and paleoanthropological specimens from natural history collections.

The detailed description of the scientific and technical innovation in the proposed JRAs is in Section 3.1.3, WP5. The consortium foresees cutting-edge scientific and technological development, pushing the boundaries of heritage science (WP6).

Networking activities (NA)

IPERION HS Networking Activities represent a coordinated approach to key issues in the integration of national nodes and facilities into a fully operational pan-European RI. NA will bind IPERION HS resources together, and reinforce the links between partners and multi-disciplinary communities. Three WPs will provide the development of networking activities in the project: WP6, 7 and 8.

WP6 will implement actions to support interoperability, sustainability, exploitation and innovation. This WP focuses on impact. It encompasses actions to maximise the project impact in several areas where exploitation of project results is foreseen to have significant influence on future initiatives. It will help to define pipelines for heritage science innovation in enterprises in different domains (technological, cultural, creative industries). WP6 will also develop interoperability of: data, methods and instruments, and will promote sustainable development of national RI facilities in a coordinated way. Finally, WP6 will enhance the potential for exploitation of the results and expertise in the future E-RIHS ERIC.

WP7 activities are centred on user engagement. WP7 will implement training, but also engagement of scholars in new user communities. To widen the user base of the RI, new communities in heritage science will be addressed by specific engagement activities. Training initiatives will promote the use of the RI by new users, increasing the added value of RI services. Development of the User Forum and Organisation for the heritage science RI will be a concrete outcome with the aim to engage users in an organised way, giving them a voice in the management structures of IPERION HS and in the future E-RIHS ERIC.

WP8 will represent the organisational core for all the centrally supported activities, operating as a central office of an RI. WP8 will carry out activities supporting all the WPs and project actions, enabling high level of integration between WPs and Tasks. Moreover, WP8 will focus on communication, dissemination and development of international relationships.

1.3.2.1 Gender dimension analysis

Gender equality is not a common issue in the multi-disciplinary heritage science domain: neither in research teams, as there is usually an excellent gender balance, nor in the potential objects of research and innovation, as these are generally gender-neutral. IPERION HS will continued and enhance this commitment with guidelines in accordance with the relevant EU gender policies[12] and to apply them to HS.

Gender balance is reflected in the key consortium personnel. The Steering Committee will adopt a proactive action plan to avoid imbalances. In particular, the national nodes participating in the consortium will commit to involve both genders and non-binary individuals at all levels of participation in the project, without bias. Each partner will take heed of the equal opportunities policies in their member states, and of European legislation in this area, and explore the implications for staff within the project. IPERION HS quality management processes will monitor gender balance in all activities, among TNA users and participants in project events.

[12] http://ec.europa.eu/research/swafs/gendered-innovations/index_en.cfm?pg=home

The strength of European heritage science research is globally recognised. It consists of an active and culturally diverse network of institutions working in a wide variety of scientific disciplines, applied to a broad range of our cultural heritage, ranging from collections of individual works of art or historic objects to large scale archaeological sites, palaeontological assets or historic buildings. Heritage scientists work in diverse research environments, ranging from research institutes (specialised or not), to research groups or individuals in heritage institutions such as museums, galleries, libraries and archives, and organisations responsible for built heritage and archaeological sites. European research groups, also through the projects preceding IPERION HS, have pioneered the development of instruments and databases of unparalleled quality, frequently accessed by researchers from all over the world. This ecosystem is rich and creative, multi-disciplinary and vibrant. To avoid fragmentation, duplication of effort and isolation of small research groups, further integration of the European heritage science research area remains a priority.

IPERION HS will deliver innovation in heritage science by interfacing humanities research with science, technology, engineering and mathematics (STEM), as well as ICT, thus fostering the culture of multi-disciplinary exchange and cooperation to enable growth of the ERA. IPERION HS will be the tool to improve the interaction and the integration between these communities involved in heritage science, by providing a level of pan-European engagement which has not been achieved before. IPERION HS is committed to overcoming on-going limitations and to break down barriers to the wider use of multi-disciplinary scientific methods by a growing community of users, advancing knowledge and the international role of European heritage science research.

1.4.1 Advancement beyond the state-of-the-art

Following its mission, and its nine objectives (Section 1.1.2), IPERION HS will significantly advance beyond the state-of-the-art in many areas. Its core business is to provide high-quality TNA to the widest possible community of users (objective 1), therefore, a highly extended catalogue of services will be made available. This will decisively expand the capacities offered by the RI to enable excellent research. Concerning objective 2, the IPERION HS JRAs will further advance the scientific and technical excellence of the infrastructure, which are already at the forefront of global heritage science research. The activities planned in IPERION HS to open data and reference collections in heritage science (objectives 3, 4 and 6), developed both in the JRA (T5.4) and in a networking activity (T6.3) will create synergy with digital heritage science research in other projects (e.g. the SSHOC cluster) accelerating the process towards optimal use of the EOSC. To release the potential of heritage science research (objective 5), the proposal will innovate and focus on the impacts of heritage science, advance the exploitation of IPERION HS results, and, more generally, promote the transfer of value between heritage science and society at large. The enhanced use of the RI by new communities and by new user groups (objectives 7 and 8) will be the outcome of outreach, training and engagement activities in WP7. Finally, EU heritage science will be put at the centre of a strong international cooperation program (objective 9) through the project as a whole, considering the participation of four non-EU RIs, and more specifically through T8.6.

Advancement beyond the state-of-the-art is expected also on much wider project missions, such as:

Support the establishment of a permanent European RI. IPERION HS activities will greatly promote the convergence of a very large number of national facilities towards E-RIHS ERIC, the permanent pan-European distributed RI. The consortium is very close to becoming pan-European, as it includes 24 partners from 23 countries, of which 18 are Members States, 2 Associated Countries and 3 Third Countries. Further work will be undertaken to establish collaboration with facilities of recognised excellence in countries not yet included in the partnership. The TNA services that will be provided are of a high level of quality and are demonstrably state-of-the-art. Remarkably, more than 80% of the partners are access providers, an increase from 70% in the previous project.

Bridging heritage science communities across the ERA. Heritage science is a young and cross-cutting scientific domain embracing a wide range of research disciplines enabling deeper understanding of the past and improved care for the future of heritage. Heritage science is the result of multi-disciplinary combination of many natural science domains with a variety of humanities disciplines. The sector is still in need for the establishment of scientific network at EU level, and the activities of IPERION HS would provide a unifying factor, bringing together researchers to effectively recognise a new common multi-disciplinary scientific

identity. As the RI enabling heritage science, it will aggregate user communities and help the alignment of heritage science strategies, supporting the JPI CH research agenda. It will also play a major role in reducing fragmentation within this research domain, allowing deeper integration between the multi-disciplinary communities involved and more effective structuring of the ERA. IPERION HS is also playing a prominent role in the environment of existing initiatives within the humanities, particularly through collaboration with other RIs and e-Infrastructures and cluster initiatives. IPERION HS has strong and fruitful collaborations with several ESFRI landmarks and projects, such as: DARIAH ERIC, CERIC ERIC, DiSSCo and EHRI.

Global leadership in heritage science. IPERION HS will pursue stable integration of European world-class facilities and resources to create a cohesive entity playing a leading role in the global community of heritage science. The global landscape of RIs for heritage science is perhaps more fragmented than the European one, with some notable exceptions. There is a well-justified view of Europe being a global leader in heritage science, which need to be maintained. For IPERION HS, operating at a global level will not imply scientific competition, but rather mutual learning and cooperation with international RIs in heritage science on major issues in the study and conservation of world heritage.

1.4.2 Innovation potential

The rich and multi-disciplinary research environment of the IPERION HS advanced community is the foundation for translation of scientific knowledge into technological, social and cultural innovation. To achieve this seamlessly, IPERION HS will adopt the Open Innovation principles,[13,14] which offer participation in the innovation process to all partners, to allow free knowledge circulation and its transformation into products and services for new markets, and to foster a stronger culture of entrepreneurship. This implies an evolution, from a model based on bi-lateral transaction and collaboration, towards a more dynamic, networked, multi-collaborative system that generates innovation at several levels. To that purpose, IPERION HS will implement a user-centred strategy, where users of the RI, as 'distributed' sources of knowledge, become integral part of the process of co-creation of knowledge – and through knowledge, of value. Users are then key to generation of innovation.

Through the synergistic development of IPERION HS integrating activities, the innovation potential of the infrastructure will advance in several aspects:

Technological innovation. The integrating activities in the projects preceding IPERION HS have made clear that new knowledge for CH preservation and management, innovative methods and new instrumentation improve RI capacities and broaden the spectrum of services provided to users. Advances concerning multi-scale coupling of analytical methods and the fusion of information generated by complementary techniques applied to the study of materials and objects have resulted in key instrumental improvements in the performance of workstations and beamlines at many facilities within the consortium. Exploitation of the latest developments in compact instrumentation that combine complementary techniques in custom-designed, mobile/portable, hybrid instruments nowadays enables scientists to pursue multi-analytical studies more effectively. On the other hand, developing methods to optimally integrate and easily handle documentation and analytical information enables European researchers and scholars working within the remit of cultural heritage to make the most efficient use of diverse types of data obtained by different methods and instruments.

Open innovation approaches will be implemented in TNA activities to foster dynamic involvement of cultural and creative industries and SMEs in the generation of new knowledge and products. Collaborations aiming at generating innovation will make use of the afore-mentioned co-creation principle, where these sectors will benefit of the different access modes of IPERION HS. In this way, the IPERION HS RI will, as a distributed infrastructure on the supply side of new knowledge, act as a testbed or as a benchmark for the more established methods or devices for heritage research, conservation and preservation. IPERION HS TNA will support this activity by adoption of new reference materials, good practices and shared measurement protocols, conditions for safe analysis, new archival materials and new digital tools, all enhancing the basis for technical innovation and economic growth in the cultural heritage sector.

[13] https://ec.europa.eu/digital-single-market/en/news/open-innovation-open-science-open-world-vision-europe

[14] Chesbrough, Henry (2006) http://openinnovation.net/Book/NewParadigm/Chapters/index.html; "Open Innovation: A New Paradigm for Understanding Industrial Innovation," in H. Chesbrough, W. Vanhaverbeke, and J. West, eds. "Open Innovation: Researching a New Paradigm". Oxford: Oxford University Press http://hchesbrough.wpengine.com/NewParadigm

To comply with the above, the transnational access activities of IPERION HS (WPs 2, 3, and 4) are designed following an integrated approach, that regardless of the type of access (ARCHLAB, FIXLAB or MOLAB), shares a common structure. This is based on interaction with users, management of proposals, access delivery, as well as support and services for users. Innovation in the access procedures is foreseen in relation to previous projects. Due to its distributed nature and its wide geographical coverage, IPERION HS will support the management of innovation in heritage technologies and in the heritage sector through coordinated planning at regional and local level. This is a more effective strategy than if developed centrally, and subsequently implemented in target regions by local stakeholders.

Social and cultural innovation. The social, societal and public-sector dimensions of innovation of IPERION HS will help to respond to European great challenges involving cultural heritage[15] as contributor to a more inclusive, resilient, sustainable Europe with stronger capacities in global partnership by reinforcing international cooperation. IPERION HS will strongly reinforce the heritage science and conservation sector in Europe and its global leadership and will also impact the economy and industrial sector by developing its role as an ecosystem of innovation through stronger links with the societal environment.[16] An important aspect of social and cultural innovation of IPERION HS will come by contributions to training a world-leading new generation of researchers and professionals through access leading to PhDs and specific training events designed in WP 7.

Technological, social and cultural innovation within IPERION HS are closely linked. Namely, development and assessment of new technologies, analytical tools and approaches for the study of cultural heritage will yield a better understanding of artefacts and generate new insights into preservation. in addition, social and cultural innovation will be derived from the implementation of open data resources and management for cultural heritage. Examples are virtual access to data and tools for heritage research and searchable registries of multidimensional images, analytical data and documentation from large academic as well as research and heritage institutions.

[15] Commission Staff Working Document, European Framework for Action on Cultural Heritage Brussels, 5.12.2018 SWD (2018) 491 final.

[16] Innovation-oriented cooperation of Research Infrastructures, European Strategy Forum on Research Infrastructures Innovation Working Group, ESFRI Scripta Volume III, January 2018.

2 Impact

Heritage science is a cross-disciplinary scientific discipline leading to improved care for heritage and its understanding and can have a decisive impact on sustainable development. IPERION HS provision of services for advancing heritage science can produce different impacts in different fields and on different time scales. The following discussion provides an overview of how IPERION HS, by supporting heritage science, research and technology, with their culture of multi-disciplinarity, collaboration and inclusion, beyond having several direct and indirect impacts, can also contribute to the global Sustainable Development Goals[17].

IPERION HS main impacts

The specific impacts that IPERION HS is expected to lead to can be divided into direct (short-term) and indirect impacts.

Direct impacts

- As expected from any research infrastructure, the main field of impact is **science**. Increased efficiency in co-creation of knowledge is expected resulting in **enhanced scientific production** in the heritage science community. The mission of IPERION HS is to facilitate and improve the availability of high quality services to the community. Being an emerging, multi-disciplinary, though currently fragmented research community, a unique point of access facilitating and coordinating TNA to technologies, data and skills of excellent quality is expected to improve the efficiency and effectiveness of research production.
- Another impact related to the existence, even if *ad interim*, of an RI for heritage science is its **enabling** power. IPERION HS aims at operating the **enabling framework** (as described by the JPI CH[18]) to facilitate the development of four themes of the JPI CH Strategic Research Agenda: 'Developing a reflective society', 'Connecting people to heritage', 'Creating knowledge' and 'Safeguarding the cultural heritage resource'.
- Human capital formation: in addition to TNA, networking activities organised by IPERION HS will benefit the scientific community. For example, training events, including hands-on specialised training either on site or at large-scale facilities, will have an impact on scientific development of junior heritage scientists enhancing their capability to exploit the advanced technological offer of the RI, developing their future careers in the field.
- Lifelong learning of staff in charge of operation of IPERION HS facilities. Operators will be trained in the application of protocols and in the use of the best available tools for data sharing. This internally oriented training will positively impact on the quality of services provided by the RI.
- Public engagement, dissemination events and outreach activities. The IPERION HS programme of outreach, aimed at informing the public on advances in HS (such as permanent or temporary exhibitions, special events, open days, lectures, workshops, conferences etc.), will inform and affect the European public as well as public administrators, who will benefit from better non-technical knowledge, awareness and understanding of artistic and cultural assets, including those with tourism potential.

Indirect impacts

The activities of IPERION HS have the potential to achieve wider socio-economic impacts, provided that certain facilitating conditions are ensured. These impacts can be facilitated by IPERION HS but to fully materialise they need additional investment, activities and actions undertaken by different stakeholders. They relate in particular to:

- Impact on access to culture and tourism. These effects can be derived from innovation in museums and heritage sites based on application of the knowledge and experience developed in the context of IPERION HS and further exploited downstream. They may be new products or services enriching the cultural offer, development of new narratives and communication tools for visitors and similar.
- Innovation and knowledge transfer to other sectors. IPERION HS will make use and develop key enabling technologies and competences in particular in the ICT sector related to the development of digital standards, protocols and software applications. The application of these may expand to sectors

[17] The UN 2030 Agenda for Sustainable Development (https://sustainabledevelopment.un.org/post2015/transformingourworld)
[18] JPI CH is the Joint Programming Initiative on Cultural Heritage and Global Change (http://www.jpi-culturalheritage.eu/)

other than HS. The impact of innovation and knowledge transfer will be felt by SMEs, public administration as well as citizens.

- Science and cultural diplomacy and policy. IPERION HS will have an impact on cultural identity at national and European levels, as well as on cultural diplomacy and soft power in bilateral and international relations. Institutional activities including participation in international conferences and events, as well as advocacy activities related to cultural activities and policies, will have positive impacts not only on the development of cultural policies but also on broad international diplomatic relationships. This will be achieved as long as the influence of IPERION HS spreads globally. The inclusion of E-RIHS in the GSO as well as its collaboration with ICCROM are indications of this potential.

IPERION HS and the SDG in Agenda 2030

The potential impacts of heritage science activities on the Agenda 2030 will be reinforced by IPERION HS. The enabling activities promoted by this proposal will be empowered by the collaborating institutions across 21 countries, mobilising a high number of multi-lateral cooperation initiatives. This will maximise the potential of achieving significant impact on SDGs in the aspects discussed below. Heritage science will foster the development of at least 7 out of the 17 SDGs:

Goal 3. Ensure healthy lives and promote well-being for all at all ages

3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being

Engagement with heritage is essential to the definition of a community, and it defines how we engage with our environment as individuals, i.e. to our sense of time and place. Loss of access to heritage has been shown to have a major impact on the loss of social purpose by migrants, and shared heritage is essential to the development and health of communities. On the level of an individual, heritage science has shown that hospital recovery rates are faster if individuals have the possibility to connect with heritage objects on a personal level. For dementia patients, reconnecting with memories and heritage decreases the rate of memory loss. Nationally, social prescription is thus already being explored as a mechanism to ensure access to social services including access to heritage, which demonstrates that the understanding of the role that cultural heritage plays in health and well-being is rapidly reinforcing. Heritage science plays an essential role in this, as it participates in the development of the expertise and social tools that contribute to the Goal.

Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending

Heritage science is part of a unique innovation chain that includes public bodies, independent organizations, as well as individuals, which are an integral part of the heritage industry. The field directly addresses four specific industries: (i) construction industry, which includes significant sectors of building conservation (which fosters sustainability via upkeep, use and reuse of buildings), commercial archaeology, as well as development; this industry has been sensitized to heritage through national heritage protection plans, so policy frameworks for engagement exist; (ii) creative and digital industry, which often requires heritage science services in relation to digitisation and provision of digital data and services, as well as access to heritage landscapes, sites and urban centres, e.g. for the media industry; (iii) conservation services, including instrumentation, are an integral part of the innovation chain leading to conservation of heritage as a resource, which requires a sustainable approach, which has already led to major advances in green conservation, i.e. environmentally sustainable conservation; (iv) tourism, as a form of direct exploitation of heritage with its direct and indirect services. These are highly dynamic and innovative fields that require a sustainable approach to resource exploitation, which is where there is a unique place for heritage to develop sustainable models of engagement, value creation and job creation.

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable

11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage

11.B By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels

Heritage science is a key driver in the safeguarding of the world's cultural and natural heritage. Science is an integral part of conservation curricula. Investment in heritage scientific research is increasing on national levels and increasingly so at international levels, such as the EU or the World Bank. One of the greatest challenges of heritage science is working towards the development of resilient communities particularly in environments at risk by studying how past cultures have adapted to such risks and proposing solutions for the future. Cultural heritage is always embedded in the broader natural environment, and there is but a thin line between cultural landscapes and natural landscapes, therefore, sustainable management of cultural environments seamlessly links with sustainable management of natural environments. Furthermore, management of indoor environments in collecting institutions has led the transformation of the built environment where largest benefits can be made in relation to energy efficiency and CO2 emissions. There are many case studies to prove how management of cultural heritage has promoted, indeed led, sustainable and resilient use of resources. The resilience of heritage to climate change, resilience to disasters is in a topic of research that can only be pursued by experts in the heritage science field. At an urban level, cities such as Florence are excellent examples where e.g. the flood in 1966 created a decisive impulse to the birth of modern conservation and restoration which provided the basis for the development of heritage science.

Goal 12. Ensure sustainable consumption and production patterns

12.B Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products

Through sustainable tourism and use of heritage as a resource, this sub-goal is closely linked to Sustainable Development Goal 8.9. Sustainable use of cultural heritage needs to take economic, social and environmental aspects into accounts, that have an impact on the livelihoods of local communities, preservation of crafts and intangible heritage and practices that are part of sustainable tourism. Heritage science contributes to the understanding of how effective cross-generational transfer of production can be achieved sustainably. Properly managed cultural tourism respects the balance of heritage and its social and natural environments. Only by doing so, local communities can take advantage of the available cultural heritage resources such that a balance between use and conservation can be achieved. This is enabled by heritage science, which e.g. includes the development of digital and digitally manufactured material copies of artworks and sites to decrease the pressure on the non-renewable original. Through examples like this, heritage technologies contribute to increased employment on a regional and local level, strongly contributing to development of knowledge-based economy. As an example, the small village of Belmonte (Portugal) used the fact that the person who discovered Brazil had their roots in the village, which served as the inspiration to establish the Museum of Maritime Exploration, now attracting visitors and offering a demand for local traditional crafts, restaurants and accommodation.

Goal 13. Take urgent action to combat climate change and its impacts

13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Heritage science supports the development of (i) the resilience of historic structures and historic urban centres to climate change, and by studying past adaptations it can inform policies and develop construction practices that can benefit local communities on very practical levels; (ii) through exploration of how social migration affects what is perceived as heritage, we promote the development of identity as social migration follows climate change, and make societies more resilient; (iii) through the development of technical solutions for monitoring and early hazard identification, e.g. using satellite and sensor technologies, heritage science substantially contributes to the resilience of both cultural heritage and communities living with cultural heritage in risk zones. This SDG is closely aligned with SDG11, however, there are specific fields of expertise in heritage science related to the response of the built environment to climate change and what the effects

could be in the future, such as increased (or changed) poll[ution] levels, biodeterioration, risk of weathering, risk of coastal erosion etc. All of these risks have already been mapped and case studies developed on how climate change might impact heritage and inhabitants, and policies developed. This attests to the huge potential for heritage science to contribute to SDG13.

Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

16.4 By 2030, significantly reduce illicit financial and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organized crime

In times of conflict, heritage trafficking is endemic. Heritage science provides methods of authentication, provenancing, dating and documentation that are essential in the fight for the return of stolen heritage assets to their rightful owners. Using satellite tracking of structures or tracking of individual objects, illicit trade can be pursued and successfully brought to justice. Using advanced imaging and reproduction methods, it is possible to produce close-to-real replicas of structures that have been destroyed in conflict and thus achieve some reconciliation even in the most difficult cases of grief over lost heritage. Furthermore, cultural heritage is fundamental to culture. It forms a central link between citizens and their social environment, and it is fundamental to understanding – and promoting – cultural diversity and global citizenship. Sustainable engagement of citizens with heritage requires of us to engage with many possible futures and thus requires social, economic and environmental reflection. The latter is important e.g. in the study of natural history collections, as well as the study of the dialogue between natural and cultural landscapes and buildings, which promote ideas of mutually reinforced coexistence of cultural and natural diversity.

Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development

17.6 Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism

17.7 Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed

17.9 Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the sustainable development goals, including through North-South, South-South and triangular cooperation

The field of heritage science is in the process of developing a global research infrastructure that will support scientific research into understanding and management of cultural heritage, wherever it is found. This principle fundamentally supports SDG17 as by supporting sustainable heritage management regionally and locally, heritage science contributes to stronger communities as well as development of crafts, manufacture and technologies, necessarily using locally sourced raw materials and processes, thus supporting local development and knowledge-based growth. Heritage, as is defined locally irrespective of geography, is uniquely and uniformly distributed across the globe, therefore, heritage science has the capacity to become the unique driver for a revitalized global partnership for sustainable development. Capacity building in sustainable heritage preservation, enabled through a global system of scientific cooperation, is one of the missions of the global heritage science research infrastructure. The primary aim of training is to develop knowledge that is cutting edge, however, given that heritage is local, such knowledge also needs to be applicable locally in order to be relevant. By following this strategy, we will enable sustainable sharing of knowledge within the communities, where principles of sustainable development need to be promoted and where heritage can be found. This will enhance North-South, South-South and triangular cooperation.

With respect to the expected impacts as described in the Work Programme (listed below in *Italic*), IPERION HS will deliver as follows:

EI(1). Researchers will have wider, simplified, and more efficient access to the best research infrastructures they require to conduct their research, irrespective of location. They benefit from an increased focus on user needs.

IPERION HS will provide heritage science researchers with a unique access point to a comprehensive catalogue of cutting edge services (WPs 2, 3 and 4), in an extended range of excellent facilities in the three platforms ARCHLAB, FIXLAB and MOLAB. The substantially improved access procedures, unified for the three platforms and introducing a stronger involvement of users in the decision processes, will guarantee an excellent user experience. Task 7.2 will develop a user organisation to provide quality feedback.

EI(2). New or more advanced research infrastructure services, enabling leading-edge or multidisciplinary research, are made available to a wider user community.

The catalogue of services of IPERION HS has increased from 19 to 52 providers, with the inclusion and the reinforcement of specific services for new communities of users (in particular palaeontology and archaeology).

EI(3). Operators of related infrastructures develop synergies and complementary capabilities, leading to improved and harmonised services. There is less duplication of services, leading to an improved use of resources across Europe. Economies of scale and saving of resources are also realised due to common development and the optimisation of operations.

Interoperability is one of the key aspects of IPERION HS operation. Joint decision-making on how to improve services (e.g. in Task 6.2) is a clear indication of the engagement of the heritage science community in alignment of research and harmonisation of methodologies across the EU and beyond.

EI(4). Innovation is fostered through a reinforced partnership of research organisations with industry.

As stated before, there is a strong link between research and industry of relevance to our scientific domain. The entire WP6 will focus on innovation and exploitation. Implementing Open Innovation principles will promote the partnership of research organizations with SMEs, cultural industry and policy-makers. Coordinated communication and dissemination organized within WP8 will help to establish the audiences to efficiently target the stakeholders.

EI(5). A new generation of researchers is educated that is ready to optimally exploit all the essential tools for their research.

Training of PhDs through access and dedicated training events (WP7) will develop junior researchers to make the best use of resources available at the European level, in terms of expertise, instrumentation, techniques and archival material, for conducting their heritage science research. By pursuing their professional careers in academy or in the industrial sector, the researchers will strengthen the links of the RI with these sectors.

EI(6). Closer interactions between larger number of researchers active in and around a number of infrastructures facilitate cross-disciplinary fertilisations and a wider sharing of information, knowledge and technologies across fields and between academia and industry.

Opportunities for multi-disciplinary research will be increased due to access enabled to the IPERION HS facilities. Full implementation of the co-creation principle, joining the user and provider expertise, will lead to continuous cross-fertilisation and a better service to all researchers accessing the RI.

EI(7). For communities which have received three or more grants in the past, the sustainability of the integrated research infrastructure services they provide at European level is improved.

The sustainability of the integrated services provided by IPERION HS will be ensured through the future E-RIHS ERIC, as the IPERION HS consortium is determined to support the steps required for the implementation of the E-RIHS ERIC (thus capitalizing on the efforts carried out by the E-RIHS Preparatory Phase project, a H2020 Coordination and Support Action, which included participation of the majority of IPERION HS partners). The integration of national RIs in a sustainable European RI will support the

development of the ERA in Heritage Science. Task 6.2 focusing on sustainability will ensure balanced and sustainable development of the heritage science sector in Europe.

EI(8). The integration of major scientific equipment or sets of instruments and of knowledge-based resources (collections, archives, structured scientific information, data infrastructures, etc.) leads to a better management of the continuous flow of data collected or produced by these facilities and resources.

Implementing Open Access EU strategy[19], participation in EOSC[20] and application of the FAIR principles[21], and good practices such as those adopted e.g. by DANS-KNAW[22] to well-documented, high quality research data derived from access to IPERION HS facilities will open up opportunities for the transfer of technologies and knowledge. Additionally, impact on heritage science innovation locally, regionally and globally will be ensured.

EI(9). When applicable, the integrated and harmonised access to resources at European level can facilitate the use beyond research and contribute to evidence-based policy making.

The above discussion of the possible impacts of heritage science on SDGs reinforces this EI. IPERION HS community is dedicated to using the power of heritage science as a global tool for science diplomacy and policy-making. Actions in T8.5 will be implemented to support the process.

EI(10). When applicable, the socio-economic impact of past investments in research infrastructures from the European Structural and Investment Funds is enhanced.

More than 50% of the facilities providing TNA in IPERION HS have been partly or entirely funded by ESIF. ESIF will remain a fundamental tool to ensure that a distributed RI such as IPERION HS is upgraded and extended.

2.2 Measures to maximize impact

Plan for the dissemination, exploitation and communication of the project's results

Maximised impact of research activities will be enabled by three WPs: WP6, WP7 and WP8. WP6 will promote exploitation through promotion of innovative solutions, re-use of data and other project results by further EU initiatives, and by the E-RIHS ERIC in particular. It will define the strategy of delivering impact on the national heritage science RI facilities. WP7 will contribute to impact through training and engagement of user communities in new fields of heritage science, and through training of researchers on the main developments in the project. However, it will also enable the development of a strong user community, through development of the forum and of the user organisation. WP8 will ensure targeted dissemination (T8.4) and focused communication (T8.3) of the project initiatives and major results, supporting their exploitation by the scientific community, industry and the society more generally. Though these three WPs, IPERION HS will reach out to policy makers, citizen organizations, European foundations, intergovernmental organizations and the general public. Plans for dissemination and communication will include both static (such as the website, relying on the interest of external people) and dynamic tools (e-mailing, social networking etc.) to optimize the engagement of different audiences and to serve the variable purposes and project aims. IPERION HS will strive to maximise its impacts, also exploiting the extraordinary public exposure that several members of its consortium enjoy: museums and galleries that are among the most visited in the world, attracting tens of millions of visitors annually, and millions more who engage with their collections online, accessing knowledge about the European heritage communicated in a cutting-edge manner.

[19] Open Access EU policies: http://ec.europa.eu/research/openscience/index.cfm?pg=openaccess
[20] European Open Access Cloud: "Prompting an EOSC in practice", Final report and recommendations of the Commission 2nd High Level Expert Group on the European Open Science Cloud (EOSC), 2018.
[21] Turning FAIR into reality. Final report and action plan from the European Commission expert group on FAIR data. 2018.
[22] DANS: Preparing data for sharing. https://dans.knaw.nl/nl/over/organisatie-beleid/publicaties/DANSpreparingdataforsharing.pdf

2.2.1 Dissemination Plan - draft

2.2.1.1 Dissemination activities: objectives and targets

The consortium of IPERION HS is an advanced well-established community whose objective is to respond to strategic challenges in heritage science. Responding to these challenges, IPERION HS dissemination is highly impact-oriented and focussed on the following pipeline:

The activities will aim at long-term objectives: to maximise the impact of project results and to ensure the sustainability of the RI. In line with this vision, shorter-term objectives have been developed as follows:

- To raise the awareness of scientific communities and stakeholders of the project, its results and its innovations
- To engage communities of potential users, through training activities and focused events
- To enable mutual learning through exchange with other initiatives in the heritage domain
- To maximise the impact of project results in collaboration with users, stakeholders, the scientific community and the society.

The inclusion of some of the most visited museums and galleries in the world within the consortium will enormously increase IPERION HS potential impact, thus multiplying opportunities for dissemination and engagement of new users. IPERION HS dissemination activities will strongly involve the users at different levels through the organization of Users Forum online, the establishment of a heritage science User Organisation and the organisation of training activities, as described in WP7. This former work package is devoted to boost dissemination and innovation through a closer engagement of new communities across the lifecycle of the access process (pre-access, access, post-access). Together with SSH community, built environment, palaeontology and archaeology communities, joint events and shared conference sessions and presentations will be organized to share knowledge, discuss research issues and collect needs of the different domains and sectors.

2.2.1.2 Dissemination strategies

A **dissemination plan** (DP) will be delivered in M10 (D8.4) defined by a detailed dissemination strategy: outlining specific objectives, identifying key audiences, identifying communication and dissemination tools. The plan will set a clear temporal framework for dissemination activities. In the dissemination plan, targets in terms of areas and audiences will be clearly identified and dissemination channels and tools will be identified to efficiently deliver the dissemination strategy.

An **editorial committee** will be established, at the kick-off meeting, with the role to actively promote dissemination. The editorial committee will be responsible for the quality and impact of the dissemination activities. The Editorial Committee has already taken preliminary agreements to organize special sessions within international conferences such as LACONA 2020, TECHNART 2021, TechnoHeritage 2021, SPIE O3A (Optics for Art, Architecture and Archaeology) 2021, and to participate in the Gordon Research Conference on Scientific Methods in Cultural Heritage Research 2020 and 2022 to primarily disseminate the results of the joint research and access activities.

A **coordinated visual identity**, elaborated in T8.3, will underline dissemination to achieve easily recognisable identification and enhanced visibility of IPERION HS. The consortium will enable publication of **open access publications** in international journals and symposia, based on project results. Scientific publications will be available open access via the IPERION HS website or via the platform OpenAire (https://www.openaire.eu/).

The following KPIs will be used to evaluate the dissemination activities.

KPIs	Number
Number of scientific publication published by IPERION HS partners	> 20 yearly
Number of participants at events organized by IPERION HS partners	> 500 yearly
Attendees in Training camps / Summer schools	> 30 yearly
Number of visitors to the website	> 1,000 monthly

Other specific KPIs will be defined in D8.4 (Dissemination Plan).

2.2.1.3 Dissemination tools

The main dissemination media and tools in IPERION HS will be: the project website (T8.3), the visual identity (T8.3), events for dissemination, exploitation and engagement (by WP6, WP7 and WP8), training activities (WP7), user forum (WP7) and open access publishing.

The **project website** will be based on the existing IPERION CH website (www.iperionch.eu). However, this will be extended and redesigned and will in this way provide continuity with the previous project. The domain (www.iperionhs.eu) has been already registered and the previous domain will be redirected. The website will be the main tool for **dissemination** and **communication**. It will be continuously updated in collaboration with the Editorial Committee. The website will contain all relevant project information and will inform its users about training, engagement (e.g. user forum) and access services provided by the infrastructure. The website will be the unique access point for all IPERON HS activities and services.

The **logo** and visual identity. The IPERION HS logo, inspired by a Leonardo da Vinci design, was developed by chromatic variation of the IPERION CH logo, ensuring continuity of recognition. The logo will be used in all dissemination and communication activities. A visual identity handbook will be created by T8.3. Coordinated identity of project activities will be the basis of coherent communication within the group and externally.

Events and **training activities**. Several types of events organized by IPERION HS will disseminate project achievements and will be used for outreach to potential users and industry. Success stories, project results and best practices will be presented at focused events (WP6), at workshops (WP8), through the user forum (WP7), training camps and summer schools (WP7). Conferences attended by partners disseminating scientific activities or setting up conference exhibition stands will be the staple of dissemination activities. Particularly effective dissemination will be achieved through international conferences organized or chaired by partners, e.g. by organising sessions dedicated to the project, but also by organising national events. Events will promote using social media, the user forum and web tools, when practical, video streamed.

2.2.1.4 Open access publishing

Open access publishing. The IPERION HS consortium will publish its achievements open access in peer-reviewed journals. However, the decision to publish will be taken once the results are fully evaluated and intellectual property rights protected. Different, inclusive practices of open access publication will be used: (i) green open access, also through online self-archiving as part of the IPERION HS website repository; (ii) gold open access, where access to scientific papers is made open by publishers themselves.
Bibliographic metadata will be an integral part of each publication. These will identify the deposited publication in a standard format and will include the following terms: “European Union (EU)” and “Horizon 2020”, the action call, the project acronym and the grant number; the publication date and embargo period length if applicable. Videos and images acquired during the project, when relevant, will be available in the web site repository or uploaded on streaming services (Youtube, Vimeo, Flickr etc.).

2.2.2 Exploitation

The IPERION HS integrating activities (JRAs, TNA and NAs) have been developed synergistically and coherently with the mission and vision of E-RIHS. The project results will contribute to the development of

the RI through effective exploitation in the future ERIC. Relative to the previous integrating activities, IPERION HS innovation will improve the quality of heritage science services at European level, including through the incorporation of the domains of archaeology and palaeontology. The new results, approaches, and products will be incorporated in E-RIHS, examples are: new research methodologies, new interoperable instruments and digital tools, new protocols and techniques that will improve the understanding of heritage objects and sites. Innovation in large-scale instrumentation, non-invasive portable technologies, hybrid and multimodal approaches, and methods of safer analysis, will be used in E-RIHS, ensuring that the research community has access to cutting edge infrastructure services. By extending the current formal frameworks for data interpretation and management, we will innovate in order to re-use information and promote data fusion.

However, E-RIHS ERIC will not be the only exploitation route for IPERION HS. For new products, services, cutting-edge instrumentation and prototypes, the consortium will establish, through WP6 "Impact and sustainability", a pro-active innovation strategy promoting interactions with the industrial (SMEs and other industrial stakeholders) and cultural partners. In turn, this will reinforce the long-term sustainability of the distributed heritage science RI. The derived socio-economic benefits that will encourage advances in the heritage sector and significantly improve the understanding, preservation and dissemination of cultural heritage, will surpass those commonly associated with research activities (such as publications, conference presentations, developed through WP8) and will expand to technology transfer actions that will give industry stakeholders the opportunities for commercialization,[23] including cooperative working to design new instruments or equipment, joint research actions with industrial partners, licensing of IP, creation of spin-offs and business incubation. Particularly for SMEs, new growth opportunities will come from the transfer of new products and services derived from the technological breakthroughs of IPERION HS and of its predecessor, IPERION CH.

2.2.2.1 Exploitation strategies

IPERION HS, as an advanced community, will develop its exploitation potential by building on the innovation in heritage science and in the socioeconomic stakeholders within the domain, specifically the future distributed RI. The exploitation strategy of IPERION HS will be developed in M12 in WP6: D6.2 (Detailed Exploitation Plan) within Task 6.4 (Exploitation towards the E-RIHS). This will take advantage of the large multi-disciplinary and intersectoral audiences, mobilized by the activities organized in WP7 (Training and community engagement), T8.3 (Communication), T8.4 (Dissemination) and T8.6 (International dimension).

The advanced community that has developed over the past 15 years with the support of LabS-TECH (FP5), EU-ARTECH (FP6), CHARISMA (FP7) and IPERION CH (H2020), has defined and consolidated the concept of E-RIHS. An optimum and efficient exploitation of the achievements so far, and of the potential for innovation existing in IPERION HS, will be achieved through a number of actions. These will map the key developments, such as instruments, technologies, protocols, documentation tools and data management procedures, as well as implement mechanisms for monitoring and evaluating new ideas and tools leading to innovation.

Diverse expertise across the partnership will be pooled through knowledge transfer and shared best practice with the aim of optimising advanced access opportunities. Areas in need of further development (e.g. in terms of instruments, tools or methods), and new funding opportunities will be identified. Suitable technology transfer channels will be promoted to enable the design of new instruments or equipment, e.g. joint research actions with industry, licensing, creation of spin-offs and business incubation. Finally, we will involve the user community in the evaluation of the quality and impact of access. We will also work with the user organisation to identify the needs for enhanced access services, to explore pathways of exploitation and to promote knowledge generated through ARCHLAB, FIXLAB and MOLAB platforms, in order to create impact at academic and non-academic levels.

2.2.2.2 Exploitation pathways

A quantitative research study of the relevant industry segments (cultural industries, instrumentation, media and creative businesses etc.) will be carried out **to formulate an innovation strategy**. This will aim to impact

[23] Cornell University, INSEAD, and WIPO (2018): The Global Innovation Index 2018: Energizing the World with Innovation. Ithaca, Fontainebleau, and Geneva.

the heritage industry and promote its clustering in the form of public-private partnerships (D6.3 by T6.1). In addition, an **event** including a meeting and a series of focus-group workshops with national coordinators, main access providers, users, stakeholders and policy makers will be organized to explore interaction with the future E-RIHS ERIC (D6.5 by T6.2).

Guidelines for effective exploitation and impact creation based on mapping of the key achievements and expertise across IPERION HS, will be drafted to identify research and application areas that require further development, in collaboration with the organisation of users of ARCHLAB, FIXLAB and MOLAB platforms (D6.3 by T6.3 and T7.3-T7.6).

Furthermore, dissemination will support exploitation, particularly through open access publications, organisation of events and training activities.

2.2.2.3 Data Management in IPERION HS

There is a strong commitment in the IPERION HS consortium to effectively manage the research data generated during the project. We will build on the track record of the previous integrating activity (IPERION CH) where a Data Management Plan (DMP, IPERION CH Deliverable n. 2.2) was developed and rigorously maintained. The IPERION HS DMP (T6.3: D6.1) will extend the existing document and adapt it. The goal of the IPERION HS DMP is to define common practices and recommendations in terms of curation, storage, formatting, dissemination and licensing of data used in the frame of IPERION HS. This will create the operative foundation, also in view of the future E-RIHS ERIC. The DMP will build on the complexity and specificity of data management within the IPERION HS partnership, in order to (i) anticipate publication of the whole corpus of collected information, and (ii) pave the way towards a global data management policy within the future RI.

Considering that IPERION HS is an infrastructure project integrating 52 facilities providing TNA from 16 countries with diverging data standards, legal structures and data management practices, the project has to deal with significant complexities. To create usable guidelines, the exploration of applicable legal frameworks, and development of standards and recommendations for data dissemination will be a continuous project activity. The main type of data will be scientific, explored by users and access providers in the context of the IPERION HS project. Each of the 52 participating facilities may manage several data sets. In total, more than 100 different kind of data sets are expected within the partnership. The main difficulty lies in identifying and documenting the various possible sets, which can be split into the following categories:

- completion of an existing dataset by means of newly created data
- creation of a new data set
- new conditions attached to existing data sets facilitating their re-use.

Here we provide a general overview of such data sets and their management at facility level:

- Digitized data: all data (raw and processed) are either digital or digitized.
- Formats: most of the data is stored in proprietary formats (readable and non-human readable formats) and/or “standard” formats (docx, tiff, pdf, jpg, xlsx etc.).
- Raw data: these are obtained through scientific studies, after being processed by researchers themselves. These data are usually not accessible to third parties or only under specific conditions (e.g. authorisation by the facility or user required). Most of such data sets remain accessible only internally.
- Data privacy: sensitive or privately owned data sets require specific licensing and occasionally, specific analytical software is required to process such data.
- Hosting: data is hosted by various stakeholders: users (personal computers), institutions (internal servers, restricted data bases, digital archives), infrastructures (aggregated and syndicated databases) etc.
- Dissemination: dissemination of (processed) results is usually aimed at the scientific community and not the general public.

Open directories and repositories of digital data will be created hosting information about the available instruments and archives, as well as scientific project results. These will be made available online. Curation of IPERION HS data will be carried out, and the associated costs borne by, the E-RIHS ERIC, which will be established in time to inherit and manage the IPERION HS data.

As mentioned, Task 6.3 will define and maintain the DMP (D6.1) throughout the project. The DMP will detail the types of datasets used/generated, along with any formatting, storage, access, re-use, licence and IPR issues. This work will bring together the outputs of T2.4, T3.4, T4.4, and the research in T5.2 and T5.4,

in order to put into practice the data management procedures needed for the E-RIHS. The DMP will be set up as a live document and will continue to be updated during the project as required.

2.2.3 Communication activities

The general objectives of IPERION HS communication can be summarized in three keywords: inform, engage and promote.

Inform	Communicate vision, mission and activities of IPERION HS
	Exchange information among partners
	Inform about IPERION HS events and activities
Engage	Engage users, stakeholders and the public at large in events or actions organized by IPERION HS
	Grow and engage the online community using social media
	Mutually amplify partners' visibility across social media
Promote	Maximise the project impact
	Reinforce the reputation of IPERION HS and its activities
	Attract new potential users

A holistic communication strategy will be defined in the initial phase of the project. Effective communication activities will be carried out in collaboration with expert staff from the partner institutions. A specific project Task (T8.3) will be dedicated to communication, and the **communication officer** will be a member of the Central Office and Head of the Editorial Committee. The impact of communication will be quantitatively monitored (T1.3) using specific indicators (KPIs).

2.2.3.1 Communication strategies

The communication officer, appointed at the kick-off meeting, will manage all internal and external communication activities within WP8. To increase effectiveness, each partner (national node) will appoint a representative responsible for communication, in charge of collecting and sharing information and materials within the national IPERION HS community and with the communication officer. This will create a network of national communication experts. The communication officer, together with the national experts, will be in charge of defining a SMART (specific, measurable, achievable, relevant and time-bound) strategy to manage communication activities. Following this approach and the general objectives, the **communication plan** (CP) will be delivered in M9 (D8.3), with communication guidelines for partners. It will clearly identify specific objectives, key messages, target audiences, tools and channels, a timetable of the activities and Key Performance Indicators (KPIs). KPIs will be set at M9, before implementing any activity, and they will take into consideration the inputs, outputs and outcomes of the project. The communication plan will provide the details of internal and external communication activities and detail the traditional and digital communication tools.

A selection of KPIs for communication is below, as an example:

KPIs	Number
Active IPERION HS website users	> 500 monthly
Social media followers	> 20% increase with respect to the previous project (IPERION CH)

2.2.3.2 Communication tools

IPERION HS communication will innovatively combine traditional and digital communication tools to create excellent project impact. A visual identity handbook will be created to provide instructions for partners to effectively use the IPERION HS communication and branding tools.

IPERION HS communication tools are listed below:

Traditional tools	Digital & social media tools
General mailing list This will be continuously updated throughout the project in accordance with the GDPR. It will aim at users, media, stakeholders, affiliated partners etc. and will be used for electronic communication.	**Project website** Already described as a dissemination tool, the website will contain all relevant information about the project and its activities and will be continuously updated during the project and maintained after the project end as legacy within E-RIHS ERIC.
Press releases A template for press release will be developed in the early stage of the project.	**Social media profiles** Facebook, Twitter, Instagram, YouTube and other social media profiles will be opened. The decision will be made on whether to continue to use social media profiles created for the IPERION CH project, to ensure continuity. LinkedIn will be used specifically to build the user forum.
Promotional materials For distribution, such as: leaflet, card, poster, roll up.	**Digital communication toolkit** It will contain files such as logo, templates for presentation, letterhead, template for leaflet, template invite, template poster. Other templates will be added as needed. The instructions for use will be part of the Visual Identity Book.
Promotional items for events Bags, lanyards, cards for badges, folders, pens, etc.	**Multimedia products** Short videos, image collections, etc.

If needed, partners can translate the communication materials into their own languages. As required by the GA, article 38, all the communication and dissemination materials will acknowledge EU funding.

Internal communication

The main tools used for internal communication will be e-mail, videoconferencing tools (e.g. Zoom, Skype), Basecamp, cloud services and a **project repository**. The consortium will use D4science (www.d4science.org) as the internal repository for exchange of publications, reports, work documents, videos and images, digital communication toolkit etc. D4science is an open source system offering a data infrastructure service and virtual research communication environments.

3 Implementation

The IPERION HS consortium comprises more than 60 prominent institutions across Europe, within 18 Member States and 2 Associated Countries, plus outstanding international research infrastructures represented by 4 nodes: in Brazil, Mexico and 2 in the USA. Complementarity is a major asset of this highly skilled advanced community, and there is an excellent fit of their competences to enable implementation of the proposed workplan. Collaborative heritage science research, TNA provision and cooperation activities are jointly performed by multi-disciplinary groups of experts from world-class institutions, very experienced in international collaboration. While the implementation of IPERION HS is a challenge, it is primarily a huge opportunity to further integrate the national infrastructures in a solid and stable system representing and supporting the heritage science community in the European Research Area.

3.1 Work plan – Work packages, deliverables

3.1.1 Work plan overall structure

The IPERION HS integrating activity will advance the state-of-the-art of the heritage science RI on three closely interacting fronts: (1) trans-national access provision, (2) joint research and (3) networking and cooperation. The activities will be organized in eight work packages (WPs). Each WP will be subdivided into tasks, according to the planned actions. The project flow will be controlled by a structured management and quality assurance system (subject of WP1), in which all partners will play roles in governance, quality management and/or support. The provision of state-of-the-art TNA, covering the needs of heritage science users, is the core business of the project. TNA is divided into three platforms, each of these will be operated by a separate WP: ARCHLAB (WP2) for access to archival information and data from previous studies; FIXLAB (WP3) for access to the most advanced laboratory techniques and fixed facilities, and MOLAB (WP4), a mobile collection of instruments for in situ non-invasive measurements on heritage objects, collections, buildings and sites.

All joint research activities will be coordinated in a single WP (WP5) with five tasks devoted to advancing the scientific and technical quality of the different TNA platforms and to create solutions for more efficient data management in heritage science.

Three WPs will support networking activities within IPERION HS. WP6 will be devoted to the exploitation of the project results in different contexts: (i) to maximise the impact of innovation, feeding on WP5 results; (ii) to provide routes for exploitation of the expertise in the future E-RIHS ERIC; (iii) to improve interoperability of instrumentation and digital data; (iv) to reinforce long-term sustainability of the heritage science RI by devising a policy for balanced development of national infrastructures, increasing the potential of E-RIHS to impact the ERA. WP7 will aim to engage with users throughout their journey through IPERION HS, by developing an intensive plan for training and engagement activities with a particular focus on new communities, promoting RI use by new users. A User Forum AND A User Organisation will be developed to engage with users: (i) to enable them to share experience and skills, and (ii) to enable them to form an independent voice and thus feed back into the management structures of IPERION HS. This WP will work in close alignment with WPs 2-4, where user helpdesks will be organised to deal with access- and platform-specific enquiries, and with WP8, through which dissemination of user-led research will be enabled.
WP8 will develop an actual Central Office, providing support and integration of all the project activities, thus minimising costs and maximising efficiency, internal communication and collaborative management of TNAs and networking.

A PERT diagram with the interactions between WPs in the work plan is provided in Figure 3.1a of Section 3.1.4.

3.1.2 GANTT chart

			1st year				2nd year				3rd year			
	Start	End	M3	M6	M9	M12	M15	M18	M21	M24	M27	M30	M33	M36
WP1	M1	M36	Project Management											
T1.1	M1	M36												
T1.2	M1	M36												
T1.3	M1	M36												
WP2	M1	M36	TNA1 - ARCHLAB											
T2.1	M1	M36												
T2.2	M5	M36												
T2.3	M5	M36												
T2.4	M1	M36												
WP3	M1	M30	TNA2 - FIXLAB											
T3.1	M1	M36												
T3.2	M5	M36												
T3.3	M5	M36												
T3.4	M1	M36												
WP4	M1	M30	TNA3 - MOLAB											
T4.1	M1	M36												
T4.2	M5	M36												
T4.3	M5	M36												
T4.4	M1	M36												
WP5	M1	M36	JRA - Joint Research Activities											
T5.1	M1	M36												
T5.2	M1	M36												
T5.3	M1	M36												
T5.4	M1	M36												
T5.5	M1	M36												
WP6	M1	M36	NA1 - Innovation and Sustainability											
T6.1	M1	M36												
T6.2	M1	M36												
T6.3	M1	M36												
T6.4	M1	M34												
WP7	M1	M36	NA2 - Training and Engagement											
T7.1	M3	M36												
T7.2	M3	M36												
T7.3	M1	M36												
T7.4	M1	M36												
T7.5	M1	M36												
T7.6	M1	M36												
WP8	M1	M36	NA 3 - Central Support Activities											
T8.1	M1	M36												
T8.2	M1	M36												
T8.3	M1	M36												
T8.4	M4	M36												
T8.5	M4	M34												
T8.6	M13	M36												

Table 3.1a – IPERION HS GANTT chart

3.2 Management structure, milestones and procedures

The IPERION HS project will be carried out by a consortium of institutions that are experienced in European projects. Furthermore, the complexity, international dimension of the actions and the high number of partners demand a robust project management structure. The decision-making procedures will transparent, prompt and distribute executive tasks equitably, fully respecting gender equality and the principles expressed in the Consortium Agreement, while maximizing the representation of all the partner countries in governance role

3.2.1 Structures for IPERION HS management

Figure 3.2a gives a visual representation of the project governance structure and is followed by a description of the specific tasks and responsibilities of the various project bodies. Relationships are indicated by arrows: in green for advisory bodies, in blue for management/coordination while orange indicates bi-directional interaction.

Figure 3.2a – IPERION HS governance structure

3.2.1.1 Work packages and tasks

Work packages and WP leaders. The IPERION HS consortium provides eight integrated actions (**Work Packages – WPs**). Each WP is managed by a **WP leader**. The WP leaders are responsible for:

- day-to-day management of the work within the respective work packages;
- periodic reporting to the coordinator;
- delivery of the project deliverables specific to the WP.

The WP leaders will solve any minor problems within their WP, such as issues relating to either content or personnel. Minor issues could involve: non-critical delays in the delivery of intermediate results, changes in approaches to the implementation of the work, differences in interpretation of results and underperformance. If the WP leader cannot resolve an issue, he/she will immediately inform the project coordinator. Major problems will be resolved by, or in close collaboration with, the project coordinator. Major problems might include: critical delays in delivery of intermediate results, delays or problems regarding project deliverables, changes or delays affecting the workflow of one or more WPs, the need to replace task leaders or a partner that wishes to withdraw from the project. Each WP Leader will indicate a Deputy WP Leader who will secure continuity of action in all cases of (temporary) unavailability of the WP Leader.

Tasks and task leaders. The work in each of the WPs will be distributed in tasks, according to the complexity of the actions. Each task will be coordinated by one of the partners involved in that WP; a named task leader will be appointed for this purpose. Task leaders will be responsible for the delivery of the results from the tasks to which they are appointed. A general description of the tasks within each WP is given in Section 3.1.3. If the task leader suspects that there may be an issue in delivering the results of the task, he/she must report this to the WP leader as soon as possible. WP leaders and task leaders are expected to work together to find a solution. In the event that there is divergence over possible solutions, the WP leader will decide.

3.2.1.2 Governance structure

The management structure of the project encompasses the following entities:

Decision-making bodies

- **Governing Board (GB)**
- **Steering Committee (SC)**

- **Project Coordinator (PC)**

Advisory bodies

- **Access Board (AB)**
- **Three Peer Review Panels (PRP)**
- **Scientific Advisory Board (SAB)**
- **Advisory Board for Regional Development Strategy (RDSAB)**

Supporting bodies

- **Central Office** (**ICO**-*IPERION HS Central Office*).

Decision-making bodies

The **Governing Board** will be chaired by the PC and will be composed of one fully authorized representative from each beneficiary. The GB will be the decision-making and arbitration body of the consortium and will be in charge of the overall direction of the project. The GB will meet annually under ordinary conditions; extraordinary meetings will take place only in critical circumstances. Decisions will be taken by a simple majority vote. In special cases, unanimous consensus will be required. The Consortium Agreement will contain all the details of the GB voting system. All partners will be strongly recommended to appoint their E-RIHS national coordinators to the GB.

The **Steering Committee** is the body that supervises the delivery of the project, performing the coordination of horizontal and vertical activities and reporting to the GB. It consists of the eight **WP leaders** and is chaired by the PC, who is also leader of WP1. The SC represents the managerial core of the scientific activities, overseeing the routine implementation of the IPERION HS project. The SC is in charge of monitoring the proper development of all the activities that are planned (TNA, JRA and NA) on a day-to-day basis taking into account the long-term interests of the project and the fulfilment of Grant Agreement commitments. The SC is responsible for actual governance, as well as directing quality assurance and the technical progress of the project. The SC will meet twice per year under normal conditions and only more frequently if deemed necessary.

WP#	WP short name	WP leader	Partner
1	Project Management	Luca Pezzati (PC)	CNR
2	ARCHLAB	Hilde De Clercq	KIK-IRPA
3	FIXLAB	Michel Menu	CNRS
4	MOLAB	Costanza Miliani	CNR
5	Joint Research Activities	Loïc Bertrand	CNRS
6	Innovation and Exploitation	Marta Castillejo	CSIC
7	Training and Engagement	Matija Strlic	UCL
8	Central Support Activities	Jana Striova	CNR

*Table 3.2a – **WP leaders***

The **Project Coordinator** (PC) will be in charge of the scientific and financial coordination of IPERION HS. The PC is ultimately responsible for the project results. The PC chairs the GB and the SC. The PC is also specifically responsible for communication with the EC and for the management of the EC financial contribution.

Advisory bodies

The **Access Board (AB)** is an internal advisory body composed of access experts helping the integration of user services. It includes six (6) representatives – namely: the WP Leader, the Deputy WP Leader and four (4) Task Leaders – for each access platform of IPERION HS, thus totalling eighteen (18) members. The Access Board operation will be secured by T8.1 (Integrating TNA procedures) in WP8. The AB will serve as a forum to ensure continued interaction and exchange of experiences between TNA platforms on common issues, such as IPR, interoperability and data management. To secure connections among related activities carried out in other WPs, also task leaders of T5.4 Data management, T6.3 Interoperability and T6.5 IPR management will also participate in the AB. The AB will:

- collect and process all TNA submissions;
- provide technical advice on TNA to users, supporting the activities of the Welcome Desk and User Helpdesk;
- provide technical advice to the Peer Review Panels about the research projects submitted for TNA;
- provide feedback to the SC and, in cooperation with the quality officer (see at ICO description), monitor the quality of TNA activity and identify possible contingencies in TNA provision;
- advise the SC about quality and impact of communication and feedback to users, helping to identify optimized solutions wherever needed.

The AB will meet at the kick-off meeting and then at least every six months, in time to provide input to the Peer Review Panels. At the kick-off and mid-term meetings, the AB will elect, for a three-year mandate, one chair and two vice-chairs, each representing the three platforms of TNA. The addition of selected representatives of the user community to the AB (one/two for each TNA platform) will be considered during the development of the project, and decided on consultation with the SC.

Three **Peer Review Panels,** composed of acknowledged experts selected outside the consortium, will be in charge of the scientific evaluation and ranking of TNA submissions: one **A-PRP** for the ARCHLAB platform, one **M-PRP** for the MOLAB platform and one **F-PRP** for the FIXLAB platform. IPERION HS introduces an innovation in the reviewing process: the use of additional experts in the PRPs. The fixed members of the three unique PRP will be able to call on additional experts to involve them in the evaluation of the proposals, related to their specific experience. Details of experts will be held on a list in accordance with General Data Protection Regulation (GDPR) – maintained with the help of T8.2 – from which the PRPs will be able to select the desired co-reviewers. The list will be populated by heritage science experts, past users of the RI (expert users) and by experts working for national facilities and access providers. The composition of the fixed part of PRPs will be proposed by the AB and approved by the SC. Each PRP will decide the procedures required to involve additional experts in the review process. PRPs shall meet biennially, following the deadlines of the periodic calls for TNA. The WP leader for the associated TNA will chair the PRP. WP8 (T8.1) will coordinate PRP operation and document activities. The PRPs will meet in person, or make efficient and effective use of web communication tools to discuss and provide consensual scores and recommendations. At the end of each meeting, a review report will be written ranking the approved projects and their classification in order of priority.

The **Scientific Advisory Board** will provide advice on general project strategies and will offer independent views and evaluations of the effectiveness and impact of the project. The SAB will include representatives of all stakeholder groups: researcher communities, industrial associations, professional associations, museums and cultural heritage institutions. The SAB can be consulted by the PC whenever deemed appropriate (e.g. in case of a major issue) and will be consulted at three stages in the project: 1) at M9 of the project; 2) after publication of the mid-term report and 3) before publication of the final report. Finally, the SAB will be consulted in the event of a critical situation, such as the possible dismissal of a WP leader or the PC. The SAB is entitled to give unsolicited advice at any stage in the project. Although such advice from the SAB is not binding, the Project Coordinator should be able to show that any advice given has been duly considered. The composition of the SAB will be completed before the kick-off meeting. Shortly after the kick-off the selected members will be invited formally to join the board. The first advisory board meeting will be held within eight months of the kick-off meeting, tentatively at M9. The SAB will elect its Chair at its first meeting. If necessary, SAB meetings may also be held through teleconferencing or Skype.

The **Advisory Board for Regional Development Strategies (RDSAB)** will support the networking activities for sustainability developed mainly in T6.2. The members of the board will be experts appointed by the national nodes – one for each node – to help in the following activities: 1) scouting of perspective national facilities (access providers) to be developed for their use in the research infrastructure; 2) identification of potential national/European resources to enable the implementation of such reinforcements; 3) alignment of national development strategies to support the coherent development of the RI at European level; 4) supporting the implementation at national level of the resulting agenda for balanced development.
The RDSAB composition will be completed before the kick-off meeting. The first RDSAB meeting will be held within six months of the kick-off meeting. The RDSAB will elect its Chair at its first meeting and will decide the calendar of its meetings together with the WP6 Leader, who will Co-chair the RDSAB. If necessary, RDSAB meetings may also be held through teleconferencing or Skype.

The **IPERION HS Central Office (ICO)** will support the PC and the SC in the day-to-day management of the project. The Leader of WP8 is the head of the ICO. Four specific positions in the ICO will be appointed, at kick-off meeting, to support specific tasks of the ICO:

- **Financial Officer** to support the PC and SC in all financial issues;
- **Quality Officer** to support the internal quality management system;
- **Reporting Officer** to support the PC and SC in all issues related to internal project reporting and reporting to the Commission;
- **Communication Officer** to support the PC and SC in providing efficient, high impact communication. The CO will also chair the Editorial Committee.

More specific positions can be established by the SC during the project development, if deemed useful to the functionality of the ICO, upon the WP8 Leader's proposal.

3.2.2 Rules and Procedures

3.2.2.1 The Consortium Agreement

All rules of governance will be set out in a Consortium Agreement among the partners, regulating mutual relations, responsibilities and rights among participants and vis-à-vis the EC.

3.2.2.2 Monitoring the progress of the project: reporting

Progress monitoring is a crucial element in the management of a complex project with interrelated activities and a large consortium of partners. Monitoring practices are therefore part of the management structure. T1.2 and T1.3 will be totally devoted to monitoring project developments and assessing the project quality. Each partner will maintain its own administration, covering all relevant details of costs and results, to allow for easy and regular reporting. The central administration, maintained by the PC with the support of the Central Office will ensure that administrative practices comply with EC requirements. Throughout the project, the Reporting Officer can be contacted by partners for more information on reporting requirements.
Specific reporting actions will include:

- **Workshop on reporting requirements** to be held at the kick-off meeting, explaining in detail the required reporting structure in the project, the supporting role of the Central Office and the partners' duties;

- **WP-specific reporting** (internal): every six months, each partner will provide an overview of costs and results of the work for each WP. Overviews will be provided using a standard reporting format, to be provided at the beginning of the project. Digital copies will be sent to the WP leader within two weeks of the end of each period. The information to be provided in the report will include:

  – Person months spent per task
  – Personnel costs
  – Other costs per task
  – Actual results per task
  – Eventualities
  – Newly identified risks
  – (Adjusted) planning for the next period.

The respective WP leaders will integrate the partner reports into a WP report. The PC and the SC will use these periodic WP reports to monitor progress.

- **General project reporting** (external). Every 18 months, the WP-specific reports by the WP leaders will be used to draw up the financial and management reports for the EC. Reports will be submitted each 18 months: first report (also mid-term report) and final report. Before submission, these reports will be discussed at a SC meeting.

3.2.2.3 Monitoring the development of the project: quality assessment

The key object of quality management will be to ensure that the project demonstrably meets its contractual commitments, preparing the ground for improved performance in all subsequent initiatives. The quality

system should be agreed by all partners as a tool for improvement and engendering confidence. Each partner will nominate a quality representative, who will communicate with the quality officer, conduct internal audits for that partner (if applicable) and help with feedback. Each user of the information or services offered to the community by IPERION HS (be it access, courses, other events or simply information from the site) will be considered as an external auditor and requested to provide voluntary feedback. Written requests will always include a space for responders to indicate what they think could be improved in the information or service. Their views will be treated as opportunities for improvement.

Five main types of KPIs are, at this moment, expected to be needed. Each broad KPI type identified below can be resolved in dedicated KPIs, e.g. according to the type of service or the partner involved in its provision. KPI types to be considered are:

- *Feedback KPIs*: collected following completion of provision of access or other services to users;
- *Demand KPIs*: based on access compared to availability;
- *Extent of use KPIs*: based on the extent to which an asset is being used;
- *Productivity KPIs*: based on what is actually achieved vs. the goals set for specific activities;
- *Impact KPIs*: measured by consequences obtained from targeted actions.

One month after the information pertaining to relations with the community is collected, the PC will have produced a dashboard of data, presented in a factual and synthetic manner, including performance indicators, the improvement opportunities identified from feedback suggestions, and any other particularly relevant data collected through the quality system. The dashboard will provide a resumé of all the data obtained through the quality system, to help monitor the development of the project. Table 3.2b summarizes possible KPIs to be used in quality management. Target values for these will be set in the Quality Monitoring Plan, together with complete lists of project-level KPIs (Deliverable 1.1 at M9).

KPI	Applies to…	Unit of measure
Access provision efficiency	ARCHLAB, FIXLAB, MOLAB	% of accesses provided vs. planned
User support quality	ARCHLAB, FIXLAB, MOLAB	% of proposals accepted by PRP vs. available access slots
Efficiency of TNA user outreach	ARCHLAB, FIXLAB, MOLAB	% of submitted projects vs. available access slots
Access quality	ARCHLAB, FIXLAB, MOLAB	% of users rating satisfaction for services in the two top categories
Training event quality	WP7	% of attendees rating usefulness of a course in the top category
Dissemination intensity	WP6, WP7 and WP8	Number of events organized, co-organized or participated in
Dissemination event quality	WP8	% of attendees rating an event usefulness in the top category
Website visibility	IPERION HS website	Number of accesses/month
Website attractiveness	IPERION HS website	Average duration of single accesses
Internal reporting efficiency	All Internal Reporting	Average delay in weeks
Scientific quality	Publications referring to IPERION HS as a source of financing	Number of peer-reviewed publications at conferences or in open-access international scientific journals
Scientific interest	invitations related to the project or its results	Number of invitations as speakers at international conferences

Table 3.2b – Selection of Potential Key Performance Indicators (KPI)

3.2.2.4 Communication structures for management

In addition to the standard use of e-mail, telephone, teleconferencing, skype and direct conversations, communication within the consortium takes places through:

- ***The IPERION HS website.*** The IPERION HS website will act as the main access point to the services of the infrastructure. Website maintenance falls under T8.3 in WP8.
- ***D4science repository.*** D4science (*www.d4science.org*) is an open source system, a Data Infrastructure connecting + 5500 scientists in +50 countries and integrates heterogeneous data providers. Tested in the E-RIHS PP project, the repository will serve especially for internal communication. All relevant, but relatively confidential, documents such as draft reports and notes from meetings are stored on this repository. This tool will be used to set up specific structures for communication and document exchange.
- ***SC and GB Meetings (T1.1).*** The SC will meet at least every six months, starting at kick-off, to discuss project progress. The location of the SC meetings will rotate. Participation in SC meetings through teleconferencing will be permitted but discouraged. Yearly, the GB will meet at the same location and time as the SC. The project officer from the EC will also be invited to these meetings, as will the SAB members. The kick-off meeting will take place in Italy. The locations of the following meetings will rotate as agreed among the partners, and will be formalised by the Steering Committee at the kick-off. The hosting partners will provide technical and logistical support for the organization of the meetings.

3.2.2.5 Estimated resources allocation

Management tasks will be carried out through an activity that will include expenses for:

- Financial Statement Certificates, when requested by the Grant Agreement;
- Central office expenses supporting routine management work;
- Travel costs for the PC, SC, CO and SAB members in pursuance of management activity;
- Other specific costs, that are strictly necessary for the management of the project.

The total amount of the budget estimated for management is about 7% (seven per cent) of the total budget of the project.

3.2.4 Risk management

Risk Management (RM) is the set of coordinated activities to identify, analyse and respond to risks relating to all aspects of the project, including the creation of mitigations and the management of the risk should it 'crystallise' and become an Issue. The Risk Management methods used in IPERION HS will be based on the Risk Management Framework developed for the E-RIHS by the preparatory phase project, which is founded on the International Standard ISO 31000:2018(E) – "Risk Management Guidelines". The implementation of the RM procedures, modified to meet the specific circumstances of the IPERION HS project are briefly described below in the following. As part of the Project Initiation Phase of IPERION HS, they will be developed into a Project Risk Management Handbook.

The ISO definition of risk is "the effect of uncertainty on objectives". The adoption of this manual will ensure that a transparent and consistent approach to risk management, based on internationally-recognised best practice, will be adopted throughout the project. This will serve to reassure the bodies and groups to which the participating organisations are accountable that proper consideration is being given to all aspects of risk which confront them in their activities on behalf of the project. It will also serve to demonstrate to the wider stakeholder community of IPERION HS that preservation actions relating to objects of potentially high heritage and cultural value have all been defined, planned and executed with proper regard to all risks identified as relating to those objects, and to the health and safety of personnel engaged in such preservation actions.

The Steering Committee and the Project Coordinator will have overall responsibility for the ongoing compliance with the risk management procedures throughout the project and for overall management of Risk. A Risk Management Database (which constitutes an enhanced version of the conventional Risk Register) will be maintained by the Project Coordination Team and will be accessible to all participants in the Project. The Work Package Leaders will have responsibility for managing compliance within their WPs and for

communicating information about Risk both down to the team and up to the Project Coordinators. Task Leaders and their participating organisations will be similarly responsible for RM inside their Tasks, and finally all individuals in the project will be made aware of their roles in securing a consistent and effective approach to RM. By the use of a Risk Management Database, all the above organisations will ensure that their compliance activities are visible to the bodies which are above and below them in the organisational hierarchy and will be able to ensure that Risk Ownership is correctly allocated and Risk Mitigations are applied uniformly and consistently (*See Figure 3.2b*).

<table>
<tr><th></th><th>Identify</th><th>Own/Manage</th><th>Monitor</th><th>Escalate</th><th>Communicate and Consult</th></tr>
<tr><td>Steering Committee</td><td rowspan="3">Any participating organisation may identify any risk at any time. Ownership will be allocated according to the adopted procedures.</td><td>Risks relating to the overall project including reputational risks</td><td rowspan="3">All risks owned / managed by the organisation also all risks at any level which are deemed to have an impact on that organisation</td><td></td><td>Report all risks deemed to have an impact on WP or Task activities</td></tr>
<tr><td>WP Leader</td><td>Risks relating to the WP activities including reputational risks</td><td>Notify all risks deemed to have a potential impact at project level</td><td>Report all risks deemed to have an impact on one or more Tasks</td></tr>
<tr><td>Task Leader</td><td>Risks relating to the Task activities</td><td>Notify all risks deemed to have a potential impact at WP level</td><td></td></tr>
</table>

Figure 3.2b – Hierarchy of Risk Management Activities in IPERION HS

Evaluation

At each hierarchical level, the management of the project shall, periodically, assess the effectiveness of their RM. RM shall be an automatic agenda item at all meetings of the Governing Board and the Steering Committee. KPIs for measuring the effectiveness of RM will be agreed during Year 1 of the project. Where any risk 'crystallises' or an unforeseen event occurs, action will be taken to identify whether any modifications to the procedures adopted locally to implement the Framework are required to prevent or further mitigate a recurrence. It is assumed that all project partners will regularly perform a self-evaluation of the effectiveness of their internal RM procedures referring to performance experienced in both this project and in other spheres of activity.

Implementation of RM

Risk Management must be implemented across the whole of the operation of the project. To enable this, a Risk Management Policy will be created before kick-off which will include:

- Identification of levels at which different risk management decisions and actions are to be taken
- Identification of the roles which fulfil these responsibilities
- Identification of how such decisions are taken – levels of authority, levels of delegation, methods for upwards and downward communication of decisions about risk(s)
- Responsibility for the ongoing maintenance and amendment of the RM approach
- Responsibility for the communication and promotion of the project's approach to RM.

It will be the responsibility of all participants in the project from individual employees of individual partner organisation up to Steering Committee and Governing Board to report any risks which they identify as having a potential impact on the operations of the ERIC.

Identification and allocation of risks

A risk is always best expressed in the form: "There is a Risk that [xxxxxxx] will occur, with the consequence for the project/WP/Task/other of [zzzzzzzzzzz]". This facilitates assessment of probability and impact, and also the identification of the most appropriate Risk Owner. Once identified, all risks will be analysed and initially evaluated by the person(s) responsible for RM within the organization/action where the risk was initially identified and a decision taken about escalation and/or treatment. During all phases of risk identification, consideration will be given to involving persons with appropriate skills and knowledge to ensure the most accurate outcome.

Upon initial identification, the person with overall responsibility for RM within the organisation whence the risk has been identified will have initial responsibility for assessing the risk and determining the most likely ownership. Where necessary, the risk will be escalated to RM at WP or project level to agree the most appropriate ownership. Risks should, except in exceptional cases, always be allocated to a role and not to a named individual.

Management of risks

It is the Risk Owner, working in consultation and collaboration with other organisations where appropriate, who will take overall responsibility for the management, treatment and monitoring of a specific risk. Even where multiple persons/organisations are responsible for performing activities relating to a specific risk, ultimate responsibility and authority will always be vested in the Risk Owner. It is the Risk Owner who must report on the status of a risk to the overseeing body and must oversee any actions applied to mitigate it.

The Risk Owner (in consultation with the appropriate risk manager(s) will be responsible for:

- A detailed analysis of Impact, Probability and Proximity (see below).
- Evaluation of the risk against organisational criteria for RM and appetites for risk defined in the organisation's RM policies.
- Identification of option(s) for risk treatment, including identification of any risks created by the selection of any particular option.
- Recommendation to governing bodies of the treatment(s) to be adopted.
- Creation of an action plan of the treatment(s) adopted.
- Implementation of the treatment plan – delegating as necessary.
- Monitoring, recording and reporting on the risk and the action plan.
- Execution of any actions in the event that a risk occurs.

It should be noted that risk mitigation actions may be performed by one or more other persons or organisations which may or may not be under the direct control of the Risk Owner. It is the responsibility of the Risk Owner to continue to liaise with others involved in the action plan.

Monitoring and review of risks

Monitoring and review of risk are both regular activities and may also be performed on an ad hoc basis in the event of a change of circumstances relating to the risk.

The purposes of this activity are:

- To check that the risk has not changed in its nature, affecting impact, likelihood or proximity.
- To ensure that controls relating to risks are still effective.
- To ensure that there have been no changes in external or internal contexts which might have an effect on risk.
- To consider whether lessons learned relating to other risks may have an impact on this risk.
- To identify any emerging risks arising from the existing ones.

Monitoring of risk may occur at levels within the project where there is no ownership or even responsibility for action, but where the consequences of the risk may have an impact at that level.

A risk measurement scale is defined in the following terms:

IMPACT	PROBABILITY	PROXIMITY	WEIGHTING
Very High	Very High	Now/At any time	5
High	High	Very Soon	4
Medium	Medium	In 1 Year	3
Low	Low	In 2 Years	2
Very Low	Very Low	In > 2 Years	1

A Risk is identified with a **High** Impact, **Medium** Probability and likely to occur in **2** Years. The weightings are thus 4 x 3 x 2 = 24

Another Risk is identified with a **Medium** Impact but a **Very High** Probability which is likely to occur **Very Soon.** The weightings are therefore 3 x 5 x 4 = 60

Provided agreed, consistent definitions are applied to each weighting, this system can be used to compare and prioritise Risks for Treatment.

Figure 3.2c – Risk Weighting

Risk analysis

Risks are measured in terms of a combination of the consequences of an event and their likelihood; high risks may be unlikely events that will have a major impact or more likely events that will have a moderate impact. Depending on the severity of a risk and the cost of potential measures, appropriate control measures are determined. Risk is often measured in terms of impact and probability in order to permit quantitative methods to be applied. In order to compare different risks and identify those which are the greatest threat to the organisation, it is common to multiply numeric values assigned to different levels of impact and probability and then evaluate product of that multiplication in order to create a measurement scale for risk weighting[24] (see Figure 3.2c).

An initial Risk Assessment has identified the project risks shown in table 3.2d, followed by possible measures to mitigate their impact. Each risk is allocated an arithmetic score, based on the weightings shown Table 3.2c, and is then recalculated based on the application of the proposed mitigations to show the extent to which the risk has been reduced. A more detailed list of risks and control measures will be drawn up in the first year of the project and approved by the Steering Committee.

About the risks connected to Brexit (hard or negotiated), we decided not to insert specific items in the above list. The advice of the UK government, UKRO, all Programme Committee Members and all units of the DG research and innovation are that Brexit does not need to be addressed in any H2020 application.

We are operating on the assumption that the partners from UK, should this proposal be funded, will be securing the resources for the project to be completed under any possible future situation related to Brexit. The UK Government has committed to underwrite all funding until the end of 2020. This means should the UK leave the EU with no deal and become a Third Country, then the funding would be underwritten by the UK.

[24] Corporate Risk Management 2nd (second) Edition by Merna, Tony, Al-Thani, Faisal F. [2008]

3.3 Consortium as a whole

The IPERION HS consortium has been enlarged by the inclusion of 9 new Countries (compared to IPERION CH). Currently, it consists of 24 partners representing 23 countries: 18 Member States, 2 Associated Countries and 3 Third Countries clustered around their national nodes bringing together leading institutions in heritage science.

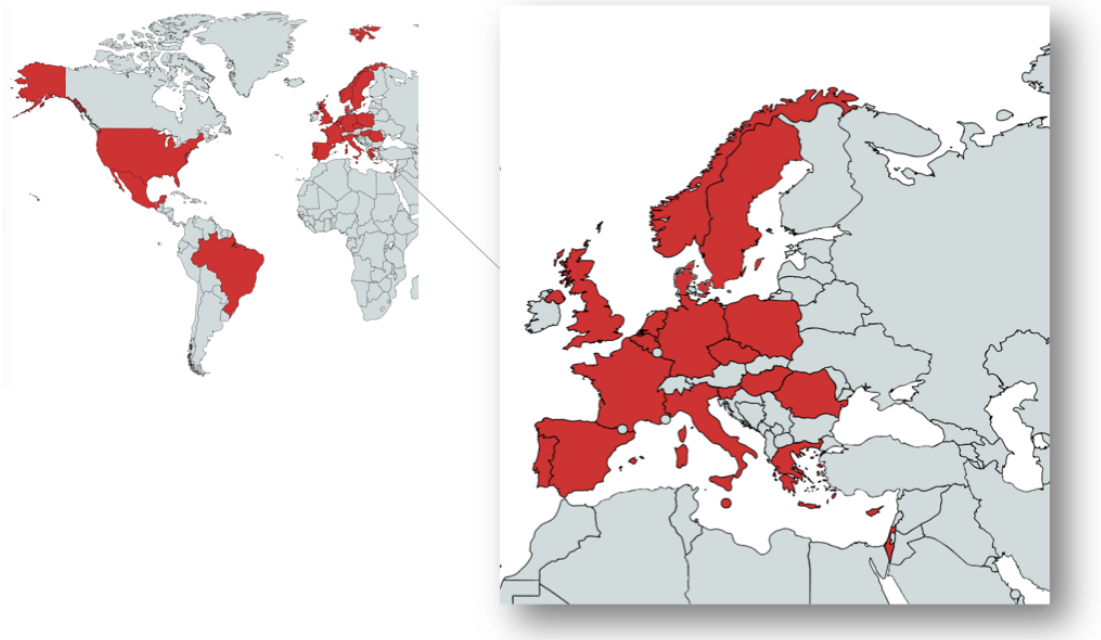

Figure3.3a – IPERION HS Geographical distribution

More than 60 institutions[25], organised around their national nodes, are engaged in the project activities. The increased number of the involved organisations reflects the improved capacity of providing advanced services to heritage science, including the engagement of new communities, enlarged offer and complementarity in the provision of TNA (more than 80% of the partner institution will be access providers) and advancement in JRA.

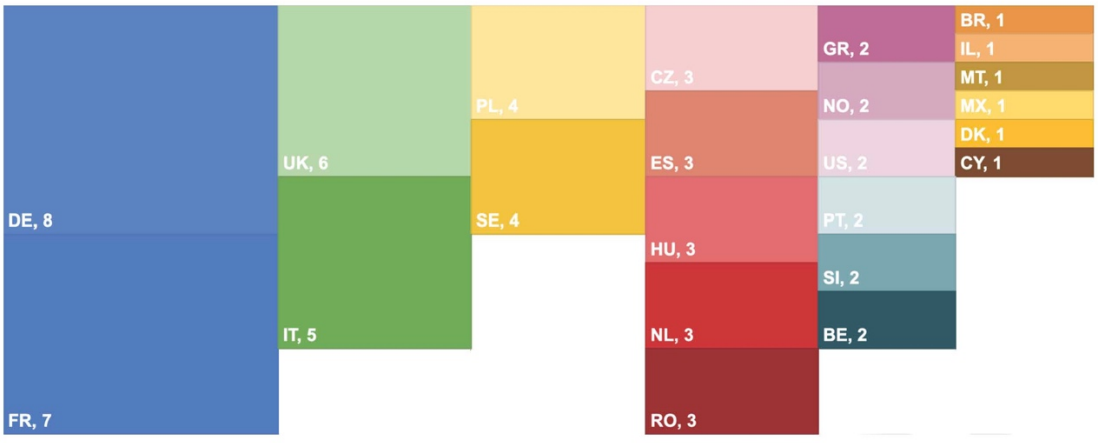

Table 3.3a – Diagram of IPERION HS national nodes (the number totals the partner and its third parties within each national node).

[25] Details on affiliations are provided in section 4.1 "Participants (applicants)" and 4.2 "Third parties involved in the project (including use of third-party resources)".

Table 3.3b gives a synopsis of the participation in key project activities for MNG (WP1), TNA (WP2, 3, 4), JRA (WP5) and NA (WP6, 7, 8).

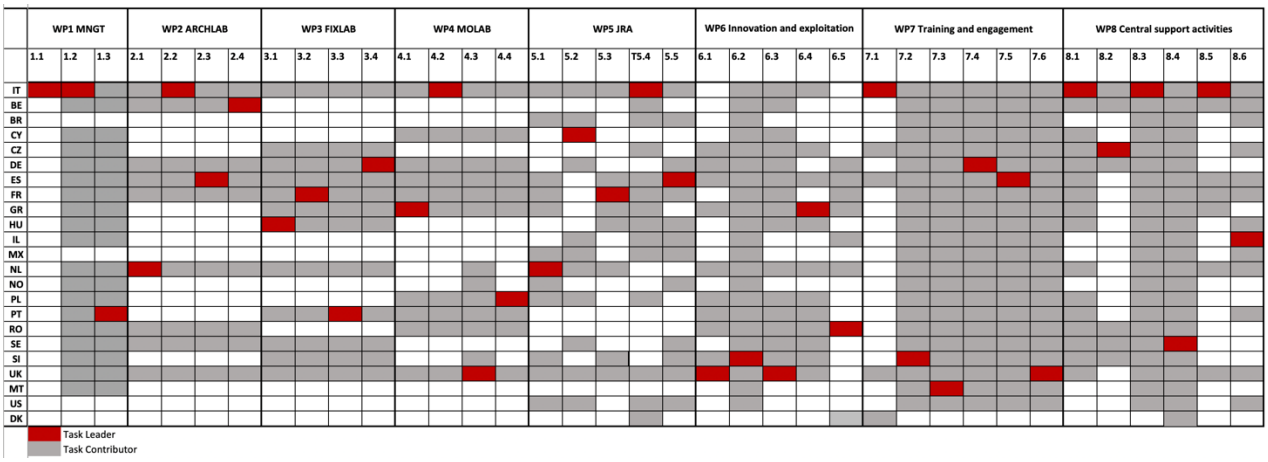

Figure 3.3b – IPERION HS task distribution across eight WPs.

3.4 Resources to be Committed

Due to the huge complexity and ambition of IPERION HS the actual estimation of the IPERION HS costs sums up to nearly 9M€. In order to ensure the full and correct implementation of the proposed activities all the National Nodes involved have agreed to provide in-kind contribution, in terms of PMs, thus reinforcing the commitment towards the establishment of the Research Infrastructure. In particular the budget distribution follows the "national node" approach.
Among the 23 Beneficiaries 4 are located in 3 different Third Countries (1 from Brazil, 1 from Mexico and 2 from US) and are not receiving any funding from the and do not have third parties receiving EU funding. IPERION HS is requesting a total of 6,162,711.12€ in terms of EC contribution, the resources are allocated as follows:

	Personnel costs	Subcontracting	Other direct costs	Indirect costs	Special unit costs	Total costs	Maximum EU contribution	Maximum grant amount	International partners not receiving funding
IT	636.334,00	40.000,00	375.523,86	252.964,47	0,00	1.304.822,33	1.304.822,33	1.294.235,90	0,00
BE	71.274,00	0,00	56.697,00	31.992,75	0,00	159.963,75	159.963,75	158.665,91	0,00
BR	0	0	0	0	0	0,00	0	0	33.750,00
CY	92.743,00		18.000,00	27.685,75	0,00	138.428,75	138.428,75	94.849,16	0
CZ	42.200,00	0,00	37.400,00	19.900,00	0,00	99.500,00	99.500,00	98.692,73	0,00
DE	186.634,00	0,00	67.618,40	63.563,10	193.500,00	511.315,50	511.315,50	502.947,36	0,00
ES	234.169,00	0,00	184.041,00	104.552,50	0,00	522.762,50	522.762,50	518.091,23	0,00
FR	480.321,96	0,00	197.541,00	169.465,75	151.900,00	999.228,71	999.228,71	991.121,65	0,00
GR	134.000,00	0,00	50.800,00	46.200,00	30.000,00	261.000,00	261.000,00	258.882,43	0,00
HU	24.000,00	0,00	70.976,00	23.744,00	290.280,00	409.000,00	409.000,00	405.681,66	0,00
IL	57.100,00	0,00	29.250,00	21.587,50	0,00	107.937,50	107.937,50	89.269,80	0
MT	34.672,00	0,00	19.570,00	13.560,50	0,00	67.802,50	67.802,50	59.500,80	0
MX	0	0	0	0	0	0,00	0	0	33.750,00
NL	171.841,85	0,00	45.894,00	54.433,96	28.000,00	300.169,81	300.169,81	297.734,40	0,00
NO	61.528,00	0,00	27.668,00	22.299,00	0,00	111.495,00	111.495,00	85.797,91	0
PL	51.000,00	0,00	52.400,00	25.850,00	0,00	129.250,00	129.250,00	128.201,92	0,00
PT	47.400,00	0,00	49.200,00	24.150,00	18.000,00	138.750,00	138.750,00	137.624,28	0,00
RO	34.630,00	20.000,00	29.620,00	16.062,50	0,00	100.312,50	100.312,50	99.498,63	0,00
SE	102.311,22	0,00	33.000,79	33.828,00	0,00	169.140,01	169.140,01	167.767,59	0,00
SI	82.880,00	0,00	36.720,00	29.900,00	0,00	149.500,00	149.500,00	148.287,06	0,00
UK	313.731,56	22.846,00	128.686,89	110.604,62	0,00	575.869,07	575.869,07	575.860,70	0,00
US	0	0	0	0	0	0,00	0	0	67.500,00
US	0	0	0	0	0	0,00	0	0	67.500,00
DK	30.000,00	0,00	10.000,00	10.000,00	0,00	50.000,00	50.000,00	50.000,00	0
total	2.888.770,59	82.846,00	1.520.606,94	1.102.344,40	711.680,00	6.306.247,93	6.306.247,93	6.162.711,12	202.500,00

Figures 3.4a – IPERION HS budget.

The value of the different WPs and activities is also well distributed and balanced, indeed:

- about 7% will be devoted to management-related activities;
- about 33% will support TNAs;
- about 37% will be invested in JRA and
- about 23% for NAs

WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8
7%	7%	8%	10%	38%	10%	11%	9%

MNGT	TNA	JRA	NA
7%	24%	38%	31%

Figures 3.4b/c – IPERION HS effort distribution.

3.4.1 Summary of Staff Effort and National in-kind contribution

The following Table 3.4a summarizes the staff effort of IPERION HS partners related to the costs for personnel including both in the requested EC contribution and the co-funding provision.

	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	Total person months
CNR	57,5	10,0	5,0	53,8	39,0	5,6	11,0	18,5	200,4
KIK-IRPA	0,5	8,7	0,0	0,0	10,0	2,0	1,0	2,0	24,2
ANTECIPA*	0,0	0,0	0,0	0,0	2,0	0,0	2,0	5,0	9,0
CyI	0,2	0,0	0,0	1,0	9,3	3,0	5,0	1,0	19,5
ITAM	0,2	0,0	1,0	0,0	7,6	3,7	4,4	6,3	23,2
SPK	0,2	0,0	9,0	5,5	10,5	4,0	7,5	1,5	38,2
CSIC	1,0	16,0	12,5	3,0	38,3	10,7	7,5	1,2	90,2
CNRS	12,6	6,0	41,5	22,0	52,8	11,4	10,0	11,5	167,8
FORTH	0,2	0,0	5,0	3,0	27,0	12,0	3,5	0,5	51,2
Atomki	0,2	0,0	2,0	0,0	8,0	3,0	1,0	3,0	17,2
IAA	0,2	0,0	0,0	0,0	6,0	1,0	0,5	5,0	12,7
UOM	0,2	0,0	0,0	0,0	0,0	1,0	10,0	1,0	12,2
UNAM*	0,0	0,0	0,0	0,0	2,0	0,0	2,0	5,0	9,0
RCE	0,2	0,9	0,0	0,0	21,5	0,8	0,8	2,4	26,6
UiO	0,2	0,0	0,0	0,0	4,6	0,5	0,5	2,2	8,0
NCU	0,2	0,0	0,0	2,0	23,0	7,0	3,0	5,0	40,2
UEVORA	2,5	0,0	3,1	6,0	0,0	1,5	3,1	1,8	18,0
INOE	0,2	3,5	0,0	3,0	0,0	1,0	0,5	0,5	8,7
RAA	0,2	1,0	5,0	0,0	9,0	1,0	0,8	3,0	20,0
ZVKDS	0,2	0,0	8,0	0,0	29,0	16,0	19,6	5,5	78,3
UCL	1,0	11,0	16,0	12,0	28,0	15,0	13,0	7,0	103,0
GCI*	0,0	0,0	0,0	0,0	10,0	0,0	0,5	0,5	11,0
SI MCI*	0,0	0,0	0,0	0,0	2,0	0,0	2,0	5,0	9,0
UPCH	0,0	0,0	0,0	0,0	0,2	0,3	2,0	0,3	2,8
Total / WP	**77,7**	**57,1**	**108,1**	**111,3**	**339,7**	**100,2**	**109,2**	**94,4**	**997,6**

Table 3.4a – Summary of staff effort

	EC contribution	Co-funding	TOT
CNR	119,9	70,5	190,4
KIK-IRPA	14,2	10	24,2
ANTECIPA	0	9	9
CyI	12,3	7,2	19,5
ITAM	13,5	9,7	23,2
SPK	27,5	10,7	38,2
CSIC	63,2	27	90,2
CNRS	36,5	14	50,5
FORTH	38	13,2	51,2
Atomki	12	5,2	17,2
IAA	9,5	3,2	12,7
UOM	10	2,2	12,2
UNAM	0	9	9
RCE	20,4	6,2	26,6
UiO	5,4	2,6	8
NCU	18	22,2	40,2
UEVORA	12	6	18
INOE	5,5	3,2	8,7
RAA	11,8	8,2	20
ZVKDS	29,6	48,7	78,3
UCL	96	7	103
GCI	0	11	11
SI MCI	0	9	9
UCPH	2,8	0	2,8

Table 3.4d – Summary of staff effort: EC requested contribution and National in-kind provision

3.4.2 Other Direct Cost Items (Travel, Equipment, Other Goods and Services, Access Costs)

Tables 3.4b – Other direct costs of participants (below)[26]

1/CNR	**Cost (€)**	**Justification**
Travel	100,000.00	Participation to project meetings, users' meetings and international joint meetings
Equipment	-	
Other goods and services	40,210.00	Organisation of the kick-off meeting, communication and dissemination material, Audit certificates
Access cost (if applicable)	123,217.86	ARCHLAB, FIXLAB and MOLAB
Travel and subsistence for trans-national access (if applicable)	112,096.00	
Total	**375,523.86**	

[26] The costs include both those of the main Beneficiary and the Linked Third Party, if any

2/KIK-IRPA	Cost (€)	Justification
Travel	35,715.00	Participation to WP1/2/5/6/7/8 meetings, users' meetings and international joint meetings, Participation to WP2 and users' meetings
Equipment		
Other goods and services	10,000.00	Organisation of the Midterm meeting
Access cost		
Travel and subsistence for trans-national access	10,982.00	T&S for ARCHLAB users
Total	**56,697.00**	

4/CyI	Cost (€)	Justification
Travel	9,000.00	Travel for project meetings
Equipment		
Other goods and services		
Access cost	3,000.00	MOLAB Other costs
Travel and subsistence for trans-national access	6,000.00	T&S for MOLAB users
Total	**18,000.00**	

5/ITAM	Cost (€)	Justification
Travel	13,000.00	Participation in project meetings, conferences and scientific meetings
Equipment		
Other goods and services	19,200.00	Organisation of project meeting and summer school
Access cost	2,000.00	FIXLAB Other costs
Travel and subsistence for trans-national access	3,200.00	T&S for FIXLAB users
Total	**37,400.00**	

6/SPK	Cost (€)	Justification
Travel	15,750.90	Participation in project meetings, conferences and scientific meetings
Equipment		
Other goods and services	20,000.00	Consumables Organisation and preparation of the workshops with the built heritage community (coordination of task 7.5)
Access cost	10,000.00	ARCHLAb, FIXLAB, MOLAB Other costs
Travel and subsistence for trans-national access	21,867.50	
Total	**67,618.40**	

7/CSIC	Cost (€)	Justification
Travel	53,139.00	Travel to project and WP meetings.
Equipment		
Other goods and services	23.896.66	Mainteinance of equipment, laboratory materials and consumables.
Access cost	71,605.34	
Travel and subsistence for trans-national access	35.400,00	T&S for ARCHLAB, FIXLAB and MOLAB users
Total	**184,041.00**	

8/CNRS	Cost (€)	Justification
Travel	26,176.00	Participation in project meetings, conferences and scientific meetings,
Equipment		
Other goods and services		
Access cost	66,820.00	ARCHLAB, FIXLAB and MOLAB Other costs
Travel and subsistence for trans-national access	104,545.00	T&S for ARCHLAB and FIXLAB users and MOLAB operators
Total	**197,541.00**	

9/FORTH	Cost (€)	Justification
Travel	9,100.00	Participation in project meetings, conferences and scientific meetings
Equipment		
Other goods and services	8,000.00	Lab and facility consumables, instrument service and maintenance
Access cost	14,300.00	MOLAB
Travel and subsistence for trans-national access	19,400.00	T&S for FIXLAB and MOLAB users
Total	**50,800.00**	

10/Atomki	Cost (€)	Justification
Travel	26,176.00	Participation in project meetings and events
Equipment		
Other goods and services	3,200.00	Consumables
Access cost		
Travel and subsistence for trans-national access	41,600.00	T&S for FIXLAB users
Total	**70,976.00**	

11/IAA	Cost (€)	Justification
Travel	29.250,00	Participation in project meetings and events
Equipment		
Other goods and services		
Access cost		
Travel and subsistence for trans-national access		
Total	**29,250.00**	

12/UOM	Cost (€)	Justification
Travel	10,970.00	Participation to project meetings and workshops
Equipment		
Other goods and services	8,600.00	Dissemination activities and organisation on 1 workshop on SSH engagement
Access cost (		
Travel and subsistence for trans-national access		
Total	**19,570.00**	

14/RCE	Cost (€)	Justification
Travel	13,250.00	Participation in project meetings and specific WP-related activities
Equipment		
Other goods and services		
Access cost	7,600.00	Costs for ARCHLAB
Travel and subsistence for trans-national access	25,044.00	T&S for ARCHLAB and FIXLAB users' travels
Total	**45,894.00**	

15/UiO	Cost (€)	Justification
Travel	27,668.00	Participation in project meetings, WP5 meetings, training activities, user forum and communication activities
Equipment		
Other goods and services		
Access cost		
Travel and subsistence for trans-national access		
Total	**27,668.00**	

16/NCU	Cost (€)	Justification
Travel	26,600.00	Participation to project meetings and conferences
Equipment	2,000.00	Modernisation of OCT instrument
Other goods and services	5,800.00	Consumables, OA publications
Access cost	10,000.00	MOLAB Other costs
Travel and subsistence for trans-national access	8,000.00	T&S for MOLAB operators
Total	**52,400.00**	

17/UEVORA	Cost (€)	Justification
Travel	36,600.00	Participation in general project meetings, conferences and events
Equipment		
Other goods and services		
Access cost	3,000.00	MOLAB Other costs
Travel and subsistence for trans-national access	9,600.00	T&S for FIXLAB users and MOLAB operators
Total	**49,200.00**	

18/INOE	Cost (€)	Justification
Travel	2,050.00	Participation to project meetings
Equipment	2,000.00	Depreciation of equipment
Other goods and services	4,000.00	Lab consumables
Access cost	6,000.00	MOLAB Other direct costs
Travel and subsistence for trans-national access	15,570.00	T&S for MOLAB operators
Total	**29,620.00**	

19/RAA	Cost (€)	Justification
Travel	13,000.00	Participation in project meetings and events for staff from RAA and MAL
Equipment		
Other goods and services	8,000.00	Support for open access publications
Access cost	3,500.79	FIXLAB Other direct costs
Travel and subsistence for trans-national access	8,500.00	T&S for ARCHLAB and FIXLAB users
Total	**33,079.00**	

20/ZVKDS	Cost (€)	Justification
Travel	17,150.00	Participation to project meetings
Equipment		
Other goods and services	13,970.00	Organisation of project meeting in January 2022 (M24) in Ljubljana within WP8.2 and Organisation of events within WP7.2 "Users forum" and dissemination material within WP8.4
Access cost		
Travel and subsistence for trans-national access	5,600.00	T&S for FIXLAB users
Total	**36,720.00**	

21/UCL	Cost (€)	Justification
Travel	20,000.00	Participation to project meetings and workshops
Equipment		
Other goods and services	27,500.00	Development of an online module Event organisation in WP7
Access cost	34,045.53	ARCHLAB, FIXLAB and MOLAB other direct costs
Travel and subsistence for trans-national access	53,141.36	T&S for ARCHLAB and FIXLAB users and for MOLAB operators
Total	**134,686.89**	

24/UPCH	Cost (€)	Justification
Travel	10,000.00	Project meetings
Equipment		
Other goods and services		
Access cost		
Travel and subsistence for trans-national access		
Total	**10,000.00**	

4.1. Participants (applicants)

The list of participants presents the composition of the different national nodes, here follows a summary of the Beneficiaries (B) and Third Parties (TP), if any, including their participation to the TNAs (ARCHLAB, FIXLAB, MOLAB).

	National Node	ARCHLAB	FIXLAB	MOLAB
	1. IT			
B	CNR			
TP	OPD			
TP	INFN			
TP	UNIPG			
TP	UNIBO			
	2. BE			
B	KIK-IRPA			
TP	KMKG-MRAH			
	3. BR			
B	ANTECIPA			
	4. CY			
B	Star lab			
	5. CZ			
B	ITAM			
TP	IAP			
TP	IAB			
	6. DE			
B	SPK/SMB			
TP	RWTH			
TP	Doerner Institut			
TP	CEZA			
TP	MLZ			
TP	DAI			
TP	CCA-BW			
TP	Fraunhofer			
	7. ES			
B	CSIC			
TP	IPCE			
TP	CENIEH			
	8. FR			
B	CNRS			
TP	MC			
TP	SOLEIL			
TP	UBx			
TP	Univ Lille MSAP			
TP	MNHN-CRC			

	National Node	ARCHLAB	FIXLAB	MOLAB
	9. GR			
B	FORTH			
TP	Of-ADC Ormylia			
	10. HU			
B	MTA Atomki			
TP	Wigner			
TP	BNC-EK			
	11. IL			
B				
	IAA			
	12. MT			
B	UOM			
	13. MX			
B	UNAM			
	14. NL			
B	RCE			
TP	RUG			
TP	Delft			
TP	VU			
TP	RMA			
TP	KNAW-DANS			
	15. NO			
B	UiO			
	16. PL			
B	NCU			
TP	AGH			
TP	JHI			
TP	UoW			
	17. PT			
B	HERCULES			
TP	LNEC			
	18. RO			
B	INOE			
TP	NIH			

	National Node	ARCHLAB	FIXLAB	MOLAB
	19. SE			
B	RAA			
TP	SciLife Lab			
TP	CL			
TP	MAL			
	20. SI			
B	ZVKDS			
TP	ULJ			
	21. UK			
B	UCL			
TP	HEL-FC			
TP	NG			
TP	BioArch			
TP	NTU-ISAAC			
TP	BM			
	22. US			
B	GCI			
	23. US			
B	SI MCI			
	24. DK			
B	UCPH			

1. Consiglio Nazionale delle Ricerche – National Research Council (CNR)

www.cnr.it - **(IT)**

CNR represents the Italian node (main participant) and is linked with 4 third parties (OPD, INFN, UNIBO, UNIPG).

Description of the legal entity

CNR is the largest public research institution in Italy under the Ministry for Education, University and Research. CNR performs multidisciplinary research activities and ensures large and effective European and International cooperation in all fields of knowledge. CNR is an active member of the European Heads of the Research Councils association (EuroHORCs), of the European Science Foundation (ESF), and of Science Europe (SE). Social sciences and humanities, and cultural heritage have been investigated at CNR since the agency's reform on 4th March 1963. Today most of the SSH and CH researchers are part of the Department of Social Sciences and Humanities, Cultural Heritage (DSU-CNR). CNR is a long-term stakeholder in the framework of the European projects with more than 700 projects funded in FP7. CNR takes part in IPERION HS with the National Institute of Optics (INO), the Department of Social Sciences and Humanities, Cultural Heritage (DSU), the Institute of Heritage Science (ISPC), the Institute of Chemical Sciences and Technologies Giulio Natta (SCITEC), the Italian Dictionary (Opera del Vocabolario Italiano OVI), the Institute of Information Science and Technology (ISTI), the Institute of Applied Physics "Nello Carrara"(IFAC).

INO – National Institute of Optics, www.ino.cnr.it, INO activities are in the field of advanced research in optics and optoelectronics, quantum optics and information processing. Since 1990, the Heritage Science group at INO has studied applications of optical techniques and developing instruments for non-invasive analysis on Heritage objects. The HS group collaborates both with institutions of the Italian Ministry of Cultural Heritage and Tourism, and with prominent international research centres, conservation institutes and museums.

DSU – Department of Social Sciences and Humanities, Cultural Heritage, www.dsu.cnr.it. Its mission consists of basic and applied research, doctoral and post-doctoral training and knowledge transfer. In dialogue with the physical and natural sciences, the DSU promotes a unified and non-reductive vision of knowledge, focusing on the development of critical knowledge. In 2014, it organized the SIS-RIR conference that resulted in the 'Rome Declaration'. It is in charge of the leadership of E-RIHS and the national nodes of all European RIs in SCI and the Italian programme manager and owner of HERA JRP UP.

ISPC - Institute of Heritage Science, www.ispc.cnr.it, promotes an interdisciplinary approach to research in the field of knowledge, documentation, diagnosis, preservation, enhancement, fruition, and communication of cultural heritage. Researchers from different disciplines (archaeologists, architects, geologists, engineers, chemists, physicists, computer scientists) collaborate in the following areas: i) the development of diagnostic methodologies for the characterization of materials in artworks and buildings; ii) monitoring and identification of significant environmental parameters for conservation; development of reliable and sustainable protocols to assess the state of conservation; iii) development of advanced protocols for preventive conservation and planned maintenance, iv) development of new methodologies for 3D documentation, computer graphics, multimedia, virtual reality, interface and interaction design, communication of CH, user experience evaluation.

SCITEC- Institute of Chemical Sciences and Technologies Giulio Natta, https://www.cnr.it/it/istituto/132/istituto-di-scienze-e-tecnologie-chimiche-giulio-natta-scitec. The Cultural Heritage lab of SCITEC (CH-lab) in Perugia conducts research activities in the field of Heritage Materials Science. In collaboration with the Center SMAArt of Perugia University in 2001 it funded the mobile laboratory MOLAB®, which was the beginning of the EU MOLAB program (within the project Eu-ARTECH, CHARISMA and IPERION CH).

IFAC – Institute of Applied Physics "Nello Carrara", www.ifac.cnr.it, develops basic and applied research in cultural heritage, environment, biomedicine and space, with a strong involvement in the European and Italian research programmes. The group working in the field of cultural heritage focuses on the development of innovative laser and optoelectronic techniques for material characterization and conservation of Heritage artefacts. IFAC contributed to the project CHARISMA by coordinating the NA dedicated to the promotion of scientific excellence through focused training initiatives and dissemination events and was also responsible for the JRA focused on the definition of advanced laser treatments for addressing a set of open conservation problems.

OVI – Institute of the Italian Dictionary, http://www.ovi.cnr.it, is an institute with the institutional task of compiling an historical dictionary of the Italian language. OVI is hosting the Italian National Hub of DARIAH-ERIC and is involved in a number of projects related to Digital Research and Service infrastructures (DSI, DRI) such as EUROPEANA, DARIAH and E-RIHS.
ISTI – Institute of Information Science and Technologies, www.isti.cnr.it. The institute is devoted to research on ICT, with several major application domains, which include Cultural Heritage. NetworkedMultimedia Information Systems Lab of ISTI is active on technologies for the management, distribution and fruition of multimedia information, i.e. information represented not only in textual form but also in audio/video.

Main tasks in the project

CNR will lead WP1 (Project Management), WP4 (MOLAB), and WP8 (Central Support Activities). CNR will take a major role in the tasks on Management of project consortium and bodies (T1.1), Administration (T1.2), Access provision management (T4.2), Data management and link with EOSC (T5.4), Integrating TNA procedures (T8.1), Communication (T8.3) and Relations with relevant initiatives (T8.5). CNR institutes will all be involved in the joint research activities T5.1-T5.5.

Profiles of key persons

Luca Pezzati (male) Physicist and Optics Specialist. Researcher at INO-CNR. He started the Art Diagnostic Group of INO and the "Optical Metrology Lab for the Diagnostic of Cultural Heritage" at OPD-Opificio delle Pietre Dure in Florence in 1998.). He has managed a number of research projects. Full profile at http://it.linkedin.com/pub/luca-pezzati/6/15b/550/
Raffaella Fontana (female) is researcher at INO since 2004 with PhD in Non-Destructive Techniques (1997), a II level MD in Medical Physics (2000), a MD in Physics (1992). Currently coordinator of INO Heritage Science Group; Deputy Coordinator and task leader for Dissemination in H2020 IPERION CH. Task leader of scientific activities concerning innovative instruments in INSIDDE and CHARISMA; scientific responsible for INO in more than 20 projects; author of more than 50 publications. She is responsible for the mobile facility at INO included in the MOLAB platform.
Jana Striova (female) is researcher at INO, currently Head of Coordination Office of both H2020 IPERION CH and E-RIHS PP projects, PhD in Science for Conservation of Cultural Heritage (IT 2009), MSc in Anal. Chemistry (USA 2004), MSc in Chemistry for Environment and Cultural Heritage (CZ 2002), Marie-Curie Early Stage Researcher (2005-8). Author of more than 40 publications, participated in H2020 *INSIDDE* project and teaching activities in Sciences for DIPLOMAzia.
Monique Bossi (female) currently member of the E-RIHS Coordination Office as "expert in international relationship and in EU projects". She has been active in EU RTD Programme since FP5 also as coordinator of funded projects and was nominated by the Italian Ministry of Research as National Contact Point for H2020 Research Infrastructures Programme and for H2020 Legal and Financial aspects (until 2018). She is now attending the Executive Masters in Management of Research Infrastructures (MBA) at Milano Bicocca University and represents E-RIHS PP within the ERIC Forum initiative.
Elisabetta Andreassi (female) Archaeologist with over twenty years of experience in the field of scientific dissemination and communication of Cultural Heritage's scientific data, through the use of information systems. Activities as a content editor for historical, artistic and archaeological web sites and multimedia applications. She is a member of the Coordination Office of IPERION CH and E-RIHS PP.
Laura Benassi (female) is a researcher in Architectural History and has a Master degree in Public and Political Communication. She has over ten years of experience in cultural heritage research and education and in the field of scientific dissemination and communication. Her publications include books and articles. She currently works at the CNR as technologist and she is a member of the Coordination Office of IPERION CH and E-RIHS PP.
Francesca Usala (female) is a financial officer at INO-CNR since 2012. M.A. in Literature and Philosophy at Università di Pisa. From 2001-2012, she worked as a financial manager in private companies. She is in charge of giving legal and financial support to the scientific network for participating in, managing and reporting EU, national and regional projects.
Marta Rapallini (female) Architect, PhD in History of Science and Building Construction Techniques. She has been teacher and researcher in the fields of masonry mechanics, in particular masonry vaulted structures, and of the history of building science. In recent years, she has held executive positions for co-ordination and support of policies involving higher education, research, infrastructures, at the Tuscany Region, at the

Ministry of Education, University and Research (MIUR). Presently she is senior technologist at CNR member of the technical scientific staff of the President of CNR.
Costanza Miliani (female) is Director of ISPC. She is the author of over 130 articles in heritage science (H-index=43 from Google Scholar). Since 2004, she has been responsible for the national (E-RIHS.it) and transnational (Eu-ARTECH, CHARISMA and IPERION CH projects) access service of the MOLAB program. She is the European coordinator of the E-RIHS MOLAB platform. She has the Executive Masters in Management of Research Infrastructures (MBA) at Milano Bicocca. (http://www.emmri.unimib.it/en/). She acts as deputy of the Italian National Coordinator of the Italian Nodo of E-RIHS. Full profile at https://cnr-it.academia.edu/CostanzaMiliani/CurriculumVita.
Francesca Rosi (female) received her PhD in Chemical Sciences from the Università Degli Studi di Perugia, Italy, in 2005. She is currently a researcher at CNR-SCITEC in Perugia. Her research interests include the application and development of non-invasive and portable spectroscopic techniques for studying materials of interest in the field of cultural heritage. She is author of more than 30 scientific papers. She is the responsible of the mobile facility at SCITEC included in the MOLAB platform.
Cristiano Riminesi (male) PhD in electronic engineering, is researcher at ISPC. His main research interests are related to the construction and development of instruments to monitor environmental parameters and physico-chemical properties of materials in CH and in the evaluation of conservation conditions.
Salvatore Siano (male), a recognised expert at IFAC on laser and optoelectronic techniques for material knowledge and conservation of CH. He has achieved fundamental advances in laser treatments for conservation and in the development of various analytical techniques for material characterisation (TOF-ND, LIPS, Raman, 3D microscopy, fluorescence imaging, and other). He has had the role of 'responsible' in about thirty R&D projects, contracts, and agreements, such as for example TEMART. He is a member of various Scientific Committees and Editorial Boards and has to his credit more than two hundred publications.
Paolo Romano (male) is researcher in the area of mobile X-ray Spectrometry at the ISPC in Catania. He is authors of 85 publications in peer-review journals. He is in the Editorial Board of Microchemical Journal, X-ray Spectrometry and Heritage where he served as associate editor in several initiatives dedicated to the Cultural Heritage field. He is the responsible of the mobile facility at ISPC Catania included in the MOLAB platform.
Nicola Masini (male) is a Senior researcher and responsible of seat of Potenza of ISPC, Professor of Architectural Restoration in the School of Architecture in Matera, Director of the Italian Archaeogeophysics Mission in Peru. He authored and co-authored over 350 publications. Currently he is the Responsible of two H2020 Projects: ATHENA (H2020-TWINN-2015) and GeoMOP (H2020-MSCA-IF-2016). For additional information see: http://cnr-it.academia.edu/NicolaMasini/CurriculumVitae He is the responsible of the mobile facility at ISPC Potenza included in the MOLAB platform.
Emiliano Degli Innocenti (male) PhD, researcher at OVI, National Coordinator of DARIAH-IT ond DIGILAB.it; European Co-coordinator of the E-RIHS DIGILAB Platform. Holds a Laurea in Philosophy and a Ph.D. in History of Philosophy. He has been designing and directing several projects in the field of Digital Humanities, publishing scholarly databases, online repositories of digital texts and images, scientific datasets and tools. He is leading WP and Tasks in EU (PARTHENOS, SSHOC, Rise of Literacy, Humanities at Scale) and National (SHINE, DARIAH-IT, IDEHA) Projects.
Carlo Meghini (male) Senior Researcher at ISTI and Principal Investigator for the ISTI Team in the project. Competence in logical modelling, ontology and semantic web languages (including Linked Data), multimedia information retrieval, digital libraries and digital preservation.
Sofia Pescarin (female) Researcher at ISPC Degree in Archaeology, Master in Exhibition Design, Ph.D. in History and Computing;, Co-director of the VHLab; Scientific Project Coordinator of the EC FP7 NoE "V-MUST.NET" (GA 270404, 2011-2015 www.v-must.net); coordinated CNR ITABC participation to 3D Icons (GA 297194) and ARIADNE (GA 313193) EU projects; technical director of the Virtual Museum of the Scrovegni Chapel project (2003); scientific director of the Italian School of Virtual Archaeology and the Director of Archeovirtual (www.archeovirtual.it) until 2017; technical curator of the exhibition "Keys To Rome" organised in 4 museums (www.keys3rome.eu); just concluded the H2020 project "Reveal" on Videogame technologies in the field of Cultural Heritage and Cultural Tourism; currently teaching "Intangible Artifacts, Cultural Heritage and Multimedia" at the University of Bologna and "Multimodal Design" at the University of Ferrara.
Augusto Palombini (male) Archaeologist. He works as a researcher at ISPC. Worked in Italy and Africa (mainly in central and western Sahara). Author of scientific and dissemination works, as well as two historical novels. Founding member of the Italian Archaeologists Confederation. His research activity is currently focussed on landscape archaeology, virtual museums, digital storytelling, computer science and multimedia

solutions applied to Cultural Heritage and topographic surveying, particularly dealing with open source software. Expert on Geographic Information Systems. In the last 6 years was involved in 5 EU research projects: V-Must.NET (NoE, GA 270404); 3D Icons (GA 297194); ARIADNE (GA 313193); Etruscanning; (VII F.P.); Reveal. Among the main recent publications: "The rights of reproducing Cultural Heritage in the digital Era. An Italian Perspective" (2017: Ex Novo Journal of Archaeology) and "Storytelling and telling history. Towards a grammar of narratives for Cultural Heritage dissemination in the Digital Era" (2017: Journal of Cultural Heritage).

Relevant publications and/or products, services

- Daffara, C, Pampaloni, E, Pezzati, L, Barucci, M, Fontana, R, 2010, 'Scanning Multispectral IR Reflectography SMIRR: An advanced Tool for Art Diagnostics', in Acc. Chem. Res., 43, pp.847-856, DOI 10.1021/ar900268t.
- Miliani, C, Rosi, F, Brunetti, BG, Sgamellotti, A, 2010, 'In situ noninvasive study of artworks: the MOLAB multitechnique approach', in Accounts of Chemical Research, 43 (6), pp. 728-738.
- C. Meghini, N. Spyratos, and J. Yang. A data model for digital libraries. International Journal on Digital Libraries, Vol. 11(1), pp. 41-46, 2011.
- Taccetti et al. The 14C AMS facility at LABEC, Florence, Nucl. Instr. & Meth. B 259 (2007), 18-22
- C. Miliani, L. Monico, S. Fantacci, A. Romani, M. J. Melo, E. Mariasole Angelin, K. Janssens.Angewandte Chemie 04/2018; DOI:10.1002/ange.201802801

Relevant previous projects or activities

- E-RIHS PP - The European Research Infrastructure for Heritage Science Preparatory Phase / Horizon 2020 (2017-2019), http://www.e-rihs.eu/
- Computationally-Based Imaging of Structure in Materials (CuBISM)" within the program PIRE (Partnerships for International Research and Education). US National Science Fundation 2017-2022.
- IPERION CH-Integrated Platforms for the European Research Infrastruture ON Cultural Heritage, 2015-2019 (H2020), www.iperionch.eu
- HEROMAT www.heromat.com/ (protection of cultural HERitage Objects with multifunctional advanced MATerials, GA No: 282992; 2011 – 2015
- CHARISMA-Cultural Heritage Advanced Research Infrastructures: Synergy for a Multidisciplinary Approach to Conservation/ Restoration (EU FP7), www.charismaproject.eu
- Eu-ARTECH-Access, Research and Technology for the conservation of the European Cultural Heritage (EU FP6), www.eu-artech.org
- DARIAH ERIC-Digital Research Infrastructure for the Arts and Humanities ERIC, www.dariah.eu
- SHINE – Strenghtening the Italian node of E-RIHS – PON Ricerca ed Innovazione 2014-2020.

A description of any significant infrastructure and/or any major items of technical equipment

The CNR partnerhip contributes to the IPERION HS **MOLAB** platform with four facilities:

MOLAB.it-1 – ISTM Perugia. The mobile lab (already operative in IPERION CH) carries out scientific and technological research aimed at the development and application of advanced mobile instrumentation and new analytical methodologies based on the use of molecular spectroscopies (point analysis and hyperspectral imaging) to be used in the non-invasive characterization of archaeological and / or art-historical materials. It offers to IPERION HS MOLAB the following equipment: i) mid-FTIR; ii) near-FTIR; iii) three Raman spectrometers (exc @532,785,1064 nm); iv) macro XRF scanner; v) XRF point analysis; vi) high resolution digital microscopy.

MOLAB.it-3 – INO Florence. Mobile lab (already operative in IPERION CH) carries out scientific and technological research aimed at the development and application of techniques and tools for the non-invasive and non-contact diagnostics of artworks. It offers to IPERION HS MOLAB the following equipment: i) multimodal imaging based on multispectral analysis on a uniquely wide spectral range; ii) high-resolution surface shape detection.

MOLAB.it-4 – IBAM Catania. The mobile lab carries out scientific and technological research aimed at the development and application of advanced mobile instrumentation and new analytical methodologies based on the use of X-ray techniques to be used in the non-invasive characterization of archaeological and / or art-historical materials. It offers to IPERION HS MOLAB the following equipment: i) portable PIXE system; ii) low energy XRF; iii) confocal XRF; iv) micro-XRF mapping; v) XRD mapping.

MOLAB.it-5 – IBAM Potenza. AirLAb offers access to earth observation technologies, processing and analysis of satellite multispectral data and SAR, airborne Lidar and close-range photogrammetric surveys with drones for applications in field of preventive archeology, landscape archeology, risk analysis and monitoring, documentation of architectural heritage, data mining and machine learning based analysis for cultural heritage. It offers to IPERION HS MOLAB the following equipment: unmanned vehicles for aerial remote sensing, using the following passive and active sensors: i) hyperspectral cameras in the visible and near infrared spectrum; ii) LiDAR; iii) thermal camera.

2. Koninklijk Instituut voor het Kunstpatrimonium – Royal Institute for Cultural Heritage (KIK-IRPA)

www.kikirpa.be - (BE)

KIK-IRPA represents the Belgian node (main participant) and is linked with 1 third party (KMKG-MRAH).

Description of the legal entity

Established in 1948, the Royal Institute for Cultural Heritage (KIK-IRPA, http://www.kikirpa.be), whose chief mission is research and public service, is one of ten scientific institutions falling within the competence of the Belgian Federal Ministry of Science Policy. KIK-IRPA is committed to the inventory, the scientific study, the conservation and the promotion of the country's artistic and cultural heritage, both movable and immovable. Three departments group art historians, photographers, chemists, physicists and conservator/restorers. Any restoration treatment is based on their interaction. KIK-IRPA specialists advise researchers and curators of both public and private collections. An impressive Information Centre is open to the public. It comprises a photo library containing over one million photos, about 800.000 of which are accessible online, and a library specialized in art history offering nearly 50.000 works and around 1.500 periodicals. Furthermore, the publications, the photo inventory and the organization of courses, conferences and seminars reflect the role KIK-IRPA plays in the promotion of heritage and the diffusion of tools for researchers and the public.

Main tasks in the project

As an ARCHLAB provider (WP2), KIK-IRPA continues to provide access to its archives to international researchers, as it did in IPERION-CH. In its initiative to digitize and improve on-line access to its heritage science data, as a part of the HESCIDA project to create a local repository for the forthcoming E-RIHS DIGILAB platform, KIK-IRPA will take a major role in the tasks on data management (T2.4, T5.4) and interoperability (T6.3).

Profiles of key persons

Hilde De Clercq (female) is a chemist and obtained a PhD in science, polymer chemistry at Ghent University (1993). Since 1994 she works as researcher in the Laboratories department of KIK-IRPA. From 2006 she is the Head of this department and from 2017 acting General Director. She is member of the Executive Board of the Joint Programming Initiative Cultural Heritage since 2011 and of the Council of ICCROM since 2013. She is WP leader for IPERION-CH's ARCHLAB and interim platform coordinator for E-RIHS' ARCHLAB.
Wim Fremout (male) is a chemist and obtained a PhD in science, analytical chemistry at Ghent University (2014). Since 2003 he works as a researcher in the Laboratories department of KIK-IRPA. Since 2018 he is National Coordinator of E-RIHS.be and since 2019 he is coordinator of HESCIDA, a project funded by the Belgian Science policy that aims to create a local repository for DIGILAB. Within IPERION-CH he leads the task "Storing and Organising Scientific Data" (T8.3).
Stephanie Buyle (female) is graduated as MA in History at the University of Antwerp (2014) and in Archival Science: Heritage and Records Management at the Free University of Brussels (2015). Since 2016 she works on a project to enhance digital data management habits in KIK-IRPA and to establish a data management policy, and will be involved in the HESCIDA project. In IPERION-CH she contributed to the task "Networking and external cooperation on Heritage digital data management/exploitation/use/reuse" (T9.4).

Relevant publications and/or products, services

- Information centre / BALaT online portal (http://balat.kikirpa.be)
- Closer to Van Eyck (http://closertovaneyck.kikirpa.be)

- E-RIHS PP - The European Research Infrastructure for Heritage Science Preparatory Phase / Horizon 2020 (2017-2019), http://www.e-rihs.eu/
- IPERION CH – Integrated Platform for the European Research Infrastructure On Cultural Heritage (H2020-INFRAIA-2014-2015, Grant No. 654028, 2015-2019)
- Eu-ARTECH-Access, Research and Technology for the conservation of the European Cultural Heritage (EU FP6), www.eu-artech.org
- CHARISMA-Cultural Heritage Advanced Research Infrastructures: Synergy for a Multidisciplinary Approach to Conservation/ Restoration (EU FP7), www.charismaproject.eu
- Heritage Science Archive - HESCIDA (Belgian Science Policy, Grant No. FSIRI/00/HE1)

A description of any significant infrastructure and/or any major items of technical equipment

KIK-IRPA: Several databases are yet free available on-line, of which BALaT, covering KIK-IRPA's photo-library of Belgian cultural heritage (visual art, artistic crafts, architecture, archaeology and landscapes) and library.

ARCHLAB.be-1

Services offered:

The access offered by KIK-IRPA within ARCHLAB regards information gathered through the scientific investigation of cultural heritage objects (paintings, sculptures, monumental decoration and mural paintings, metal, glassware, textile, monuments).

Through ARCHLAB users can have a physical access to the records of our scientific activities and documentation not transferred to the electronic system and sample collections. The reports (mostly in Dutch or French) include art historical and material-technical investigations, conservation procedures and assessment for preventive conservation purposes. Access will be offered to primary images (micro- and macro-images, X-radiographs, etc. in both digital and analogue formats) and generated data (Raman, HPLC, GC-MS, IC, XRF, XRD, SEM-EDX, FT-IR, dendrochronology, 14C dating, etc) in a variety of formats relating to the project reports held by KIK-IRPA. Sample collections include polished and thin sections of paint layer, glass, metals and stone material.

3. Universidade Federal de Minas Gerais (ANTECIPA)

http://lacicor.eba.ufmg.br (BR)

Universidade Federal de Minas Gerais (ANTECIPA) represents the Brazilian node with no linked parties.

Description of the legal entity

ANTECIPA participates with LACICOR – Conservation Science Laboratory at the Center for Conservation of Cultural Heritage - CECOR, of the School of Fine Arts. LACICOR is part of ANTECIPA, Brazilian National Association for Research in Technology and Heritage Science. ANTECIPA is a professional and scientific organization in Brazil which congregates some of the most representative research and training laboratories, independent professionals, teachers and conservation students. ANTECIPA is legally registed in Brazil as a non-profit professional organization. ANTECIPA was founded in 2018, as a follow up with the IPERION CH meeting in Rio de Janeiro and Belo Horizonte in 2015 and 2018, both promoted by LACICOR – Conservation Science Laboratory.

Main tasks in the project

Collaboration in international activities (e.g. Pan-american symposium in The Getty Institute for Conservation in 2021). Specialized training on technical examination of cultural heritage. Access to laboratories and facilities to carry out joint research projects.

Profiles of key persons

Luiz A C Souza (male) is the head of LACICOR – Conservation Science Laboratory, at the Center for Conservation of Cultural Heritage - CECOR, of the School of Fine Arts – Federal University of Minas Gerais, in Belo Horizonte, Minas Gerais, Brazil. LACICOR is totally devoted to the material study of cultural heritage, for both collections and built heritage, with a focus on Technical Art History, Preventive Conservation, Risk Management. Prof. Souza is a Full Professor of Conservation Science, originally trained

as a chemist, with part of his graduate studies developed at IRPA, in Belgium, the Getty Conservation Institute, in Los Angeles, including a Post-Doctoral Fellowship at the University of Perugia. LACICOR team is composed of conservation professionals and researchers ranging from historians, art historians, architect, chemists and conservators.

Carlos R. Appoloni (male) is head of the Applied Nuclear Physics Laboratory of the State University of Londrina (Brazil) since 1977. He earned his M.S. (1976) and Ph.D. degrees (1983) in experimental nuclear physics at State University of São Paulo and post doctoral on applied nuclear physics at Università di Roma La Sapienza (1991-93). His current research interests include applications of X-Ray Fluorescence (EDX, PXRF and TXRF), Raman Spectroscopy and X-Ray Microtomography in Art and Archaeometry;

Thiago S. Puglieri (male) is professor of Conservation Science at the Department of Museology, Conservation and Restoration of the Federal University of Pelotas (UFPel). He has PhD (2015, University of São Paulo - USP), Master (2011, USP) and Bachelor (2009, Federal University of São Carlos - UFSCar) in Chemistry and works with cultural heritage since 2009. He is specialist in vibrational spectroscopy using many other characterisation techniques to investigate paintings, ceramics, metals and modern and contemporary objects.

Relevant publications and/or products, services

- Moreno-Mayar, J. VIinner, V., De Barros Damgaard, L., De La Fuente, P., Chan, C., Spence, J., Allentoft, J.P., Vimala, M.E., Racimo, T., Pinotti, F., Rasmussen, T., Margaryan, S., Iraeta Orbegozo, A., Mylopotamitaki, M., Wooller, D., Bataille, M., Becerra-Valdivia, C., Chivall, L., Comeskey, D., Devièse, D., Grayson, T., George, D.K., Harry, L., Alexandersen, H., Verner Primeau, C., et al.; Early human dispersals within the Americas in *SCIENCE*, v., p. eaav2621, 2018.
- Marte, F., Souza, L.A.C., Concrete Art in Argentina and Brazil. Conservation Perspectives in *The GCI Newsletter*, v. 32, p. 16-18, 2017.
- Giulia, G., Souza, L. A. C., Froner Yacy-Ara, Alessandrea, R., The use of industrial paint on wood by Lygia Clark, in *Studies in Conservation*, v. 61, p. 291-293, 2016.
- Candeias, A., Rui, B., Souza, L. A. C, Froner Yacy-Ara, 3rd Portuguese-Brazilian Conference on Conservation and Restoration? Thinking Conservation in its multiple aspects, in *CONSERVAR PATRIMÓNIO*, v. 23, p. 7-8, 2016.
- De Figueiredo, J. Cura D'Ars, Oliveira, J. Alves Dos Santos, De Souza, G. Silva Marques; Froner Yacy-Ara; Souza, L. A. C .; Zarankin, A., Characterization of corrosion products on metals excavated from seal hunters' occupation in Antarctica in the eighteenth and nineteenth centuries in *Studies in Conservation*, v. 60, p. 211-216, 2015.

Relevant previous projects or activities

- History of Modern House and Industrial Paints in Brazil: The project "History of Modern House Paints in Brazil" is a continuation of the project "Concrete Art in Brazil", sponsored by the Getty Foundation during its first three years (2015 - 2018). The new focus of the project is on collecting evidences (samples of painted surfaces, ancient paint cans, historical information, historic marketing campaign materials, etc) of modern house paint making in Brazil, including whenever possible information on industrial paints as well. The project is supported and executed in collaboration with the Getty Conservation Institute, as well as the scientific partnership with the teams at the Universidad San Martin, in Buenos Aires.
- Concrete Art in Brazil: The project deals with research on the materials and technology of construction of paradigmatic works of art of the concretism period in Brazil, belonging to the following collections: Pinacoteca of the State of São Paulo; Museum of Modern Art - MAM, Rio de Janeiro; Collection Tuiuiú (owned by Luis Antonio de Almeida Braga), Rio de Janeiro; and the Pampulha Art Museum, in Belo Horizonte - Minas Gerais. The objects are studied under a methodological approach based on the principles of Technical Art History, as part of the J. Paul Getty Trust Project Pacific Standard Times - Los Angeles/Latin America - Getty PST LA/LA.
- Study of pigments in cave paintings of Paraná by Raman spectroscopy and EDXRF. Araucária Foundation Project Number 15791, Project Call 14/2008. Atomic-nuclear methodologies applied for the non-destructive characterization of pigments in cave paintings of the Jaguariaíva 1 site, Paraná
- Nuclear Atomic Analytical Methodologies Applied to the Study of Archaeological Ceramics from Sambaqui of Panaquatira (São Luís, MA). Process Brazilian Council of Science and Technology CNPq nº 480979 / 2011-1. Study of ceramic fragments collected in three archaeological sites in São Luís, MA, Brazil,

by several analytical techniques such as EDXRF, PIXE, Mössbauer, Raman, Digital Radiography, X-ray Diffractometry and others

- In situ studies of objects of archaeological and cultural heritage by non-destructive nuclear-atomic-molecular methodologies. Process Brazilian Council of Science and Technology CNPq nº 305.695/2013-4. The project involves: (1) In situ studies of rock paintings in archaeological sites in the state of Paraná; (2) In situ studies in the Museum of Archeology and Ethnology (MAE-USP) of brazilian archaeological ceramics (pigments, ceramic paste, provenance); (3) In situ studies of paintings from the collection of the São Paulo Art Museum - MASP

A description of any significant infrastructure and/or any major items of technical equipment

The laboratories and research infrastructures associated with ANTECIPA are spread over Brazil, and are based in the most important universities and research centres in the country. The laboratories associated with ANTECIPA congregate know-how and competences within the fields of study and preservation of built and movable heritage, as well integrated heritage. The scientific instrumentation is represented by portable and desktop equipment, such as FTIR, EDXRF, SEM, GC-MS, Scientific Digital Imaging equipments (for visible, infrared, and UV light, as well as X-Radiography), optical and digital microscopes, micro-tomography, 3D laser scanners, infrared cameras, etc.

No third parties involved

4. The Cyprus Institute (CyI)

www.cyi.ac.cy - (CY)

The Cyprus Institute represents the Cypriot node with no linked parties.

Description of the legal entity

The Cyprus Institute is a non-profit research and educational institution with scientific and technological focus. It consists of issue-oriented research centres that address challenging problems both at the regional and international levels. The Government of Cyprus supports The Cyprus Institute, viewing its establishment as important to its overall policy of transforming Cyprus into a regional centre for research and education. Among CyI's centers, The Science and Technology in Archaeology and Culture Research Center (STARC) is devoted to the development, introduction and use of advanced science and technologies in the field of archaeology and cultural heritage of Cyprus and the EMME region. Research scientists and doctoral students utilize STARC's cutting edge technological and scientific fix and mobile infrastructure to lead and contribute in local and international collaborative research in Cyprus, the Eastern Mediterranean and Europe. Key areas of research are Digital Cultural Heritage, Art Characterization, Archaeological Materials Sciences, Bioarchaeology, Cultural Landscapes and Built Heritage, Virtual Environments for Cultural Heritage. These efforts are closely supported by key stakeholders such as archaeological authorities, museums and heritage organizations and foundations. STARC research activities also make effective use of high-performance computing capabilities hosted at The Cyprus Institute to perform research requiring intensive computing or data storage, repositories, management and web-dissemination. New perspectives on archaeological and cultural heritage research in the region are achieved through strong collaborations with research in climate and environment facilitated by CyI's unmanned aircraft infrastructure.

Main tasks in the project

The contribution of the Cyprus Institute is mainly threefold: bridging between archaeological and heritage sciences communities and IperionHS, by engaging them with the project's main platforms, working towards the facilitation of data integration generated by such communities and finally providing access to MOLAB facilities in the domain of dendrochonology and 3D documentation. An additional effort will be put towards the identification of training needs and innovation aspects related to archaeological and heritage sciences. The Cyprus Institute will lead Task 5.2 (Innovative methods for integrating archaeological science documentation, data and collections).

Profiles of key persons

Nikolas Bakirtzis (male) is an associate professor. He studied Architectural History, Social Anthropology and Archaeology at Princeton University and the Aristotle University of Thessaloniki. He is also Director of

the Andreas Pittas Art Characterization Laboratories and the Coordinator of the Doctoral Program in Science and Technology in Cultural Heritage. His research and publications concentrate in the art and architecture of the urban and rural landscapes of the Byzantine, Medieval and Early Modern Mediterranean. The architectural development of Byzantine monasteries and their relation to their rural or urban setting is among his main interests. More recently, his work has focused on historic Mediterranean cities, the perception and appropriation of Medieval heritage in the modern period and in the application of advanced imaging and analytical methods to understand the materiality of Medieval and Early Modern Art. Awards and fellowships include a European Commission Marie Curie Grant, a Princeton Seeger Center for Hellenic Studies Visiting Fellowship, an A.G. Leventis Foundation Grant, a Guest Scholarship at the Getty Research Institute and a Getty Foundation "Connecting Art Histories" grant along with Co-PI, D. Fairchild-Ruggles (University of Illinois at Urbana-Champaign).

Thilo Rehren (male) is a professor. He is A.G. Leventis Professor for Archaeological Sciences and Director of the Science and Technology in Archaeology and Culture Research Center. After completing high school and national service in Germany he studied Earth Sciences, with an MSc dissertation on the mineralisation of a copper-silver mine in SW Germany, and a PhD thesis on the magma development of the Island Arc volcano of Nisyros in the Dodekanes, Greece. After a short postdoc training period at the Univeristy of Oxford he started his professional career at the newly-founded Institut für Archäometallurgie at the Deutsches Bergbau-Museum in Bochum, Germany. In 1999, he was appointed to a chair in archaeological materials at the UCL Institute of Archaeology in London, UK, where he built a major international research group of postgraduate students and postdocs. Following a five-year secondment to establish UCL Qatar as a postgraduate training and research Centre of Excellence in Museology, Conservation and Archaeology he joined the Cyprus Institute in 2017. His research focuses on the reconstruction and understanding of the technological processes related to the manufacture of metals, glass, glazes and ceramics. For this, he combines concepts and methods developed by the materials and natural sciences in order to shed light on the tremendous achievements of past craftspeople and proto-engineers. His main approaches are the interpretation of data obtained by structural and chemical analyses of 'technical' finds, such as raw materials, intermediate and semi-finished artefacts, and waste products, in conjunction with archaeological and historical sources. He places particular emphasis on the integration of archaeological, scientific and historical information, and on investigating the correlation and cross-fertilisation between different crafts and industries in order to understand the evolution of technical understanding within the wider setting of varied cultures and societies.

Sorin Hermon (male) is a associate professor. He leads the research group on Digital Cultural Heritage. His research interests are computer applications in archaeology, in particular development of domain ontologies, 3D scientific visualization, semantic structures, knowledge representation and archaeological digital documentation. He is a member of CAA, EAA, IIPP, VAST, IPP, VSMM, and a member of the scientific committee of VSMM, VAST and CAA conferences. Sorin published two books, he is co-editor of several books and peer-reviewed conference proceedings, and author of more than thirty scientific publications. Sorin was / is Principal Investigator in several EC funded initiatives, such as 3D COFORM, CARARE, V-MUST, 3D-ICONS, EAGLE, ARIADNE, EMAP and ARCHAEOLANDSCAPES. Currently Sorin is a member of the E-RIHS (European Infrastructure on Heritage Science) steering committee, fulfilling among others the role of communication officer for the infrastructure.

Relevant publications and/or products, services

- Gasanova, S., Bakirtzis, N., Hermon, S. 2017. Non-invasive sub-surface analysis on Titian's Studio Ecce Homo multi-layered painting in *Heritage Science* DOI 10.1186/s40494-017-0145-2
- Babalola, A.B., McIntosh, S.K., Dussubieux, L. and Rehren, Th. 2017. Ife and Igbo Olokun in the history of glass in West Africa. Antiquity 91, 732-750.
- Broschat, K. and Rehren, Th. 2017. The glass headrest of Tutankhamen. Journal of Glass Studies 59, 377- 380
- Hermon, S., Niccolucci, F. 2017. Formally defining the time - space – archaeological culture relation in archaeology - problems and prospects, *Archaeologia e Calcolatori* 28.
- Eichler, A., Gramlich, G., Kellerhals, T., Tobler, L., Rehren, Th., Schwikowski, M. 2017: Ice-core evidence of earliest extensive copper metallurgy in the Andes 2700 years ago. Scientific Reports, 7:41855 | DOI: 10.1038/srep41855.

Relevant previous projects or activities

- E-RIHS PP - The European Research Infrastructure for Heritage Science Preparatory Phase / Horizon 2020 (2017-2019), http://www.e-rihs.eu/
- Coordinator of the strategic infrastructure project 'Mobile Archaeological Lab: STAR-LAB' one of nine national infrastructure projects funded by the Cyprus Research Promotion foundation (RPF)
- Co-Coordinator of Study and Preparation of Management Plans for the UNESCO World Heritage Sites in Cyprus
- Partner in the V-MusT.net: Virtual Museum Transnational Network funded by the EC as a Network of Excellence. http://www.v-must.net/
- Partner in ARIADNE-Advanced Research Infrastructure for Archaeological Dataset Networking in Europe, 2013- 2017 (EU FP7) www.ariadne-infrastructure.eu and ARIADNE plus

A description of any significant infrastructure and/or any major items of technical equipment

APAC laboratories for Art Characterisation: integrated non-invasive and non-destructive instrumentation and dedicated software in: spectrsocopy and digital microscopy, Multi-spectral imaging, Technical imaging (including RTI), 3D documentation and scientific visualisation, Dendrochronology, Knowledge repositories. Study of **Archaeological Materials (**SEM and Dedicated microscopy), **Virtual Research Environments (**Virtual simulation and urban modelling Immersive environments Interaction design**), CyTera (**HPC computation facility Own cloud storage facility).

MOLAB.cy 1

Among the range of research activities and expertise developed at the Cyprus Institute's Science and Technology in Archaeology and Culture Research Center (STARC) and specifically in the context of the Andreas Pittas Art Characterization Laboratories (APAC Labs), a few instruments provide key features of uniqueness to enhance the capability the MOLAB platform, specifically those related to i) non-invasive, imaging-based dendrochronology and ii) 3D documentation.

No third parties involved

5. Ústav teoretické a aplikované mechaniky – The Institute of Theoretical and Applied Mechanics (ITAM)

www.itam.cas.cz - (CZ)

The Institute of Theoretical and Applied Mechanics (ITAM) of the Czech Academy of Sciences represents the Czech node and is linked with 2 third parties (IAP, IAB).

Description of the legal entity

ITAM carries out research on materials and structures including interdisciplinary projects in the field of Heritage. It operates since 2013 a new European Centre of Excellence as a specialised research infrastructure for Cultural Heritage research, which has been built under the ERDF support. The research portfolio involves projects with themes from technical and natural sciences through socio-economic research till art conservation. The ITAM team has been involved in more than 25 international projects supported by the EC (FP5-FP7), Council of Europe and other international programmes. The RI operates next to specific stationary laboratories (radiography, combined climatic wind tunnel, set of laboratories for physics, chemistry, biology) a group for complex investigations in historic environment. It consists in a mobile laboratory for diagnostics of historic materials and structures as well as several long-term monitoring networks (corrosion stations, measurement of weather and dynamic effects on historic buildings and monuments) with relevant database systems. ITAM is involved in development of the new distributed E-RIHS as a partner in the preparatory phase project. It is linked with other two research institutes of the Czech Academy of Sciences with a framework cooperation agreement in research.

Main tasks in the project

ITAM is involved in IPERION HS as a FIXLAB access provider to the unique TORATOM X-ray microCT device, located in Telč, Czech Republic (WP3); as the organizer of one Summer School (WP7) as well as the task leader of T8.2.

Profiles of key persons

Miloš Drdácký, DrSc. (male) Professor. Past Director of ITAM, Head of the Heritage Science Dept., experienced in testing and experimental investigation of materials and structures as well as in urban research of architectural heritage and historic cities, coordinator or partner in 23 European projects in the field. Chair of the Council for Research of the Czech Minister of Culture, Professor of the CTU in Prague, representative of the Czech Republic in the CH JPI Gov. and Exe. Boards.

Stanislav Pospíšil, Ph.D. (male) Associated Professor. Director of ITAM, is specialized in research into structural dynamics especially the effects of wind and seismicity on buildings and structures, including historical ones. He is the main designer of the combined climatic wind tunnel in ITAM and the scientific supervisor of this unique infrastructure. Experienced from several EC FP projects, e.g. NOAH'S ARK, CULTSTRAT, I-SAMCO, NIKER, focused on technological research of cultural objects.

Michal Vopálenský, Ph.D. (male) Associated professor. Head of the Laboratory for X-ray radioscopy and tomography. His main research interest are sensors of the physical quantities, especially of the magnetic field, measurement technology, radiography and image processing. Experienced from recent international research projects E-RIHS and Interreg AT-CZ ATCZ38 (Competence Center for High-Resolution 3D X-ray Imaging) or national project on development of mobile X-Ray Imager.

Jakub Novotný, Ph.D. (male) Engineer. Head of the CET unit in Telč, experienced in coordination of use of the CET research infrastructure and the ITAM Prague research infrastructure facilities, former chancellor of the Polytechnic College in Jihlava. Responsible for the Interreg Central Europe CE902 project "RUINS" on exploitation of CH ruins for tourism.

Relevant publications and/or products, services

- Pospíšil, S, Drdácký, M, Slížková, Z., Lesák, J, Knotková, D, 'Wind tunnel modelling in conservation', *in Proceedings Safeguarded Cultural Heritage* (SAUVEUR Project – M. Drdácký, M. Chapuis (eds.)), Vol.1, ISBN 978-80-86246-31-4 (Vol. 1), ISBN 978-80-86246-29-1 all, ITAM 2007, pp. 397-408
- Kumpová, I, Vavřík, D, Fíla, T, Koudelka, P, Jandejsek, I, Jakůbek, J, Kytýř, D, Zlámal, P, Vopálenský, M, Gantar, A, 'High resolution micro-CT of low attenuating organic materials using large area photon-counting detector', in *Journal of Instrumentation*. Vol. 11, 2 (2016), C02003. ISSN 1748-0221
- Ziegenbalg, G., Drdácký, M., Dietze, C., Schich, D. (eds.) 'Nanomaterials' in *Architecture and Art conservation*. Pan Stanford Publishing Pte. Ltd., 2018. 457 p. ISBN 978-981-4800-26-6 (Hardback), 978-1-000-00000-0 (eBook)
- Device for in-situ measuring of conventional compressive strength and the module of deformation by opening clamps in a drilled hole (wood testKLOIBer). 2014 Unique patented device for testing of built in historic wood – authors Kloiber, M., Drdácký, M.
- Multi-axis device for performing X-ray measurements, particularly computed tomography – namely Twinned Orthogonal Adjustable Tomograph (TORATOM). 2015 Unique device covered with an European patent – authors Fíla T., Vavřík, D.

Relevant previous projects or activities

- E-RIHS PP - The European Research Infrastructure for Heritage Science Preparatory Phase / Horizon 2020 (2017-2019), http://www.e-rihs.eu/
- Completed - FP7 Collaborative project - NIKER - New integrated knowledge based approaches to the protection of cultural heritage from earthquake induced risks, 2009-2012
- Running – ERDF – Engineering applications of the micro-world physics – national project with a strong international collaboration on development of neutron tomography – 2019-2026
- Running – Interreg ATCZ38 Competence Center for High-Resolution 3D X-ray Imaging – 2018-2020
- Running – Interreg Central Europe - CE902 RUINS and CE1127 ProteCHt2save – 2017-2020

A description of any significant infrastructure and/or any major items of technical equipment

ITAM operates specific infrastructure related to the CH research in Prague as well as in Telč (CET). It consists mainly in a simple shaking table with one degree of freedom (MTS servo-hydraulic system), a mobile heavy electromagnetic shaker for dynamic tests in situ. In Telč, ITAM operates the "Vincenc Strouhal" Climatic wind tunnel with a climatic section designed for the study of the environmental impact of actions working in a synergetic manner (wind and rain, radiant heat, temperature cycles) on structures and materials. Its aerodynamic section has been designed apart from others for experiments in the field of territorial

aerodynamics and flows around complex geometrical forms (e.g. sculptures) and urban sites. CET further operates a mobile diagnostics and rescue unit specifically equipped with unique devices for safeguarding cultural heritage in emergency situations. It has been upgraded with several unique tools recently developed at ITAM, including a micro-jack which enables the measurement of the mechanical characteristics of wood in real structures in situ and at various depths below the surface (CZ patent). Diagnostics of historic materials, objects and structures has been developed in ITAM for several decades, systematically namely after winning a financial support from the EC as a European centre of excellence for advanced interdisciplinary research in heritage science in 1999 (ARCCHIP).

This systematic research has been intensified when ITAM gained a joined national and ERDF support for establishment of a specialised European Centre of Excellence within the research infrastructure competition in 2009. Since 2013 a new facility operating several fixed and one mobile laboratories expanded the RI capacity of ITAM. Since January 2019 ITAM started a new organisational scheme in which a Section on Heritage Science exists with a laboratory dedicated to X-ray X-ray investigations. The X-ray tomography laboratory with a unique EU patented Twinned Orthogonal Adjustable Tomograph and a set of various imaging detectors allowing the analysis of the topology and the internal structure of objects at micrometric (one micrometre) resolutions, highlighting the differences in the material components of a scanned object, display of elements with very low attenuation, measurement of the energy of each detected ionised particle, "colour" radiography and fluorescent imaging and analysis of time dependent processes during specimen loading. Cultural heritage sustainability unit operating special databases on sustainability data – technical, social and economic – supporting the research and services for restoration and management of CH. It provides special monitoring combined with the remote transmission of data for studying various effects, e.g. mechanical characteristics (vibrations of historic buildings), physical data on environments (museum interiors), the impact of tourism or natural disasters on historic cities, etc.

FIXLAB.cz-1

The following facility has been included in the IPERION HS FIXLAB TNA activity.

A set of research laboratories providing complex information on historic materials and objects using advanced methods and technologies – X-ray radiology, X-ray computed tomography and complex material analyses. X-ray radiology applies one-shot or tile-by-tile large-area scanning of objects (flat objects, paintings) up to 1000 mm x 800 mm, available resolution in order of units of um). Advanced computed X-ray microtomography with resolution down to 1 um per pixel exploits a world-unique double source device protected under European patent and the unique detector registering individual photons with resolution of 2560x2560 pixels with the pixel pitch of 55 um, allowing resolution in order of units of micrometers per voxel.

6. Stiftung Preußischer Kulturbesitz-Staatliche Museen zu Berlin-Rathgen Forschungslabor – Rathgen Research laboratory - Prussian Cultural Heritage Foundation (SPK)

www.smb.museum/home.html - (DE)

SPK represents the German node and is linked with 7 third parties (MLZ, CEZA, RWTH, CCA-BW, Doerner Institut, DAI, Fraunhofer Building Lab).

Description of the legal entity

With its museums, libraries, archives, and research institutes, the Stiftung Preußischer Kulturbesitz (SPK, Prussian Cultural Heritage Foundation) is one of the important cultural institutions in the world. It was established in 1957 by federal law as a foundation directly responsible to the German government. The SPK has taken over tasks of national interest in various thematic areas including research and documentation of museums as such and best management practices. Because of its structure as a cross-disciplinary cultural institution, the Foundation has extensive knowledge about the preservation of cultural assets and digitization. The active part of the SPK facilities for IPERION-HS are the Staatliche Museen zu Berlin (SMB). The other organizations that fall under the auspices of the Stiftung Preußischer Kulturbesitz (SPK) are the Staatsbibliothek (State library of Berlin), Geheimes Staatsarchiv (an archive of Prussian state documents), the Ibero-Amerikanisches Institut (a specialist library of Spanish- and Portuguese-language literature), and the Staatliches Institut für Musikforschung (a musicological research institute which has its own museum:

the Musikinstrumenten-Museum). The SPK was founded in 1957 to preserve and continually enrich the cultural artefacts belonging to the former state of Prussia. The SPK is funded by the federal German government and all 16 of Germany's individual states. With its numerous institutions that have evolved over generations, the SMB constitutes an encyclopaedic museum, spread over many different sites, that aims to preserve, research, and display art treasures and cultural artefacts dating from all human history, and educate the public about their importance. The Staatliche Museen zu Berlin's collections encompass the fields of European and non-European art, archaeology and ethnology from virtually all nations, cultures, and periods. The SMB are enriched and supported by the Rathgen-Forschungslabor (Rathgen Research Laboratory, RF) for the scientific research. It is the leading institution for heritage science of the SMB. The Rathgen-Forschungslabor is believed to be the oldest museum's laboratory in the world. It was founded in 1888 as the Chemical Laboratory of the Königliche Museen zu Berlin (Royal Museums of Berlin) and was later renamed in honour of its first director Friedrich Rathgen, a chemist who specialized in the conservation and analysis of historical objects. It investigates museum objects and ancient materials of all kinds and conducts scientific research on the preservation of historical objects, monuments and archaeological sites. The five main research areas are: Preventive conservation, Study of alteration and degradation mechanisms of cultural heritage, Art-technological investigations of objects, Science for conservation, Archaeometry.

Main tasks in the project

In IPERION HS the SPK assumes the function of the German Partner, since it is the German Hub in E-RIHS. So, the SPK fulfills the important role of being the responsible coordination node for the German linked third parties. In addition, the SPK develops significantly the stabilization of the German Governance and supports in carrying out acquisition to enhance widely diversified range of services and equipment of scientific excellence. The SMB provides services based on its theoretical and methodological expertise to its partners. Particularly, the SPK grants the access to ARCHLAB in IPERION HS to natural scientific data of the collections of the National Museums in Berlin (WP2).

Profiles of key persons

Hermann Parzinger (male) has held the office of President of the Stiftung Preussischer Kulturbesitz (SPK) (Prussian Cultural Heritage Foundation) since 2008. Consisting of 27 museums, libraries, archives, and research institutions, the SPK is the second-largest cultural institution in the world. Its collections include all areas of cultural tradition: from archeological and ethnological objects, to the visual arts, literature and music. As president of the SPK, Parzinger is in charge of two major cultural projects: The renovation of the world-famous Museum Island and the realization of the Humboldt-Forum in the reconstructed Berlin Palace. Prof. Parzinger has conducted 30 years of field research in many European countries as well as in the Near East and in Central Asia. Before joining SPK he was an Assistant Professor at Munich University (1986-90), Director (1990-2003) and President (2003-2008) of the German Archaeological Institute. In 1996 has was appointed Honorary Professor at Free University in Berlin. Parzinger has received many awards, among them the Leibniz Prize, the highest scientific award in Germany. He holds several international Honorary Doctoral degrees, is a member of Academies of Sciences in Germany, Spain, Great Britain, Rumania, Russia, China and the USA and has received decorations from Germany, Russia and Italy.

Lars-Christian Koch (male) Since 2018, Prof. Dr. Lars-Christian Koch is director of the Ethnological Museum and Museum for Asian Art of the State Museums Berlin and director of Collections in the Humboldt Forum Berliner Schloss. He studied anthropology, musicology and comparative religious studies at the Rheinische Friedrich-Wilhelms-Universität in Bonn from 1980 to 1985. At the Musicological Institute of the University of Cologne he was habilitated in 2002. Koch is adjunct Professor of Music Ethnology at the University of Cologne and Honorary Professor at the Berlin University of the Arts and has been a Visiting Professor at the Universities of Vienna and Chicago (University of Chicago). His research interests include the theory and practice of North Indian music, instrumental science with special emphasis on instrument making, audiovisual media in cultural contexts, popular music and urban culture, musical interpretations in a historical context and music archeology.

Ina Reiche (female) is currently the head of the Rathgen research lab of the National Museums Berlin. She is back to CNRS in a research director position. After graduating in chemistry and art history in Germany and France in 1997, she performed her PhD in Material science at UPMC Paris VI and C2RMF, Paris, in 2000 and her post-doc at the Rathgen research laboratory until 2002. She was working as CNRS researcher at the Laboratory of the C2RMF, UMR 171 of the CNRS, between 2003 and 2011, on the understanding of physico-chemical alteration processes of complex materials and objects of our cultural heritage. She was also developing analytical strategies to study the structure of archaeological hierarchical biomaterials such as bone

and ivory. Finally, she was also involved in the development of new non-invasive techniques such as confocal microXRF for studying paintings, drawings and manuscripts. In 2009 is obtained her habilitation thesis in Analytical Chemistry at the UPMC Paris VI. Her research was awarded by the Young scientist award of the European X-ray Spectrometry Association (EXSA) in 2006 and the Berthold Prize in 2005 for innovative research in the field of non-destructive testing. Ina Reiche has more than 80 international peer-reviewed publications (H-index 18), is author of many book chapters and is managing editor of the international journal Archaeometry (Wiley).

Christin Keller (female) received her doctorate in 2014 in the field of Prehistoric Archeology at the Free University of Berlin. Since then she has worked in the field of science management and project management in various major German cultural institutions. Her focus is on digitizing archaeological objects and promoting science networks and research infrastructures.

Relevant publications and/or products, services

- L. Bertrand, S. Bernard, F. Marone, M. Thoury, I. Reiche, S. Bernard, F. Marone, M. Thoury, A. Gourrier, Ph. Sciau, U. Bergmann, Emerging Approaches in Synchrotron Studies of Materials from Cultural and Natural History Collections, *Topics in current chemistry* 374 (1) (2016) 1-39
- B. Blümich, S. Haber-Pohlmeier, W. Zia, *Compact NMR*, Walter De Gruyter Berlin/Boston (2014) 276 pp.
- Ina Reiche, Claire Heckel, Katharina Müller, Olaf Jöris, Tim Matthies, Nicholas J. Conard, Harald Floss, Randall White, Combined Non-invasive PIXE/PIGE Analyses of Mammoth Ivory from Aurignacian Archaeological Sites, *Angewandte Chemie International Edition* 57(25) (2018) 7428-7432.
- M. Hilgert, K. Hofmann, H. Simon (Hrsg.), *Objektepistemologien. Zur Vermessung eines transdisziplinären Forschungsraums,* edition TOPOI / Exzellenzcluster Topoi der Freien Universität Berlin und der Humboldt Universität zu Berlin (2018) 323 pp.
- Ricardo Eichmann, Lars-Christian Koch (Hrsg.), Musikarchäologie-Klänge der Vergangenheit, Sonderheft 07/2015 *Archäologie in Deutschland*

Relevant previous projects or activities

- ARIADNE-Advanced Research Infrastructure for Archaeological Dataset Networking in Europe, 2013- 2017 (EU FP7) www.ariadne-infrastructure.eu
- IPERION CH- Integrated Platform for the European Research Infrastructure ON Cultural Heritage, 2014-2019 (EU FP7) http://www.iperionch.eu/
- E-RIHS PP- European Research Infrastructure for Heritage Science - Preparatory phase, 2018-2020 http://www.e-rihs.eu/
- BRONZEAGETIN - Tin Isotopes and the Sources of Bronze Age Tin in the Old World, 2013-2018 (FP7-IDEAS-ERC Senior Grant) http://www.cez-archaeometrie.de/?p=1028
- TOPOI II – The Formation and Transformation of Space and Knowledge in Ancient Civilizations, 2013-2019, Exzellenzcluster 264, Freie Universität Berlin and Humboldt Universität zu Berlin, SPK, DAI Germany

A description of any significant infrastructure and/or any major items of technical equipment

The Rathgen Forschungslabor (RF) – The laboratory is well-equipped with up-to-date instruments that enable a wide range of tests andanalyses, such as optical, digital and environmental scanning electron microscopy (ESEM/EDS), portable and conventional X-ray fluorescence (µ-XRF and XRF) spectrometry, X-ray diffraction (XRD), infrared (FTIR), Raman and UV-Vis spectroscopy, multispectral imaging (UV-Vis-IR), microfading tests (MFT), pyrolysis-gas chromatography/mass spectrometry (Py-GC/MS), high performance liquid chromatography (HPLC), atomic absorption spectrometry (AAS), non-destructive ultrasonic-testing, and other equipment to determine the mechanical properties of materials. It also provides artificial ageing chambers for climatic simulation, and mobile systems to monitor the physical and chemical environments in the museums' collections.

ARCHLAB.de-1

Within ARCHLAB the RF provides access to all its scientific reports, analytical data obtained on museum materials within the National Museums in Berlin and reference samples.

The records held by the institute relate to a wide range of objects and material classes, including stone, metals, minerals, textiles, ceramics, glass, paper, paintings, basketry, gemstones, wood, enamels, etc., from every period from prehistory to the present and from most major cultures. In addition, the reports include studies

of conservation materials, conservation procedures and assessments for preventive conservation purposes.

7. Agencia Estatal Consejo Superior de Investigaciones Científicas - Superior Council for Scientific Research (CSIC)

www.csic.es - (ES)

CSIC (Spanish National Research Council) represents the Spanish node and works in collaboration with 2 third parties (art. 11) (IPCE, CENIEH).

Description of the legal entity

CSIC is the largest public research institution of Spain and ranks third among Europe's largest research organizations. Its 123 Institutes spread across the country and cover different areas of Science and Technology. CSIC has a broad experience in managing large and singular infrastructures and a long-standing experience in conducting R&D projects funded by national and international public agencies and industry. Heritage Science is well represented in an intrinsically multidisciplinary organization as CSIC with more than 15 groups in different CSIC Institutes carrying out research in several areas of this domain, including materials science, physics chemistry and biology, engineering and information and communications technologies. These groups are associated in the Thematic Network "Red Temática para la Conservación del Patrimonio Cultural" with University Departments, cultural institutions and museums and conservation companies. The activity of CSIC groups in heritage science is internationally recognized and is funded through participation in regional, national and EU funded projects.

Main tasks in the project

CSIC will lead WP6 (Innovation and Exploitation) and will participate in JRA, NA and TNA activities, by itself and in collaboration with its Third Parties IPCE and CENIEH.

Profiles of key persons

Emilio Cano (male) is Tenured Scientist at CENIM, CSIC. PhD from Complutense University of Madrid (2001), Head of the group "Corrosion and Protection of metals in cultural heritage and construction" (COPAC) working in corrosion and protection of metallic heritage, indoor corrosion and electrochemical techniques. Author of 88 articles in indexed journals, and Assistant Coordinator of ICOM-CC Metal Working Group; coordinator of the Spanish Network on Science and Technology for the Conservation of Cultural Heritage (TechnoHeritage) and the Spanish Node of E-RIHS. He is responsible of the mobile lab included in the MOLAB platform.

Marta Castillejo (female) PhD in Physics, Senior Research Scientist at IQFR, CSIC, Head of Group (http://lanamap.iqfr.csic.es/). Works in fundamentals of laser-matter interactions and applications of laser methods in Cultural Heritage. Authored more than 200 publications in peer-reviewed journals, supervisor of 8 PhDs, has participated in numerous projects funded by EU framework programs and committee member of various international conference series in the field of Cultural Heritage. Acts as Integration Director of the European Infrastructure for Heritage Science (E-RIHS).

Mohamed Oujja (male) PhD in Chemistry, Research Scientist at IQFR, CSIC (http://lanamap.iqfr.csic.es/). Works in development and applications of laser methods in Cultural Heritage. Authored more than 130 publications in peer-reviewed journals, has participated in numerous projects funded by EU framework programs and bilateral exchanges in the field of Cultural Heritage. Ample experience in training and dissemination activities in this field.

Relevant publications and/or products, services

- Oujja M., Psilodimitrakopoulos S., Carrasco E., Sanz M., Philippidis A., Selimis A., Pouli P., Filippidis G., Castillejo M., 'Nonlinear imaging microscopy for assessing structural and photochemical modifications upon laser removal of dammar varnish on photosensitive substrates', in *Physical Chemistry and Chemical Physics*, 19, 22836-22843 (2017)
- Martínez-Hernández A., Oujja M., Sanz M., Carrasco E., Detalle V., Castillejo M., 'Analysis of heritage stones and model wall paintings by pulsed laser excitation of Raman, laser-induced fluorescence and laser-induced breakdown spectroscopy signals with a hybrid system', in *Journal of Cultural Heritage*, 32, 1-8. (2018)

• B. Ramírez Barat, A. Crespo, E. García, S. Díaz, E. Cano, 'An LIS study of the conservation treatment of the bronze sphinxes at the Museo Arqueológico Nacional (Madrid)', in *Journal of Cultural Heritage*, 24 (2017) 93-9.
• Sahnouni, M., Parés, J. M., Duval, M., Cáceres, I., Harichane, Z., Made, J., Pérez-González, A., Abdessadok, S., Kandi, N., Derradji, A., Medig, M., Boulaghraif, K., & Semaw, S. (2018). '1.9-million- and 2.4-million-year-old artifacts and stone tool–cutmarked bones from Ain Boucherit, Algeria', in *Science* (0). doi: 10.1126/science.aau0008.
• IPCE HISTORICAL HERITAGE PHOTO LIBRARY. Including several historic photograph archives https://ipce.culturaydeporte.gob.es/documentacion/fototeca/fondos-de-la-fototeca.html

Relevant previous projects or activities

• Advanced Research Infrastructure for Archaeological Data Networking in Europe – plus (ARIADNEplus) H2020-INFRAIA-2018-1, G.A 823914. January 2019-December 2022
• E-RIHS PP - The European Research Infrastructure for Heritage Science Preparatory Phase / Horizon 2020 (2017-2019), http://www.e-rihs.eu/
• IPERION CH-Integrated Platforms for the European Research Infrastruture ON Cultural Heritage, 2015-2019 (H2020), www.iperionch.eu
• Pooling Activities, Resources and Tools for Heritage E-research Networking, Optimization and Synergies, PARTHENOS, Project H2020, G.A. 654119, May 2015-December 2019.
• Nanomaterials for the Restoration of Works of Art (NANORESTART) H2020-NMP-2014, G.A. Nº 646063. June 2015-November 2018.

A description of any significant infrastructure and/or any major items of technical equipment

CSIC research team participating in IPERION HS is constituted by scientists belonging to Centro Nacional de Investigaciones Metalúrgicas (CENIM) and to Instituto de Química Física Rocasolano (IQFR), two of the research institutes of CSIC, and from IPCE and CENIEH as third parties. This team has a well-founded trajectory of more than 15 years of research and applications of laser methodologies applied to conservation of Cultural Heritage (CH) and study and protection of metallic cultural heritage. The team has made important contributions to the topics of advanced methodologies for laser cleaning, analysis and diagnostics applied to CH objects, understanding the degradation mechanisms of heritage metals in museums and exhibitions, electrochemical methods for the treatment and evaluation of protection systems for metallic CH.

MOLAB.es-1

CSIC-CENIM will contribute to the MOLAB platform bringing unique expertise and analytical capacity in the field of electrochemical methods for the treatment and evaluation of protection systems for metallic CH. Specifically the prototype for Electrochemical impedance spectroscopy, will be profitably integrated in the IPERION HS offer.

FIXLAB.es-2

Access provider**:** Laser Laboratory for Heritage Science, Instituto de Química Física Rocasolano, CSIC (LAS4HS IQFR-CSIC) – https://lanamap.iqfr.csic.es/research/researchlines/66-lasersintheconservation

Description of FIXLAB.es-2:

This installation, housed at Instituto de Química Física Rocasolano of CSIC, offers laser-based analytical strategies specifically tailored for Heritage Science applications, including laser spectroscopies and microscopies for non-sampling, non-invasive analysis of heritage materials and objects and advanced laser cleaning methodologies. Capabilities include expert knowledge, based on almost two decades of research activity in the field of Heritage Science by the facility team. The installation offers access to: a) pulsed laser sources with spectral coverage from ultraviolet to infrared, with pulse duration in the nanosecond and femtosecond regimes; b) to the laser spectroscopic techniques of laser-induced breakdown spectroscopy (LIBS), laser-induced fluorescence (LIF) and Raman, with time resolution capabilities and different laser excitation wavelengths; and c) to a nonlinear optical microscope. A large number of complementary techniques is available for material physicochemical characterization.

Services offered by FIXLAB.es-2:

The facility offers the following services:

- Non-sampling, non-invasive determination of elemental and molecular composition of materials of artworks and heritage substrates based in the application of LIBS, LIF and Raman spectroscopies, in individual or integrated, combined setups. These techniques are well established for compositional analysis and to provide information of physicochemical transformations associated with ageing, degradation or restoration.
- Morphological, structural and chemical non-destructive characterization in 3D with micrometer accuracy of thickness and composition in multilayer substrates using nonlinear optical microscopy techniques, based on the excitation of the nonlinear optical response of materials generated upon excitation with laser pulses of femtosecond duration.
- Controlled laser removal of unwanted layers constituted by materials of diverse origin (organic and inorganic), assembled in mixtures (thick pollution, burial accumulations) or in layers (multiple protective, dirt and/or overpaint layers) on weathered, even fragile, original surfaces.

The laboratories of the facility have hosted international visitors for almost two decades through bilateral and multilateral programs. Among the most interesting achievements are the characterization of historical glasses, metallic objects, painting layers and polychromes and the removal of degraded varnishes and biodeterioration crusts on heritage stone.

8. Centre National de la Recherche Scientifique – National Scientific research Centre (CNRS)

www.cnrs.fr - (FR)

The National Centre for Scientific Research (CNRS) represents the French node and is linked with 5 linked third parties (MC, MNHN, SOLEIL, UBx, Univ-Lille-MSAP).

Description of the legal entity

CNRS is an interdisciplinary public research organisation under the administrative supervision of the French Ministry of Higher Education, Research and Innovation that covers all area of science. Because of its extensive network of units and partners, the CNRS was selected to represent the French National Node in IPERION HS. The following units will be involved: FR 3506 New AGLAE (*Accélérateur Grand Louvre d'Analyse Elémentaire*, Research Unit mixed with MC), as the French project coordinator, IPANEMA (*Institut Photonique d'Analyse Non-destructive Européen des Matériaux* Anciens, USR 3461, Service Research Unit mixed with MC and MNHN), the Centre de Recherche sur la Conservation (CRC, USR 3224), the *Institut De Chimie Et De Biologie Des Membranes Et Des Nanoobjets* (CBMN, UMR 5248, Research Unit mixed with UBx), *Miniaturisation pour la Synthèse, l'Analyse et la Protéomique* (MSAP, USR 3290), and *Modèles et simulations pour l'Architecture et le Patrimoine* (MAP, UMR 3495). For administrative purposes, the French Ministry of Culture (MC, including the *Centre de Recherche et de Restauration des Musées de France* and the *Laboratoire de Recherche des Monuments Historiques*), the *Muséum National d'Histoire Naturelle* (MNHN), Synchrotron SOLEIL, Lille and Bordeaux Universities will be involved as linked third parties.

Main tasks in the project

The CNRS and its third parties will be involved in all Work Packages of the Project and provide Transnational Access through all IPERION HS Platforms. It will be responsible for two Work Packages (WP 3 FIXLAB through the FR 3506 New AGLAE, and WP 5 through IPANEMA), and two tasks (T3.2 and T5.3).

Profiles of key persons

Aurélie Tournié (female) CRC CNRS research engineer, PhD in Physics. She focuses her research on the development of non-invasive optical technical techniques for the study of Heritage materials.

Christian Rolando (male) MSAP. CNRS senior scientist working at the University of Lille and has been the Deputy director at the CNRS Institute for Chemistry in charge of scientific infrastructures. He has authored over 200 papers cited more than 6500 times (Google scholar) and has supervised over 40 PhD theses. He has an h-index higher than 40. He is a member of the Steering Committee of the Division of Analytical Chemistry of EuCheMS and has organized several congresses, the last being EuroAnalysis 2015 in Bordeaux (France). He is the PI of just funded (start 1st January 2018) Horizon Infra for Starting

Communities EU_FT-ICR_MS which includes 10 FT-ICR academic centers from nine European countries, an instrumentation companies and 2 SMEs.

Livio de Luca (male) MAP Architect, Phd in Computer Science, he is Research Director at the CNRS and director of MAP. Co-president of the international congress NESCO/IEEE/EG DigitalHeritage (Marseille 2013, Grenade 2015), coordinator of several national and European research programmes, he focuses his research activities on the acquisition, the geometrical modelling and the semantics of digital representations of Heritage artefacts and buildings.

Relevant publications and/or products, services

- F. Kergourlay, S. Réguer, D. Neff, E. Foy, P. Dillmann, (2018), "Stabilization treatment of cultural heritage artefacts: In situ monitoring of marine iron objects dechlorinated in alkali solution", Corrosion science., 132: 21-34. 2018
- F. Pottier, A. Michelin, S. Kwimang, C. Andraud, F. Goubard, B. Lavédrine, (2018), , Macroscopic reflectance spectral imaging to reveal multiple and complementary types of information for the non-invasive study of an entire polychromatic manuscript, Journal of Cultural Heritage (2018).
- Gonzalez, Victor and Calligaro, Thomas and Wallez, Gilles and Eveno, Myriam and Toussaint, K. and Menu, Michel (2016), Composition and microstructure of the lead white pigment in Masters paintings using HR Synchrotron XRD. Microchemical Journal, 125. pp. 43-49. ISSN 0026-265X
- L. Bertrand, S. Bernard, F. Marone, M. Thoury, I. Reiche, A. Gourrier, P. Sciau, and U. Bergmann, (2016), Emerging approaches in synchrotron studies of materials from cultural and natural history collections. Top. Curr. Chem., 374(1):1–39.
- Dallongeville S., Garnier N., Rolando C., Tokarski C., (2016), Proteins in Art, Archaeology and Paleontology: from Detection to Identification. Chemical Reviews, 116(1): 2–79.

Relevant previous projects or activities

- E-RIHS PP – European Research Infrastructure for Heritage Science (Preparatory Phase) (H2020), 2017-2020, www.e-rihs.eu
- IPERION CH-Integrated platform for the European Research Infrastructure ON Cultural Heritage (H2020), 2015-2019, www.iperionch.eu
- CHARISMA-Cultural Heritage Advanced Research Infrastructures. Synergy for a Multidisciplinary Approach to Conservation/Restoration (EU FP7), www.charismaproject.eu
- EU ARTECH - Access, Research and Technology for the conservation of the European Cultural Heritage (EU-FP7) http://services.chm.unipg.it:8080/eu-artech/
- PATRIMA-The French Heritage Laboratory of Excellence project (2011–2020), and PATRIMEX-TheFrench Heritage Equipment of Excellence project (2011–2020) developed and coordinated by the Fédération des Sciences du Patrimoine http://www.sciencespatrimoine.org/index.php/homepage.html.

A description of any significant infrastructure and/or any major items of technical equipment

MOLAB.fr-1

The CNRS facility fully operative in IPERION CH will offer access via the IPERION HS platform. Specifically, the following equipment will be provided and integrated with the platform: i) NIR hyperspectral camera; ii) XRF/XRD; iii) Teraherz Time Domain Spectroscopy (TDS): iv) Stimulated Infrared Thermography (SIRT); v) LIBS-LIF-Raman (notably a new instrument specifically developed in IPERION CH JRA).

9. The Foundation for Research and Technology Hellas (FORTH)

www.iesl.forth.gr - (GR)

The Foundation for Research and Technology-Hellas (FORTH) represents the Greek node and is linked with 1 third party (Of-ADC).

Description of the legal entity

Established in 1983, FORTH is a major research center in Greece with state-of-the-art research facilities, highly qualified academic personnel and a reputation as a top-level research foundation worldwide, as also shown by evaluations by international expert committees. FORTH currently hosts over 30% of the ERC grants running Greece while it maintains strong participation in H-2020 projects.

The **Institute of Electronic Structure and Laser (IESL)** is the main laser centre in Greece, with internationally established research activities in the areas of Laser and photonics and materials science. IESL has been operating as a European Research Infrastructure since 1990, being currently a member of the LASERLAB EUROPE, NFFA and ESMI networks of RIs. In the context of Heritage Science, IESL has pioneered the use of enabling laser technologies in diagnostics and conservation, with emphasis on laser cleaning and analysis of works of art and monuments, as well as the development of portable instruments for diagnostics and analysis. Highlights of this research include laser conservation projects at the Athens Parthenon and the Acropolis Museum (honoured with the IIC 2012 Keck award). It is currently involved actively in the IPERION-CH, PARTHENOS and E-RIHS PP projects (H-2020).
The Laboratory of Geophysical-Satellite Remote Sensing & Archaeoenvironment (GeoSat ReSeArch Lab) in the **Institute of Mediterranean Studies (IMS)** is one of the leading facilities internationally on the applications of geoinformatics in the humanities. It has been the first in Eastern Mediterranean offering an integrated and specialized suite of tools for geophysical and satellite remote sensing prospection as well as GIS analysis, photogrammetry and 3D reconstructions of CH monuments and archaeological sites. In the past 23 years, the Lab has performed over 250 geophysical prospection surveys (in Greece, Cyprus, Italy, Turkey, Hungary, Egypt, S. Korea, USA, Australia) and has trained several young researchers.

Main tasks in the project

FORTH will be actively involved in all WPs of the project with emphasis on a) providing access, 3 MOLAB facilities (one offered by the third party) and one FIXLAB (of which 3 are newly introduced in the network expanding the TNA offer) and leading Task 4.1 b) participating in the JRAs, all tasks in WP5 and c) contributing to WP6, leading Task 6.4.

Profiles of key persons

Demetrios Anglos (male) BSc, Chemistry: Univ. of Athens, Greece (1986), PhD, Physical Chemistry: Cornell Univ. USA (1994)) - Professor of Chemistry (Univ. of Crete) and Associated Researcher at IESL-FORTH. He leads the Applied Spectroscopy Laboratory and the activities of his research group focus among others on the applications of laser spectroscopic techniques in the analysis of materials, with particular emphasis on the development of mobile instrumentation for CH diagnostics and analysis. He is member of the Editorial Board of Heritage Science.
Nikos Papadopoulos (male) BSc, Geology (2001), MSc (2003) and PhD (2007) in Applied Geophysics, Univ. of Thessaloniki, Greece. He is Principal Researcher at IMS-FORTH, GeoSat ReSeArch Lab. Ha has participated in and/or organized over 100 geophysical projects in Greece, Cyprus, Hungary, Egypt, Australia and S. Korea and has been main investigator in 30 Nationally and EU funded large scale projects He maintains extensive collaborations with national and international universities and research centers (in Turkey, Hungary, Cyprus, S. Korea, USA) and has strong record in graduate and undergraduate student supervision.
Paraskevi Pouli (female) B.Sc., Physics, Aristotle Univ. of Thessaloniki (1995), Ph.D., Physics, Loughborough Univ., UK (2000)) is a Researcher at IESL-FORTH. Her research interests concentrate on the investigation of laser ablation cleaning methodologies applied in the context of CH, with emphasis on the understanding & prevention of side effects of laser cleaning and the optimization of cleaning by use of novel & prototype laser systems & methodologies. Since 2001 she has been scientist in charge of the laser-cleaning projects at the Athens Acropolis (Parthenon West-Frieze, Erechtheion Caryatids etc).
Apostolos Sarris (male) B.A. in Astronomy & Physics (1985) and M.A. in Physics (1988), Boston Univ. USA; M.Sc. (1990) and Ph.D. in Physics/Geophysics (1992), Univ. of Nebraska-Lincoln, USA). He is Research Director at IMS-FORTH and Head of the GeoSat ReSeArch Lab. His research focuses on the development and implementation of Geophysical Exploration, Satellite Remote Sensing, Geographical Information Systems, Spatial Analysis and predictive modelling, and Archaeo-environmental analysis within the cultural and environmental domain.
Sophia Sotiropoulou (female) BSc, Physics: Univ. of Athens, Greece (1991), PhD, Chem. Engineering, National Technical Univ. of Athens, Greece (2000)) –She is a Senior Research Associate at IESL with strong expertise in acquisition, interpretation and integration of technical and analytical data in the context of conservation, documentation and management of artworks collections and archeological objects. She has been actively involved in many EC-funded projects (EU-ArTech, CHARISMA, IPERION-CH, E-RIHS) focusing on the development and application of analytical methodologies for the Conservation of CH.

- Cerra, D, Agapiou, A. Cavalli, R.M., Sarris, A. (2018), 'An Objective Assessment of Hyperspectral Indicators for the Detection of Buried Archaeological Relics. Remote Sensing, Special Issue Advances' in *Remote Sensing for Archaeological Heritage*, 10 (4), 500. doi:10.3390/rs10040500. EDITOR's CHOICE
- G. J. Tserevelakis, J. S. Pozo-Antonio, P. Siozos, T. Rivas, P. Pouli, G. Zacharakis (2018) 'On-line photoacoustic monitoring of laser cleaning on stone: Evaluation of cleaning effectiveness and detection of potential damage to the substrate', *in Journal of Cultural Heritage*, 2018, https://doi.org/10.1016/j.culher.2018.05.014
- P. Siozos, A. Philippidis, D. Anglos (2017) 'Portable laser-induced breakdown spectroscopy/diffuse reflectance hybrid spectrometer for analysis of inorganic pigments', in *Spectrochimica Acta* B 137, 93-100 (2017); doi.org/10.1016/j.sab.2017.09.005
- Papadopoulos, N., Simyrdanis, K., and Cantoro G., (2017), 'Recent trends in shallow marine archaeological prospection in Eastern Mediterranean', in *12th International Conference on Archaeological Prospection*, Edited by B. Jennings, C. Gaffney, T. Sparrow and S. Gaffney, Archaeopress Archaeology. 175-177
- J. Dyer and S. Sotiropoulou (2017), 'A technical step forward in the integration of visible-induced luminescence imaging methods for the study of ancient polychromy' in *Heritage Science* 20175:24; doi.org/10.1186/s40494-017-0137-2

Relevant previous projects or activities

- HERACLES (2016-19): HEritage Resilience Against CLimate Events on Site (H2020-DRS-11-2015-700395) http://www.heracles-project.eu/
- STORM (2016-19) – Safeguarding Cultural Heritage through Technical and Organizational Resources Management, (H2020, DRS-11-2015-700191) https://cordis.europa.eu/project/rcn/202681/factsheet/en
- ACCELERATE (2016-18) - ArChaeological and Climatic data from ELEmental ratios using Rapid Analysis of shell carbonaTE –", (H2020-MSCA-IF-2015, Marie Curie IEF, Project No: 703625) https://www.accelerate-project.com/index.html
- IPERION-CH (2015-19) - Integrated Platform for the European Research Infrastructure ON Cultural Heritage. (H2020-INFRAIA-2014-15, Research and Innovation Action – www.iperionch.eu
- E-RIHS PP (2017-20) The European Research Infrastructure for Heritage Science Preparatory Phase, H2020-INFRADEV-02-2016, - 739503 - http://www.e-rihs.eu/

A description of any significant infrastructure and/or any major items of technical equipment

IESL-FORTH: Laser, Spectroscopy and Materials Analysis Facilities (Pulsed laser systems, various spectrometers and optical diagnostic modules, Portable instrumentation, optical and electron microscopy facilities)
IMS-FORTH: Several geodetic stations, magnetometers, electrical tomography instruments, Ground conductivity and resistivity meters, GPR systems, laser scanner, drones, etc., Facilities and Sensors at the GeoSat ReSeArch Lab

Description of the infrastructure

FIXLAB.gr-1

FORTH – The "Photonics for HS". The "Photonics for HS" laboratory of FORTH (PhoHS-FORTH), is a multi-disciplinary scientific laboratory dedicated to laser-based science, supporting high quality basic and technological research in the field of Heritage Science. PhoHS-FORTH combines state-of-the-art experimental facilities with rich scientific expertise that provide the ideal environment for fostering new ideas and advancing scientific research in order to respond to demanding challenges in HS conservation and analysis.
A number of laser cleaning accessory workstations have been developed at FORTH in order to handle the different types of conservation problems individually and approach the various laser cleaning challenges, such as a computer controlled beam steering system for a high precision smooth laser scanning over the object (for the cleaning of paintings and large flat/homogeneous surfaces) and a XY motorized, computer controlled stage for translating the object with respect to laser beam. Additionally, a laser cleaning support station equipped with glovebox and exhaust hood for handling materials producing emissions of dust or volatiles has been also developed at the laboratory. Finally, optical (multispectral imaging) and laser analysis (LIBS, LIF, Raman) and diagnostic (Photoacoustics, Holographic interferometry etc.) modules developed at

FORTH can be used, in parallel to the laser cleaning process, for assessment and monitoring purposes.

Services offered by FIXLAB.gr 1:

PhoHS-FORTH laboratory offers access to several laser systems operating at different wavelengths (from the UV at 193nm up to the IR at 2094nm), pulse durations (from several fs up to μs) and modes (Q-switched and Short free running) and can respond to diverse conservation and cleaning challenges by developing and implementing optimum laser cleaning methodologies. In this respect, a significant number of investigation studies has been realized over the past 25 years involving diverse materials such as stonework, metals, paintings, wooden artworks, paper and fabric, biological items such as bone, ivory, feathers, leather, parchment etc. Unwanted overlayers that have been studied include pollution crusts, burial accumulations of aluminosilicate composition, biological growth such as fungi and bacteria, various corrosion layers, aged varnish and other protective organic layers, overpaints, ink and iron stains etc. In parallel, in order to ensure controlled and safe interventions, significant research effort is dedicated for the assessment of the laser cleaned surfaces and the regular monitoring of the laser ablation process, using established conventional methodologies (i.e. multispectral Imaging, optical and scanning Electron microscopies etc.), as well as laser-based analytics (LIBS, LIF, Raman, THz) and diagnostics (photoacoustic imaging, holographic interferometry etc.) PhoHS-FORTH is among the leading centers worldwide for scientific research related to the use of laser technology for the removal of unwanted overlayers/encrustations from CH objects and monuments. Highlight of its activity is the development of a prototype laser system and methodology for the removal of pollution encrustation from the Parthenon Sculptures, which ensures safe and controlled cleaning without discoloration or other side-effects (Heritage Science 4, 2016). Other important large-scale laser cleaning projects in which the laboratory has been involved are the removal of black acrylic overpaints from Ad' Reinhardt's "Black" oil painting (Laser Chemistry 2006) and the removal of burial accumulations rich in aluminosilicates from the statue of Hermes in Ancient Messene. The facility users that have been visited the PhoHS-FORTH to carry out joint research on their conservation challenges include: the Acropolis Restoration Service and the Acropolis Museum in Athens, the Palace Museum in Beijing, China, the British Museum in London, UK (ulf-forth001296 in 2006), The Museum of Copenhagen in Denmark (ulf-forth001360 in 2007), as well as many archaeological Museums across Greece (Heraklion, Aiani, Ancient Messene, Ancient Corinth, etc.) and various conservation and scientific research laboratories. Since 2000 PhoHS-FORTH has carried out around 100 research projects, on average 5 cleaning challenges per year.

MOLAB.gr-1

The Greek node will contribute to the IPERION HS platform with three facilities, two of these are offered by FORTH:

1 IESL-FORTH: Laser, Spectroscopy and Materials Analysis Facilities (Pulsed laser systems, various spectrometers and optical diagnostic modules, Portable instrumentation, optical and electron microscopy facilities). Will provide access to Digital Holographic Speckle Pattern Interferometry, already succesfully integrated in the previous project.

2 IMS-FORTH: Several geodetic stations, magnetometers, electrical tomography instruments, Ground conductivity and resistivity meters, GPR systems, laser scanner, drones, etc., Facilities and Sensors at the GeoSat ReSeArch Lab. Will strongly enhance the capability of the new MOLAB platform offering access to unique instrumentation and related expertise for archeological geophysics, namely: *i)* Electrical Resistivity Tomography; *ii)* Laser scanning, total station and GPS; *iii)* Soil resistivity and conductivity techniques *iv)* Magnetic susceptibility measurements.

10. Atommagkutató Intézet – Institute for Nuclear Research (Atomki)

www.atomki.hu - (HU)

Atomki represents the Hungarian node and is linked with 2 third parties (EK and Wigner RCP).

Description of the legal entity

Atomki is one of the leading establishments in atomic and subatomic physics in Hungary. In addition to basic research, the institute is devoted to the application of atomic and nuclear physics in the fields of archaeology, environmental research, earth sciences, materials & surface science and biomedicine. Our laboratories provide services for external (national and international) and internal users and contribute to higher education as well. Atomki has been associated with the University of Debrecen since 2000. In collaboration with several

research institutions, universities, and museums, Atomki has been engaged in heritage research investigations applying elemental analysis and carbon dating for decades. Atomki has developed an active presence in the field participating in various international (IAEA, COST, FP7, H2020) programmes, currently it is access provider within Iperion CH and partner in E-RIHS PP.
Atomki will participate in Iperion HS with two linked third parties: EK and Wigner, who are also partners in the E-RIHS.hu consortium which is the national initiative in heritage science, led by Atomki.

Main tasks in the project

Atomki will provide access to its ion beam analytical facility, as part of FIXLAB. It will also contribute to Joint Research and international activities.

Profiles of key persons

Zita Szikszai (female). Physicist, PhD in Experimental Medical Science: Senior Research Fellow, specialist in ion beam analytical methods and their interdisciplinary applications in a variety of fields. She is one of the coordinators of Atomki's extensive program to upgrade the analytical infrastructure. She was person in charge of scientific and technical/technological aspects, as well as FIXLAB contact person, in the CHARISMA and IPERION CH projects. She is also managing Hungary's involvement in E-RIHS PP.
Zsófia Kertész (female). PhD in Physics: Senior Research Fellow. Head of the Laboratory of Ion Beam Physics. She has been leading scientist or key participant in international and national projects in the fields of environmental science and cultural heritage. She has been actively engaged in technical developments in the lab, and she is also supervising several graduate and postgraduate students.
Anikó Angyal (female). PhD in Environmental Science: Research Fellow. Expert in ion beam microanalysis and its interdisciplinary applications. Her main research interest is the development and application of ion beam analytical techniques for the characterization of environmental, geological and museum samples. Ten years of experience in TNA in the HS field, also involved in joint research activities.
Boglárka Döncző (female). PhD in Molecular Medial Science: Research Fellow. Besides ion beam analytical techniques, she is expert in complementary analytical methods, especially for organic materials. Responsible for a set of instrumentation in the new laboratory for heritage science in Atomki.

Relevant publications and/or products, services

- Sánchez de la Torre M, Angyal A, Kertész Zs, Dubernet S, Le Bourdonnec F-X, Papp E, Szoboszlai Z, Török Zs, Csepregi Á, Szikszai Z, 2018 (online) 'Micro-PIXE studies on prehistoric chert tools: elemental mapping to determine Palaeolithic lithic procurement*', in Archaeological and Anthropological Sciences, DOI:10.1007/s12520-018-0668-9*
- Kertész Zs, Furu E, Angyal A., Freiler Á, Török K, Horváth Á, 2015, 'Characterization of uranium and thorium containing minerals by nuclear microscopy' in *Radioanalytical and Nuclear Chemistry 306 pp. 283-288, DOI 10.1007/s10967-015-4175-5*
- Török, Zs, Huszánk, R, Csedreki, L, Dani, J, Szoboszlai, Z, Kertész, Zs, 2015, 'Development of a new in-air micro-PIXE set-up with in-vacuum charge measurements', in Nucl. Instr. and Meth. B, vol. 362, pp. 167-171. DOI:10.1016/j.nimb.2015.09.062
- Balta, ZI, Csedreki, L, Furu, E, Cretu, I, Huszánk, R, Lupu, M, Török, Zs, Kertész, Zs, Szikszai, Z, 2015, '*Ion beam analysis of golden threads from Romanian medieval textiles', in Nucl. Instr. and Meth. B*, vol. 345, pp. 285-290. *DOI:10.1016/j.nimb.2015.01.027*
- Kostov, RI, Protochristov, C, Stoyanov, C, Csedreki, L, Simon, A, Szikszai, Z, Uzonyi, I, Gaydarska, B, Chapman, J, 2012, 'Micro-PIXE geochemical fingerprinting of nephrite neolithic artifacts from Southwest Bulgaria', in *Geoarchaeology,* vol. 27, pp. 457-469. *DOI: 10.1002/gea.21417*

Relevant previous projects or activities

- E-RIHS PP - The European Research Infrastructure for Heritage Science Preparatory Phase / Horizon 2020 (2017-2019), http://www.e-rihs.eu/
- IPERION CH - Integrated Platforms for the European Research Infrastructure ON Cultural Heritage, 2015-2019, (H2020), www.iperionch.eu
- CHARISMA - Cultural Heritage Advanced Research Infrastructures: Synergy for a Multidisciplinary Approach to Conservation/ Restoration (EU FP7), www.charismaproject.eu

- Cross section measurements in order to improve/complete available nuclear data for PIGE and their applications in the field of archaeometry and environmental research, (IAEA CRP 2011-2015), https://www-nds.iaea.org/pige
- Enhancing the Characterization, Extending and Diversifying the Application of Nuclear Technology in Cultural Heritage, (IAEA TC RER/0/039), 2014-15.

A description of any significant infrastructure and/or any major items of technical equipment

Atomki conducts complex ion beam analytical investigations at the scanning nuclear microprobe facility and other accelerator beamlines. As cultural heritage samples are often not uniform, the available beam size down to one micron in vacuum provides an important tool for the determination of concentration and distribution of elements with high lateral resolution. An external micro-beam arrangement is also available for artefacts of bigger sizes or sensitive nature, also with mapping. Based on the decades-long expertise in the field and the various available techniques employing X-ray, gamma-ray and particle detection, the analytical capacities of the laboratory cover a wide range of elements (basically from hydrogen to uranium), material types and research questions. Optical, infrared and UV spectroscopy are also on hand to assist the user projects and joint research activities. Thanks to a large-scale infrastructure project, a variable pressure electron microscope with a Raman microscope, a micro-XRF device and a 3D digital microscope have also been procured. Furthermore, the expertise and equipment of the materials science department, as well as those at the accelerator facility, can also be recruited to cover specific needs.

FIXLAB.hu-2 –Atomki www.atomki.hu

The Atomki IBA Lab – as part of a registered national infrastructure – conducts complex ion beam analytical investigations. Ion beam analysis is a family of techniques using ions in the MeV energy range. The most important beamline for HS is the scanning nuclear microprobe facility at the 5 MV Van de Graaff accelerator. As cultural heritage samples are often not uniform, the available beam size down to one micron provides an important tool for the determination of concentration and distribution of elements with high lateral resolution. An external micro-beam arrangement is also available for artefacts of bigger sizes or sensitive nature, also with mapping. Based on the decades-long expertise in the field and the various available techniques employing X-ray, gamma-ray and particle detection, the analytical capacities of the laboratory cover a wide range of elements (basically the whole periodic table), material types and research questions. Optical, infrared and UV spectroscopy are also on hand to assist the user projects. Thanks to a large-scale infrastructure upgrade, a variable pressure electron microscope with a Raman microscope, a micro-XRF device and a 3D digital microscope will arrive at the lab this year. Furthermore, the expertise and equipment of the materials science and environmental departments can also be recruited to cover specific needs.

Services offered by FIXLAB.hu-2:

Ion beam analytical techniques can be applied for various materials. In Atomki, in relation with HS, it is mostly used for metal, glass, ceramics and mineral. The information is fully quantitative, concentration values on trace element level, with spatial information. Elemental mapping produces 2D maps. Layered samples can also be handled. Our high-resolution microprobe is mostly used for archaeological and museum projects concerning a series of small objects (whole artefacts, fragments, samples) which are vacuum resistant. Some examples: Gilded metal threads from textiles – composition, thickness of the gold layer, and also indication of the gilding technique; Inclusions in mineral tools or ceramics – classification by the elemental composition of the bulk and also of the inclusions; Quantitative elemental analysis of decorated pottery fragments – information on the source material and also on technology, etc. For the external microprobe arrangement: larger objects (bulk, inlays, and other details); precious glass objects, etc. The laboratory has been TNA provider for ten years in the HS field (Charisma, Iperion CH) and also regularly visited by domestic users.

11. העתיקות רשות - Israel Antiquities Authority (IAA)

www.antiquities.org.il - (IL)

The Israel Antiquities Authority (IAA) represents the Israeli node and has no linked parties.

Description of the legal entity

IAA is the national statutory cultural heritage organisation of the State of Israel. With over 300 cultural heritage professionals, the IAA is the largest employer of archaeologists in the country, of which 60 hold

doctoral degrees. Of the approximately 400 archaeological excavations and surveys conducted annually in Israel, 95% are carried out by the staff of the IAA. These excavations are published in peer reviewed publications and book series (http://atiqot.org.il/, http://www.hadashot-esi.org.il/, http://www.antiquities.org.il/survey/new/).

Main tasks in the project

IAA will lead Task 8.6 (International dimension) and contribute to the Joint Research activitites.

Profiles of key persons

Gideon Avni (male) Archaeologist. PhD (1997), Hebrew University of Jerusalem. Head of the Archaeological Division in the Israel Antiquities Authority; adjunct professor of archaeology at the Hebrew University of Jerusalem. Expert in various aspects of Classical, Late Antique and Early Islamic archaeology. Fellow at Institute of Advanced Studies of the Hebrew University in Jerusalem (2008-2009); member of a research group of the Hebrew University and the Israel Academy of Sciences on the formation of Islamic society in Palestine (2010 – 2014), co-director of an interdisciplinary study on the ancient agriculture of the Negev and the Judaean Highlands (2009-2016).

Liat Weinblum (female) M.A. in Computer Sciences, Bar-Ilan University. Head of the Archaeological IT Unit at the IAA. Responsible for the initiation, development, management and implementation of professional IT applications designed to serve the archaeological community, as well as coordinator of Cross-organizational processes, among which – DANA: A digital documenting tool for field archeologists; The Survey of Israel Database, IAA online publications open to the research community.

Relevant publications and/or products, services

- E-RIHS PP - The European Research Infrastructure for Heritage Science Preparatory Phase / Horizon 2020 (2017-2019), http://www.e-rihs.eu/
- DANA. Collaborative platform that enables sharing of multiple datasets among researchers working in archaeological domain.
- Survey of Israel Database. A bi-lingual web based repository deploying data of the Survey of Israel, www.antiquities.org.il/survey
- National Laboratory for Digital Documentation. From 2013, initiative in cooperation with the Hebrew University of Jerusalem Initiated. The purpose is to harness mathematical and computational methods to support archaeological research, documentation and visualization.
- Repository of published and archival material of excavated sites, http://libantiquities.exlibris.co.il/F

Relevant previous projects or activities

- The Ramat Bet Shemesh Regional Project. It is the largest archaeological project in Israel, which has been conducted from 1996 in conjunction of the construction of a new town between biblical Tel Beth Shemesh and Haela Valley.
- Cross Israel Highway Survey and excavation Project, 1991-2007. Archaeological surveys and rescue excavations were conducted along its route, revealing a sequence of sites (138) dated from Prehistoric times to the Ottoman period.

A description of any significant infrastructure and/or any major items of technical equipment

The IAA maintains a series of finds treatment laboratories, specialising in ceramic restoration, digitized illustration of finds, conservation of metals, stone, textiles, organic finds, and the Dead Sea Scrolls (http://www.deadseascrolls.org.il/), petrography and conservation of sites (http://www.iaa-conservation.org.il/index_eng.asp). The IAA maintains a research archive (http://www.iaa-archives.org.il/) and a searchable database of publications (http://iaa-temp.exlibris.co.il/F). Computerised databases include GIS based archives of sites, surveys and licenses. The databases and archival material available to IAA researchers place the IAA in a primary position to both disseminate and analyse archaeological data for the advancement of research. Furthermore, with a wide ranging staff of archaeologists – with expertise from the prehistoric period up till modern time, conservators and laboratory staff, together with a strong support team of technicians, the IAA is able to conduct interdisciplinary research from the field, right through to publication.

No third parties involved

12. L-Università ta' Malta – University of Malta (UOM)

www.um.edu.mt - (MT)

UOM represents the Maltese node and has no linked parties.

Description of the legal entity

With over 400 years of history, the University of Malta (UOM), is the leading and most prestigious higher education institution in Malta. UOM is committed to high standards of research and teaching in the arts, sciences and the humanities in the context of the country's social, economic and cultural development well-being. The University seeks to carry out academic research and provide a vibrant higher education setting. The courses at UOM are designed to produce highly-qualified professionals in multiple disciplines. The UOM alumni community is growing exponentially: well over 3,500 students graduate in various disciplines annually and about twelve per cent of the student population is international. At UOM research projects address current local needs and opportunities, as well as those that may affect the country in the future, always with an international outlook. This is done in conjunction with Government and private industry, and also by participating in EU research programmes and funding. An important part of the University of Malta's research agenda is embedded in Cultural Heritage, and Heritage Science, which are of great importance also ecomically to the country, as Malta has a large number of important heritage assets which require study, research and care. And this in close collaboration with Government and private heritage entities. Various University of Malta Departments, and especially the Department of Conservation and Built Heritage (Faculty for the Built Environment) have been upgrading their staff complement, their teaching, research, and consquently infrastructure, to participate in ever-more wide-ranging, multi-disciplinary and prestigeous hands-on conservation and research projects. This Department also works in close collaboration with other University of Malta Departments, in particular those of Chemistry, Metallurgy and Materials Engineering, Art and History of Art, and Classics and Archaeology, to deliver teaching and research in Heritage Science.

Main tasks in the project

The Department of Conservation and Built Heritage, and hence the University of Malta, are ideally placed to take part in this IPERION HS proposal; its delegated task of outreach to the HSS community, including art historians, curators, other heritage professionals and conservators, stems directly from collaborations currently taking place with these diverse heritage comunities and stakeholders. As such, the University of Malta is particularly suited lease this Task within WP7 (Training and engagement).

Profiles of key persons

JoAnn Cassar (female) Full Professor and Head of the Department of Conservation and Built Heritage within the Faculty for the Built Environment, University of Malta. She is a Fellow of the International Institute for Conservation (FIIC), Fellow of the Geological Society (FGS), Chartered Chemist and Fellow of the Royal Society of Chemistry (CChem, FRSC) and chartered (CSci). She is a Board member of the Maltese national agency for museums, conservation practice and cultural heritage -Heritage Malta and a member of the Warrants Board for Conservator-Restorers in Malta. She has been carrying out research on stone characterization, deterioration and conservation for over thirty years, including specifically on the Maltese Prehistoric Megalithic Temples, for which she also sits on the Scientific Committee. She has lectured widely in foreign universities, and has given numerous presentations at international conferences in many different countries and is also a regular reviewer for many scientific and cultural heritage journals. She has over seventy scientific publications on conservation-related topics to her name, and is the co-editor of seven books.

Relevant publications and/or products, services

- 2019. "Impacts of climate change on archaeological heritage, with a case study from Malta". In N.C. Vella, A.J. Frendo & H.C.R. Vella (eds), *The Lure of the Antique. Essays on Malta and Mediterranean Archaeology in Honour of Anthony Bonanno*, Peeters Publishers.
- 2017. "Geomaterials: aggregates, building stone and earthworks: papers from 50 years of QJEGH" (joint author with JR Standing), *Quarterly Journal of Engineering Geology and Hydrogeology,* 50 (2), 95-105.
- 2017. "Onsite Testing of Ammonium Oxalate Treatment Applied to Historical Salt-Infested Limestone" (joint author with T. Dreyfuss). *Journal of Civil Engineering and Architecture*, 11, 175-183.

- 2017. "Investigating possible correlations between porosimetry and insoluble residue content of Malta's Lower Globigerina Limestone" (joint author with T Zammit), *Bulletin of Engineering Geology and the Environment*, 1-12
- 2016. "Evaluation of the shelters over the prehistoric Megalithic Temples of Malta: environmental considerations" (joint author with F Becherini, M Galea, A Bernardi), *Environmental Earth Sciences*, 75 (14), 1-13

Relevant previous projects or activities

The task entrusted to the University of Malta includes in particular outreach towards HSS communities. In this respect, the following activities are relevant: (1) Prof. Cassar was appointed by the Malta Government to sit on Warrant Board for Conservator Restorers, and separately also on the Board of Directors of Heritage Malta, the Maltese national agency for museums, conservation practice and cultural heritage. These two fora provide regular interactions with HSS communities, including conservators and other HS actors. (2) She has organised interdisciplinary seminars e.g. *Fragments and their contexts* (2017) and *Caring for our Heritage (2016)* with Heritage Malta, Valletta, again with strong interactions with the HSS communities; two publications aimed at these audiences resulted. (3) She was a full partner in "The EUROMED 4 Project "ELAICH": e-Tools for a Teaching Environment on EU Mediterranean Cultural Heritage", an outreach programme for youth from Italy, Malta, Greece, and Israel; Belgium also participated (2009-2011). Strong interactions with the HSS communities resulted from this project, across the Mediterranean (outreach included also Jordan). (4 and 5) She has worked closely with the scientific and HSS communities (especially conservators) to draw up two internationally recognised multi-lingual glossaries: *ICOMOS-ISCS glossary on stone deterioration patterns*, published in 2008; and *European Illustrated Glossary of Conservation Terms for Wall Paintings and Architectural Surfaces,* published in 2015. In both cases, translations of these essential glossaries into other languages are still ongoing.

A description of any significant infrastructure and/or any major items of technical equipment

The task allocated to UOM is outreach, and in itself does not require significant infrastructure. Still, it is pertinent to point out that the University of Malta is currently investing millions of Euros in updating its laboratories with up-to-date equipment, which will also be used for Heritage Science research. This will be in the Departments of Conservation and Built Heritage, Chemistry, and Metallurgy and Materials Engineering. The Department of Classics and Archaeology is also investing in equipment for *in situ* investigations.

No third parties involved

13. Universidad Nacional Autónoma de México - National Autonomous University of Mexico (UNAM)

www.unam.mx - (MX)

UNAM represents the Mexican node and has no linked parties.

Description of the legal entity

The National Laboratory of Sciences for Research and Conservation for Cultural Heritage (LANCIC) of the National Autonomous University of Mexico (UNAM) was created in 2014 by funding of the UNAM and the National Council of Science and Technology of Mexico (CONACYT) as a network of five consolidated groups of research on material analysis of cultural heritage. These groups have complementary research fields, methods and cutting-edge instrumentation. Nowadays, four groups compose the LANCIC. Three groups belong to the UNAM and are part of the Institute of Physics (LANCIC-IF), the Institute of Chemistry (LANCIC-IQ) and the Institute of Art History (LANCIC-IIE). UNAM teams are located in Mexico City but deserves all the country while the group of LANCIC-CICORR of the Autonomous University of Campeche is settled in the Yucatan peninsula. The Laboratory ANDREAH of LANCIC-IF is the head of the national laboratory. LANCIC tasks include installation of cutting-edge infrastructures, specialized human resources training and support to mobility of researchers and students, specialized services for cultural heritage material studies, scientific development and innovation on material science for conservation, diffusion of science and communication of knowledge to the public. The main objectives of LANCIC are the characterization of materials and techniques of Mexican cultural heritage, the development of methodologies and protocols for

conservation projects, the integration of databases and material references for Mexican cultural heritage, and the synthesis and characterization of new materials for conservation. Moreover, LANCIC activities include specialized courses and workshops and collaborate with exhibitions in museums and seminars for the public. LANCIC has about 45 academics – research and technical staff – and about 40 students – 80% related to 7 PhD programs on material science, chemical sciences, biological sciences, art history, archaeology and conservation. LANCIC is also the link to the CONACYT National Network of Laboratories for Study of Cultural Heritage in Mexico. This network has 27 National Institutions, more than 40 Mexican laboratories, 3 national labs (LANCIC, LEMA, SAN), 2 groups in the Mexican conservation schools and 7 laboratories associated in other countries with about 320 people in the network.

Main tasks in the project

Collaboration in international activities (e.g. Pan-american symposium in The Getty Institute for Conservation in 2021). Specialized training on technical examination of cultural heritage. Access to laboratories and facilities to carry out joint research projects.

Profiles of key persons

Jose Luis Ruvalcaba Sil (male) is a professor and senior research scientist. Physicist by UNAM, PhD (Physics) – Facultés Universitaires Notre Dame de la Paix, Namur, Belgium. Since 1997 joined the Physics Institute of UNAM to carry out ion beam analysis (PIXE-PIGE-RBS-IBIL) on cultural heritage. His field of research has extended to non-invasive imaging methods and in situ spectroscopic characterization by XRF, FTIR, Raman, FORS and UV-VIS. Head of the Pelletron accelerator laboratory in IF-UNAM from 2005. In 2014 created LANCIC and he has been head of the LANCIC facilities. He has developed instrumentation for in situ XRF, simultaneous XRD-XRF as well as external beam and microprobe for ion beam analyses. He has outstanding contributions for pre-Columbian metallurgy, green stone (jade) artifacts and Mexican pre-Hispanic dyes. Currently he is doing research with the Mesoamerican ancient lime production process, Colonial and Modern art Mexican painting and glass from XIX Mexican collections.

Luis Barba Pingarron (male) is a Senior researcher. Ph.D. in Anthropology, Graduate Program in the Faculty of Philosophy and Letters/Institute of Anthropological Research-IIA), UNAM in 1995. Master of Science in Archaeological Geology at the University of Georgia, USA (1984). Industrial chemical engineer of the School of Chemical Engineering of the National Polytechnic Institute) (1977). From 1983, he became founder and he is the current coordinator of the Laboratory of Archaeological Prospection. Head of the CONACYT National Networks of Mexican Laboratories for Applied Sciences to Cultural Heritage. During last 40 years, he has participated in over 200 seasons of fieldwork in archaeological sites in Mexico, Chile, Spain, Turkey and Italy. His main research lines are the application of techniques of aerial photography, geophysical and geochemical prospection to archaeology. He acted as a pioneer in the field of study of chemical residues in archaeological floors to infer human activities and the study of chemical residues in ceramic vessels.

Clara Bargellini (female) is a Senior researcher. Ph.D. in History of Art, Harvard University, 1974 Professor, Instituto de Investigaciones Estéticas, UNAM, since 1980. Visiting Professor at New York University, Institute of Fine Arts; University of Pennsylvania, University of Chicago, Universidad Nacional Mayor de San Marcos, Lima, Peru. UNAM award to research on Art History in 2005. Her research has been focused on New Spain artworks, mainly paintings and polychromy including the material examination for study of the pictorial techniques and trade of raw materials.

Relevant publications and/or products, services

- Preventive Conservation Applied to Wallpaintings in a Desert Environment in Mexico D. Charua-Ayala, R. Guerra, C. Lemoine, F. Cambieri, N.A. Pérez, J.L. Ruvalcaba-Sil Studies in Conservation 63 S1 (2018) 51–57.
- B. Cockrell, J.L. Ruvalcaba Sil, E. Ortiz Díaz. Here Comes the Hammer: Sheet Objects from the Cenote Sagrado, Chichén Itzá, Journal of Historical Metallurgy 50 (2016) 11–27.
- M.A. Maynez-Rojas, E. Casanova-González, J.L. Ruvalcaba-Sil, Identification of natural red and purple dyes on textiles by Fiber-optics Reflectance Spectroscopy, Spectrochimica Acta A 178 (2017) 239–250.
- A. A. Delgado Robles, J. L. Ruvalcaba Sil, P. Claes, M. D. Manrique Ortega, E. Casanova González, M. A. Maynez Rojas, M. Cuevas García, S. García Castillo, Non-destructive in situ spectroscopy analysis of greenstones found on royal burial offerings from the Maya site of Palenque, Chiapas. Heritage Science 3 (2015) 20-33

- A. Mitrani, J.L. Ruvalcaba, M. Manrique, V. Corregidor, Micro-chemical and micro-luminescence characterization of jadeite samples for archaeometric studies. Microscopy and Microanalysis 22, 1304–1315, 2016

Relevant previous projects or activities

- Dyes and dyestuff form pre-Hispanic tradition in Mexico. Objects, preparation techniques and raw materials.
- Non-invasive study of Green Stone artifacts from Mesoamerica using spectroscopic methods.
- Pictorial techniques and trade of raw materials of New Spain paintings (XVI-XVIII centuries).
- Technology of metallurgy in pre-Hispanic Mexico. Trade, production and raw materials.
- Study of deterioration processes of stone materials due to environmental effects.

A description of any significant infrastructure and/or any major items of technical equipment

LANCIC collaborates with the main Mexican institutions linked to the cultural heritage (National Institute of Anthropology and History - INAH, National Institute of Fine Arts- INBA), national museums, archives, and archaeological projects. LANCIC-IF is the mobile laboratory with portable equipment. This group focuses on non-invasive methods, such as X-ray Fluorescence (XRF); Reflectance, Infrared (FTIR) and Raman spectroscopies, X-ray diffraction (XRD-XRF), UV-VIS fluorescence, colorimetry, X-ray digital radiography, thermal imaging, high-resolution 3D imaging, benchtop SEM-EDS, petrography and hyperspectral imaging techniques. Also, the Pelletron particle accelerator is available for simultaneous PIXE-RBS-PIGE-IBIL measurements using an external beam for objects and samples, and ion beam micro-probe for micro-mapping. On the other hand, LANCIC-IIE has high resolution imaging techniques using VIS, UV and IR lighting, thermal imaging for in situ studies. Additionally, this group has Optical Microscopy, Confocal Microscopy, Correlative Microscopy and SEM-EDS instruments. LANCIC-IQ works with micro-chemical methods, like micro-FTIR, chromatographic techniques (HPLC, CG-EM) and NMR with a micro-crioprobe. LANCIC-CICORR is specialized in physical and electrochemical testing and has XRF, XRD, Raman and FTIR spectroscopies, colorimetry, as well as ultrasound and micro-hardness techniques, among others. This group can perform environmental survey and evaluation of degradation processes. LANCIC is linked to the Mexican CONACYT National Network of Laboratories for Study of Cultural Heritage involving more than 40 Mexican laboratories in the country and 3 national labs and 2 groups in the Mexican conservation schools. In this way, other exper
imental facilities are available for Accelerator Mass Spectrometry (AMS), Termoluminiscence TL and Archaeomagnetic dating techniques, among others.

No third parties involved

14. Rijksdienst voor het Cultureel Erfgoed, Ministerie van Onderwijs, Cultuur en Wetenschap – Cultural Heritage Agency, Ministry of Education, Culture and Science (RCE)

www.cultureelerfgoed.nl - (NL)

The Cultural Heritage Agency of the Netherlands (RCE) represents the Dutch node and has 5 linked parties (RUG, TUDelft, UVA, RMA, KNAW-DANS)

Description of the legal entity

RCE is an institute for the preservation and management of cultural heritage in the broadest sense. The area of interest involves monuments and historical buildings, archaeology, natural landscapes and movable heritage, i.e. collections. The headquarters are located in Amersfoort and there are units located in Amsterdam (Cultural Heritage Laboratory) and Rijswijk (Collection). RCE is part of the Ministry for Education, Culture and Science and has a permanent staff of about 300 persons plus c. 100 persons acting as contract researchers, Master and PhD students etc. The RCE has developed many studies of art-historical objects and precious artworks, including paintings by Van Gogh, Rembrandt, Mondrian and many others. The research department currently has a strong focus on modern materials and objects, from 1870 till present. RCE participated in the past in European projects, such as FingArtPrint, POPART, BACPOLES, MOSS, MACHU, Wreckprotect, EPISCON, Eu-ARTECH and CHARISMA. In addition, RCE is strongly involved in the Joint Programme Initiative on CH (JPI-CH).

Main tasks in the project

In the present proposal, RCE and associated third parties tasks will be to contribute to FIXLAB and ARCHLAB, and to participate in the Joint Research Activities. Its combination of scientific and conservation work and equipment, reference collections, and wide its focus on heritage in general in which RCE makes it an important contributor for FIXLAB and ARCHLAB as well as for Joint Research Activities.

Profiles of key persons

Hans Huisman (male). Prof., PhD, Cultural Heritage Laboratory Amersfoort. Background in soil science and geochemistry (PhD 1998). Responsible for the RCE part of BACPOLES, participant in MOSS, MACHU. Specialist degradation and in situ preservation of archaeological remains and specialist archaeological soil micromorphology and archaeometry. Also, Professor by Special Appointment at The Groningen Institute of Archaeology, Faculty of Arts, Groningen University.

Ineke Joosten (female). PhD, Cultural Heritage Laboratory Amsterdam. Background in geochemistry. Responsible for the RCE part of ARCHLAB in IPERION CH. Conservation scientist, involved in inorganic analysis (SEM-EDS, XRF, XRD etc.), ceramic, metals and microscope techniques. Her research is dedicated to archaeological and historical metals, textiles, stone applied in monuments and sculptures, garnets, glass and ceramics.

Relevant publications and/or products, services

- D.J. Huisman (ed.), 2009, 'Degradation of archaeological remains', *SdU Uitgevers b.v. Den Haag*, 245 pp.
- D.J. Huisman, D. Ngan-Tillard, F. Laarman, M. Tensen, D.C.M. Raemaekers, 2014, 'A question of scales: studying Neolithic subsistence using micro CT scanning of midden deposits', in *Journal of Archaeological Science*, 49: 585–594
- Iwanicka, M., Moretti, P., van Oudheusden, S., Sylwestrzak, M., Cartechini, L., van den Berg, K. J., Miliani, C. (2018), 'Complementary use of Optical Coherence Tomography (OCT) and Reflection FTIR spectroscopy for in-situ non-invasive monitoring of varnish removal from easel paintings', in *Microchemical Journal*, 138, 7-18. DOI: 10.1016/j.microc.2017.12.016
- Serrano, A., Van den Doel, A., van Bommel, M., Hallett, J., Joosten, I., & van den Berg, K. J., 'Investigation of crimson-dyed fibres for a new approach on the characterization of cochineal and kermes dyes in historical textiles', in *Analytica Chimica Acta*, 897, 116-127(2015), DOI: 10.1016/j.aca.2015.09.046
- van Dam, E. P., van den Berg, K. J., Proaño Gaibor, A. N., & van Bommel, M., 'Analysis of triglyceride degradation products in drying oils and oil paints using LC–ESI-MS', in *International Journal of Mass Spectrometry*, 413, 33-42., (2017), DOI: 10.1016/j.ijms.2016.09.004

Relevant previous projects or activities

- E-RIHS PP - The European Research Infrastructure for Heritage Science Preparatory Phase / Horizon 2020 (2017-2019), http://www.e-rihs.eu/
- IPERION CH - Integrated Platforms for the European Research Infrastructure ON Cultural Heritage, 2015-2019, (H2020), www.iperionch.eu
- CHARISMA-Cultural Heritage Advanced Research Infrastructures: Synergy for a Multidisciplinary Approach to Conservation/ Restoration (EU FP7), www.charismaproject.eu
- BACPOLES - Preserving cultural heritage by preventing bacterial decay of wood in foundation poles and archaeological sites (FP5 2002 – 2005)
- EPISCON - European PhD in science for conservation. (FP6 2005 – 2009)

A description of any significant infrastructure and/or any major items of technical equipment

The Cultural Heritage Agency of the Netherlands (RCE) https://cultureelerfgoed.nl/

The Cultural Heritage Labs of RCE have a wide range of diverse optical and analytical equipment that is relevant for FIXLAB. In addition, it houses collections of pigments and of archaeological soil micromorphology thin sections that are relevant for ARCHLAB.

ARCHLAB.nl-1

Services offered by the infrastructure:

RCE offers access to information stored in documentation files of the RCE library in Amsterdam. This documentation consists of research done in the last 50 years at the former Netherlandish Institute for Cultural

Heritage (ICN) which is now part of RCE and he RCE. The RCE often does research in collaboration with museums and other Cultural =heritage institutes and often on their objects.
Typical investigated objects and materials are paintings, historic interiors, textiles, furniture, metals, glass, ceramics, leather, plastics, pigments, binding media, varnish, resin, paper, books, inks, etc., all referred to periods varying from pre-history to date.
Typical information consists reports, analytical data, images, samples (including cross-sections) and art historical information. The information is partly registered in Dutch, partly in English, partly in German.
Users can have a physical access also to a large collection of more than 10.000 reference materials including all of the typical materials of cultural heritage mentioned above.
During their visits, access to instrumentation and related expertise is offered if appropriate. Instrumentation offered is optical microscopy, SEM-EDX, XRF, XRD, FTIR, RAMAN, HPLC-PDA, LC-MS and GC-MS.

15. The University of Oslo – (UiO)

www.uio.no/english/ - (NO)

UiO represents the Norwegian node and has no linked parties.

Description of the legal entity

UiO is Norway's oldest institution for research and higher education, with 28,000 students and 6,000 employees. UiO celebrated its 200th anniversary in 2011. UiO has 8 faculties, 2 museums and several centers. UiO has participated in the EU's framework programmes for research and development since 1991.
UiO participates in IPERION-HS with two departments: the Department of Archaeology, Conservation and History (IAKH), which is part of the Faculty of Humanities, and the Museum of Cultural History (MCH). IAKH offers a master's program in conservation studies.
The Museum of Cultural History (KHM) is Norway's largest archaeological and ethnographical museum. In addition to its two museums, The Historical Museum and the Viking Ship Museum, it has responsibilities in cultural heritage management and as a university research institution. KHM has four departments that provide a wide range of competences across different areas, such as Nordic and Mediterranean/Oriental Archaeology, conservation, ethnography, anthropology and University History.
MCH leads the initiative to create a national, distributed research infrastructure for heritage science. In this role, UiO-MCH coordinates and enables the participation of the Norwegian institutions working in heritage science in the IPERION-HS integrating activities.

Main tasks in the project

UiO will enable the Norwegian cultural heritage institutions to participate in the project's training and networking activities and contribute to WP5, T5.1, integrating archaeological science documentation, and T5.4 Data management and link with EOSC.

Profiles of key persons

Louis Boumans (male) Project manager at the Museum of Cultural History (MCH). He has previously worked in European infrastructure projects in biodiversity informatics.
Espen Uleberg (male) He is senior Engineer Digital Documentation at the Museum of Cultural History (MCH)
Calin Steindal (male) He is laboratory manager at the Museum of Cultural History (MCH). He has ample experience with chemical analysis of cultural heritage materials.
Hartmut Kutzke (male) Associate professor. Since 2007 chemist and conservation scientist at the Museum of Cultural History (MCH).
Tine Frøsysaker (female) Professor Conservation Science at the Department of Archaeology, Conservation and History (IAKH).

Relevant publications and/or products, services

- Liestøl, Gunnar; Bjørkli, Birgitte; Ledas, Sarunas; Stenarson, Tomas & Uleberg, Espen (2018). Archaeology and Augmented Reality. Visualizing Stone Age Sea Level on Location, In Mieko Matsumoto & Espen Uleberg (ed.), Oceans *of Data Proceedings of the 44th Conference on Computer Applications and Quantitative Methods in Archaeology*. Archaeopress. ISBN 978 1 78491 731 9. 3D and Visualisation. pp.367 – 376.

- Uleberg, Espen & Matsumoto, Mieko (ed.) (2018). Exploring Oceans of Data. Archaeopress. ISBN 978-1-78491-730-2. 400 pp.
- Uleberg, Espen & Matsumoto, Mieko (2016). Dynamic Distributions in Macro and Micro Perspective, In *CAA2015 Keep the revolution going. Proceedings of the 43rd Annual Conference on Computer Applications and Quantitative Methods in Arhcaeology.* Archaeopress. ISBN 978 1 78491 337 3. Artikkel. pp. 309 – 317.
- Uleberg, Espen & Matsumoto, Mieko (2015). Visualization based on the Norwegian University Museum Database, In *CAA2014. 21st Century Archaeology. Concepts, methods and tools. Proceedings of the 42nd Annual Conference on Computer Applications and Quantitative Methods in Archaeology*. Archaeopress. ISBN 9781784911003. kapittel. pp. 323 – 332.
- de Jong, Yde; Kouwenberg, Juliana; Boumans, Louis; et al. (2015). PESI - a taxonomic backbone for Europe. *Biodiversity Data Journal*. ISSN 1314-2836. *3*, s 1- 51. DOI: 10.3897/BDJ.3.e5848.

Relevant previous projects or activities

- The MCH participates in the INFRAIA project ARIADNEplus (Advanced Research Infrastructure for Archaeological Dataset Networking in Europe, https://ariadne-infrastructure.eu/).
- KHM is the hub in the hub-node organization HumGIS (Humanities GIS). HumGIS is a eInfrastructure initiative to increase the use of GIS and the interest in spatial oriented humanities at the University of Oslo.
- Museum of Cultural History hosted the international conference CAA2016 on ICT applications to CH and archaeology. KHM has also hosted several national conferences and symposia on ICT and archaeology. KHM is the Norwegian representative in the EOSC initiative for Nordic Archaeology.
- The ADED project 2018–2021 (Archaeological Digital Excavation Documentation) will create a national infrastructure for excavation documentation. This infrastructure will be incorporated in the national MUSIT infrastructure for the university museums.

A description of any significant infrastructure and/or any major items of technical equipment

The Museum of Cultural History (KHM) has advanced facilities for analytical chemical research, including FTIR, SEM-EDS, Raman, HPLC. The climate chamber-coupled XRD can be applied to study climatic oscillations on aging.

No third parties involved

16. Uniwersytet Mikołaja Kopernika Toruń – Nicolaus Copernicus University (NCU)

www.umk.pl - (PL)

The Nicolaus Copernicus University in Toruń (NCU) represents the Polish node and has 3 linked parties (AGH, JHI, UW).

Description of the legal entity

NCU is the largest university in northern Poland, comprising 17 faculties covering disciplines from science to humanities and medicine. NCU employs over 4200 people including 2250 scholars (1827 with Ph.D.), 259 of whom hold a professorial title. At present, 23,000 students are being educated in 113 disciplines, 60 post-graduate studies and 24 doctoral studies. IPERION HS will be managed jointly by the Faculty of Physics, Astronomy, and Informatics, the Faculty of Fine Arts and the Faculty of History.

The IPERION HS project will be developed in the Laboratory for Non-invasive Analyses within the Interdisciplinary Centre for Modern Technologies (ICNT), a joint project initiative of four faculties of the University, including the Faculty of Physics. The Faculty of Fine Arts conducts research in, among others, conservation science in close connection to the conservation practice. For about fifteen years the physicists now involved in the Laboratory for Non-invasive Analyses have been closely cooperating with the conservators from the Faculty of Fine Arts on developing new techniques for examination of CH objects. This collaboration is mostly devoted to searching for solutions to practical problems formulated by conservators and related to the state of preservation, former restoration/conservation attempts, attribution and dating of the artwork, and new restoration procedures and materials. Over time, the research team became a world leader in applications of OCT to conservation practice.

The NCU is the leader of the Polish Consortium for Heritage Science E-RIHS.PL (www.e-rihs.pl), which comprises 13 Polish research institutions leading in this field, including three linked third parties, involved in the project.

Main tasks in the project

The major tasks of NCU team will be providing of the portable Optical Coherence Tomography instrument to MOLAB TNA portfolio and participation in JRA in fields of preventive conservation and examination of paint surfaces and sub-surface layers, examination of archaeological building materials and reference material for CH. Researchers from Faculty of Physics, Astronomy and Informatics NCU and Faculty of Fine Arts NCU will be involved mostly in WP4 MOLAB as a provider of OCT, also in JRA under WP5 and in networking under WP6 and WP 7.
P. Targowski (Faculty of Physics, Astronomy and Informatics NCU) will be task 4.4 leader.

Profiles of key persons

Piotr Targowski (male) leads the Laboratory for Non-invasive Analyses within the ICNT. He received his PhD and Dr. Habil. degrees from NCU where he is a full Professor of optics and informatics. His main research field is application of non-invasive techniques (especially Optical Coherence Tomography-OCT) to structural imaging of artworks for both documentation and restoration purposes. He moderates a www.oct4art.eu website dedicated to application of OCT to works of art and is a co-author of about 100 research articles, cited over 1 000 times. He is a chairperson of the Governing Board of the E-RIHs.PL consortium.
Magdalena Iwanicka (female) received her PhD degree in Conservation Science in 2013 from NCU where she also graduated in art conservation. Her major research field is an implementation of OCT to art conservation practice, including the development of the methodology for using OCT for monitoring of conservation treatments. She will be responsible for the interpretation of the OCT tomograms both for MOLAB and JRA activities and she is a co-author of 32 research articles cited over 110 times.
Marcin Sylwestrzak (male) received his PhD degree in Informatics from Poznań University of Technology. Since 2008 he has been involved in the development of OCT, especially for application in conservation/restoration of cultural heritage. He is an acknowledged expert in application of Graphic Processor Units (GPU) for massive parallel calculations. He also developed software for medical applications of OCT and for advanced post processing and visualisation of the OCT data dedicated to its application for CH study. He is a co-author of 24 articles and conference reports.

Relevant publications and/or products, services

- G. Fiocco, T. Rovetta, C. Invernizzi, M. Albano, M. Malagodi, M. Licchelli, A. Re, A. Lo Giudice, G.N. Lanzafame, F. Zanini, M. Iwanicka, P. Targowski, M. Gulmini, "A Micro-Tomographic Insight into the Coating Systems of Historical Bowed String Instruments" *Coatings* 9(2), pp. 81, (2019) – MOLAB paper
- M. Iwanicka, M. Sylwestrzak, P. Targowski, "Optical Coherence Tomography (OCT) for Examination of Artworks", in: D.M. Bastidas, E. Cano (Eds.) *Advanced Characterization Techniques, Diagnostic Tools and Evaluation Methods in Heritage Science* (Springer International Publishing, Cham, 2018) pp. 49-59 – IPERION CH IA paper
- P. Targowski, M. Iwanicka, M. Sylwestrzak, C. Frosinini, J. Striova, R. Fontana, "Optical Coherence Tomography aids in revealing the hidden history of "The Landsdowne Virgin of the Yarnwinder" by Leonardo da Vinci and studio" *Angewandte Chemie* 57(25), pp. 7396-7400 (2018) – IPERION CH JRA paper
- M. Iwanicka, P. Moretti, S. van Oudheusden, M. Sylwestrzak, L. Cartechini, K.J. van den Berg, P. Targowski, C. Miliani, "Complementary use of Optical Coherence Tomography (OCT) and Reflection FTIR spectroscopy for in-situ non-invasive monitoring of varnish removal from easel paintings" *Microchemical Journal* 138, pp. 7-18, (2018) – IPERION CH JRA paper

M. Iwanicka, M. Sylwestrzak, A. Szkulmowska, P. Targowski, Pre-restoration condition of superficial layers of the Adoration of the Magi by Leonardo da Vinci as seen by optical coherence tomography, in: M. Ciatti, C. Frosinini (Eds.) Il restauro dell'Adorazione dei Magi di Leonardo La riscoperta di un capolavoro, (Edifir, Florence, 2017) pp. 287-293 – CHARISMA JRA paper

Relevant previous projects or activities

- AUTHENTICO-Methodologies for metal artefacts based on material composition and manufacturing techniques, 2007-2009 (EU FP6), http://authentico.cultnat.org/The_Project.aspx
- OCT as a tool for conservation science, 2008-2011 (grant from Polish Ministry of Science)

- CHARISMA-Cultural Heritage Advanced Research Infrastructures: Synergy for a Multidisciplinary Approach to Conservation/ Restoration (EU FP7), www.charismaproject.eu
- IPERION CH-Integrated Platforms for the European Research Infrastruture ON Cultural Heritage, 2015-2019, (H2020), www.iperionch.eu
- E-RIH PP - The European Research Infrastructure for Heritage Science - Preparatory Phase, 2016 – 2020, (H2020), www.e-rihs.eu

A description of any significant infrastructure and/or any major items of technical equipment

NCU participates in IPERION HS with MOLAB.pl-1.

MOLAB.pl-1

Description of the Infrastructure

Laboratory for Non-invasive Analyses within the Interdisciplinary Centre for Modern Technologies (ICNT), ca 70 m^2, equipped with state of the art stationary instrumentation: OCT tomograph with fs Ti-Sf laser, LIBS installation with Echelle Spectrometer ESA 4000 and Nd-YAG ULTRA laser, Macro XRF Bruker M6 Jet Stream spectrograph, SMARTTECH 3D scanner

Services provided by MOLAB.pl-1

Portable laboratory-built OCT tomograph with GPU ultra-fast processing and dedicated software. Already operative and highly requested in the previous project, the NCU portable OCT will be present in the IPERION HS offer, profitably integrated into analytical protocol develeped in the IPERIONCH project.

17. University of Evora (UEVORA) - Laboratorio Herança Cultural, Estudos e Salvaguarda (HERCULES)

http://hercules.uevora.pt/ - (PT)

UEVORA represents the Portuguese node and has 1 linked party (LNEC).

Description of the legal entity

Created in 2009 at Evora University, HERCULES Lab is a research unit devoted to the study and valorisation of cultural heritage (CH), focusing on the integration of physical and natural sciences methodologies in an interdisciplinary approach. HERCULES Lab is based in Évora, a UNESCO World Heritage city, comprising several laboratories and a mobile lab with state-of-the-art equipment (over 3Meuros investment) and capability to develop groundbreaking research. The analytical setup includes in-situ non-invasive analysis and imaging, laboratory microanalysis, high resolution chemical analysis. Currently it is also developing innovative materials and products, from bio to nano. HERCULES lab team is composed of 30 researchers with PhD from different areas of knowledge enabling a truly interdisciplinary approach. HERCULES Lab is the coordinator of an Erasmus Mundus Master and a Marie Curie ITN. HERCULES Lab aims to join resources and skills from different research areas to bring a new approach into heritage research and to strengthen Portugal position in the mainstream of European heritage research. For this, HERCULES Lab sustains its activities in 4 major lines of research: 1) Archaeometric approaches to past cultures; 2) Sciences for the Arts; 3) Science for Heritage Conservation; and 4) Novel materials and tools for cultural heritage.

Main tasks in the project

HERCULES participates in MOLAB; LNEC in FIXLAB and takes also activities within its range of experience, such as quality management and the engagement of the Building Heritage and HSS Communities.

Profiles of key persons

Ana Teresa Caldeira (female) is a Biochemistry Professor specialized in Analytical Biochemistry and Microbial Physiology applied to cultural heritage. She is the Director of the PhD in Biochemistry. During the lasts years she developed intense research in the identification and characterization of microorganisms by morphological and molecular approaches, biochemistry applied to cultural heritage, including biodeterioration assessment and novel strategies for diagnosis, monitoring and mitigation. **Antonio Candeias (male)** is Doctor in Chemistry and specialized in surface chemistry and heritage science, Vice-Rector for Research and Development of the University of Évora and Director of the ERIHS.pt Infrastructure of the Portuguese Roadmap of Strategic Research Infrastructures. He is author of more than

200 international articles and has coordinated several national and international projects (over 4Meuros). He is founder of HERCULES Lab and was its director until January 31st, 2019. **Cristina Dias (female)** is a Chemistry Professor at the University of Evora specialized in Analytical chemistry and Natural Products Chemistry. She is presently the vice-director of the HERCULES Laboratory and is the co-Director of the Master course on Environmental Analytical Analysis and ARCHMAT Erasmus Mundus course. Her main areas of research have included the study of natural dyes in historical textiles, organic materials and residues in archaeological remains and paleodiets. **Jose Mirao (male)** is a Geologist, Professor at the University of Evora specialized in mineralogy, geochemistry and solid state analytical techniques, especially microprobe and in-situ methods. His main areas of research include the study of historical mortars and renders, mural paintings, archaeological ceramics and roman glasses and ancient tile glazes. He is the present director of HERCULES Lab. **Nick Schiavon (male)** is a geologist specialized in stone alteration and environment. He is Senior Researcher at HERCULES Laboratory (Évora University), coordinator of the ERASMUS MUNDUS Master ARCHMAT (Archaeological Materials Science - www.erasmusmundus-archmat.uevora.pt) and of the Marie-Sklodowska Curie Innovative Training Network ED-ARCHMAT (European Doctorate in Archaeological and Cultural Heritage Materials).

Relevant publications and/or products, services

- T. Rosado, J. Mirão. A. Candeias and A.T. Caldeira (2014) Microbial communities analysis assessed by pyrosequencing - a new approach applied to conservation state studies of mural paintings, Anal. Bioanal. Chem, 406:887–895. DOI 10.1007/s00216-013-7516-7
- S. Valadas, R. Freire, A. Cardoso, J. Mirão, P. Vandenabeele, J.O. Caetano, A. Candeias (2016) New insight on the underdrawing of 16th Flemish-Portuguese easel paintings by combined surface analysis and microanalytical techniques. Micron, 85, 15-25. DOI: 10.1016/j.micron.2016.03.004
- P. Saragoça, A.-F. Maurer, L. Šoberl, M.C. Lopes, R. Alfenim, I. Leandro, C. Umbelino, T. Fernandes, M.J. Valente, S. Ribeiro, J.F. Santos, A.I. Janeiro, C.B. Dias. (2016) Stable isotope and multi-analytical investigation of Monte da Cegonha: A Late Antiquity population in Southern Portugal J. Archaeol. Sci. Reports. DOI: 10.1016/j.jasrep.2016.07.010
- A. Coccato, M. Costa, A. Rousaki A, B.-O. Clist, K. Karklins, K. Bostoen, A. Manhita, A. Cardoso, C.B. Dias, A. Candeias, L. Moens, J. Mirão, P. Vandenabeele, "Micro-Raman spectroscopy and complementary techniques (hXRF, VP-SEM-EDS, µ-FTIR and Py-GC/MS) applied to the study of beads from the Kongo Kingdom, J. Raman Spec. (2017), DOI: 10.1002/jrs.5106.
- M. Silva, T. Rosado, D.M. Teixeira, A. Candeias, A.T. Caldeira (2017) Green mitigation strategy for Cultural Heritage: Bacterial potential for biocide production. Environmental Science and Pollution Research.24, 4871-4881. DOI: 10.1007/s11356-016-8175-y.

Relevant previous projects or activities

- ERASMUS+ KA1-2018-599247-EPP-1-2018-1-PT-EPPKA1-JMD-MOB (Erasmus Mundus Joint Master ARCHMAT - Archaeological Materials Science)
- H2020-MSCA-ITN-2017-GA766311 (ED-ARCHMAT European Doctorate in Archaeological and Cultural Heritage MATerials science) – coordination
- ROTEIRO/0322/2013 (ERIHS.pt – Portuguese Platform of the European Infrastructure for Heritage Science) – coordination
- ALT20-03-0246-FEDER-000004 (HIT3CH - Hercules interface for technology transfer and teaming in cultural heritage) – coordination
- ICCROM project (Mora Sample Collection project) – coordination

A description of any significant infrastructure and/or any major items of technical equipment

MOLAB.pt 1

HERCULES is a fully operational mobile laboratory (http://www.e-rihs.pt/Instalacoes.html) equipped with an array of diagnostic methods. Its key components related to in situ analysis of biodeterioration will bring unique capacity in the MOLAB platform contributing to increase the proposed value for the heritage science community.

18. Institutul National de Cercetare Dezvoltare in Optoelectronica – National Institute for Research and Development in Optoelectronic (INOE)

www.inoe.ro - (RO)

*The National Institute of Research and Development for Optoelectronics **(INOE)** represents the Romanian node and has 1 linked party (INP).*

Description of the legal entity

INOE has a strong activity focused on Heritage Science from the foundation. Its centre of excellence – **CERTO** (certo.inoe.ro) – is authorised for cultural heritage investigation and intervention. The institute is member ICOMOS and ICOM, partner of the National Museum of Art from Bucharest, of The Bucharest Municipality Museum and several others, responsible for multiannual monitoring conservation status of the Ensemble "Hero's Avenue" by Constantin Brancusi. It is founder of the National Technical Committee CT 380 for Standardization in Cultural Heritage.

The institute is consultant for private galleries and art dealers, delivers requested investigation reports for national authorities. Cooperates with National Institute of the Heritage for the implementation of scientific procedures and modern monitoring conservation status in museum, monuments and deposits. The staff includes experts of the Ministry of Culture, authorised trainers.

The advanced researches are focused on contemporary art monitoring and material ageing, on on-line access to infrastructure on-site and in laboratory. Due to the recognized research activity of INOE2000, since 2004 laser cleaning was accepted by national authorities as restoration procedure and applied in certain cases. The institute represents the Romanian E-RIHS Node, which included the National Institute of Heritage (INP) and "Horia Hulubei" National Institute for Physics and Nuclear Engineering (IFIN-HH), and more than other 10 potential benefeciaries institutes.

Main tasks in the project

INOE will lead Task 6.5 (IPR management) and will be involved in MOLAB.

Profiles of key persons

Roxana Radvan (female) researcherid.com/rid/F-1005-2013 – graduated "Politehnica" University from Bucharest (1990), received doctoral degree in 1996, she is senior researcher at INOE 2000, head of CERTO, expert on physical & chemical investigation on artworks (Certified No570 of Ministry of Culture), associated professor to National Art University from Bucharest, Dpt. Restoration-Conservation. She is co-author on 10 patents in CH field. She is member of LACONA Permanent Scientific Committee, of Balkan Archaeometry Network. She has experience program of vulnerability control and conservation status monitoring, coordinated important campaign on site (Romania, Spain, India etc.).

Iulian-Alexandru Chelmuș (male) (eng., PhD student) is a researcher at the INOE 2000 in CERTO department and a PhD student at the Physics Faculty in the field of archaeology\cultural heritage investigations using radio waves and advanced non-invasive techniques, continuing this way his second master`s degree topic. His experience covers ground penetrating radar, aerial investigations using UAV and also X-ray imaging documentation (responsible for radiological security in the X-ray laboratory).

Ioana Maria Cortea (female) holds a MS in Conservation Science and a PhD in Physics from the Polytechnic University of Bucharest. Since 2012 she works within INOE 2000, Department of Optoelectronic Methods and Techniques for Artwork Restoration and Conservation, with main expertise in the analytical characterization of fine art and archaeological objects via spectroscopic techniques. Research interests and experience include material characterization and identification in multilayered works of art, investigation of aged paint layers, spectroscopic data analysis, data fusion and multivariate analysis.

Ratoiu Lucian Cristian (male) restorer, Ph.D. student in History and Theory of Art since 2014 and is part of INOE 2000 since 2009. With an educational background in conservation-restoration of mural painting (bachelor and master degree), he is focused on the theoretical aspects that concerns the concept of built cultural heritage, legislation and the correlation between the socio-cultural context and the conservation process. Also, he has experience in investigation and documentation methods like hyperspectral and multispectal imaging.

Angheluță Laurențiu-Marian (male) has been working with INOE 2000 since 2006, and is a Senior Researcher II since 2017. He got his Ph.D. in Physics in 2011, on the corroboration of imagistic data results in Cultural Heritage. His main skills are in 3D digital reconstruction with photogrammetry and 3D laser scanning, X-ray imaging, photography (certified) and aerial survey with imaging sensors.

Monica Dinu (female) Dr. Eng. Phys**.** graduated Faculty of Physics from University of Bucharest (2004), she got her major in Optics, Spectroscopy, Plasma and Lasers - at the same faculty (2006). In 2010, she obtained her PhD in Physics from Politehnica University, Faculty of Applied Science. She works for INOE 2000 since November 2004, currently as a Scientific Researcher II. Her areas of scientific interest include *laser spectroscopy techniques* for investigation and diagnosis of artworks, as well as studies on the effects of solid state lasers on different materials, with a special interest on organic materials.

Relevant publications and/or products, services

- I.M. Cortea, L. Ghervase, O. Țentea, A.C. Pârâu, R. Rădvan, 'First Analytical Study on 2nd Century Wall Paintings from Ulpia Traiana Sarmizegetusa: Insights on the Materials and Painting Technique', in International Journal of Architectural Heritage, 2019, doi: 10.1080/15583058.2019.1568614. – in press.
- L. Ghervase, I.M. Cortea, R. Rădvan, L. Ratoiu, A. Chelmuș, 'Complementary investigations of two Lipovan-style icons', in Microchemical Journal, 138, p. 509-518, 2018
- L. Ghervase, I.M. Cortea, R. Rădvan, C. Borș, 'Non-destructive spectroscopic investigation of artefacts from middle Hallstatt period – case study of a stone bead from Tărtăria I Hoard, Romania, in Archaeological and Anthropological Sciences, 10(8), p. 1841-1849. 2018
- L.M. Angheluță, R. Rădvan, '3D digitization of an antique decorative textile artifact using photogrammetry', in Romanian Reports in Physics, 69(3), p. 1-10, 2017
- D. Ene, R. Rădvan, 'Fast documentation and accurate real-time investigation for historical Buddhist building', in 2015 International Conference on Systems, Signals and Image Processing (IWSSIP), IEEE, p. 333-338, 2015

Relevant previous projects or activities

- Implementation and exploitation of the scientific research results in the restoration and conservation practice of cultural goods: IMPLEMENT, funded by CCCDI - UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0878, http://implement.inoe.ro/
- World Wide Open Workshop with Advanced Techniques for Cultural Heritage: WATCH, funded by ANCS, CNDI – UEFISCDI, Partnerships in prioritary domains, project number PN-II-PT-PCCA-2011-3.2-0356, http://certo.inoe.ro/watch/
- Contemporary Art Conservation: VISART, funded by ANCS, CNDI – UEFISCDI, Partnerships in prioritary domains, project number: PN-II-PT-PCCA-2011-3.2-0342, http://certo.inoe.ro/visart/
- Development of advanced compatible materials and techniques and their application for the protection, conservation and restoration of Cultural Heritage assets: MYTHOS, funded by ANCS, CNDI – UEFISCDI, Partnerships in prioritary domains, project number PN-II-PT-PCCA-2011-3.1-0408, http://certo.inoe.ro/mythos/
- Folkloric Multimedia Deposit: FOLKMEDIA, funded by ANCS, CNDI – UEFISCDI, Partnerships in prioritary domains, project number PN-II-PT-PCCA-2011-3.1-0363, http://certo.inoe.ro/folkmedia/

A description of any significant infrastructure and/or any major items of technical equipment

INOE 2000 operates a complex mobile laboratory (ART4ART –Advanced Research Technology for Art and Archaeology) since 2006, developed to collect scientific data, based on *non-* or *micro*-invasive methods, including the possibility to communicate on-line with the experts and consultants, to transfer data for fast processing. The mobile laboratory includes a significant infrastructure for aerial investigation (8 motors drone with lidar, thermacamera, multispectral sensors etc.) which has unique features and is included in the MOLAB offer.

MOLAB.ro-1

CERTO – Centre of Excellence for Restoration by Optoelectronic Techniques – is the advanced laboratory, including access to optics/laser calibration laboratory and databases for various material characterisation/identification by spectroscopy (FTIR, XRF, RAMAN) and hyperspectral imaging.

19. Riksantikvarieämbetet - Swedish National Heritage Board (RAA)

www.raa.se - (SE)

RAA represents the Swedish node and has 3 linked parties (ADF, CL, MAL).

Description of the legal entity

The Swedish National Heritage Board, under the auspices of the Ministry of Culture, serves since the 17th century as Sweden's central administrative agency in the area of cultural heritage and cultural or historic environment. Cultural heritage protection and management in Sweden aims to preserve and manage sites of historical, architectural or archaeological significance and to empower cultural heritage as a force in the evolution of a democratic, sustainable society. The Department for Conservation at the Swedish National Heritage Board is situated in Visby, Gotland and includes two resource facilities - the heritage laboratory and the exhibition workshop – offering transnational access via the FIXLAB.

The Swedish National Heritage Board is the convenor for the national network Heritage Science Sweden, HSS, a network of universities, heritage institutions and companies that bring together potential collaborators, pool resources on research calls, create better utilization of existing technical and laboratory equipment and make available competencies and expertise for heritage science. The third parties listed below are part of the HSS network and consortium.

Main tasks in the project

The Swedish National Heritage Board - the heritage laboratory and the exhibition workshop – offers transnational access via the FIXLAB platform where it specifically supports research projects with a focus on conservation science and exhibition technology. Additionally, Marei Hacke is responsible for T8.4 Dissemination for the IPERION HS project.

Profiles of key persons

Marei Hacke (female) is a conservation scientist. She has extensive experience in the scientific investigations of cultural heritage and conservation methods. Since 2015 she works in the Heritage Laboratory at the Swedish National Heritage Board. 2007-2015 conservation scientist at the British Museum. 2006-2007 fellow at the Smithsonian Museum Conservation Institute. 2006 PhD in Textile Science and Technology from the University of Manchester.

Kaj Thuresson (female) has a PhD in Environmental Chemistry (2005), Stockholm University, Sweden. Almost 10 years of work experience as a heritage scientist at the Department of Conservation, the Swedish National Heritage Board. Experienced in Heritage science, conservation and chemistry. Proficiency in X-Ray, XRF, SEM/EDS, FTIR, Raman, among other techniques.

Relevant publications and/or products, services

- Javér. A., M. Hacke, C.T. Delgado, K. Thuresson, 2017, Paracas textiles - colour and condition. Investigation of mordants, and degradational state of Paracas textile collections in Peru and Sweden in *ICOM-CC 18th Triennial Conference Preprints*, Copenhagen, 4–8 September 2017, ed. J. Bridgland, art. 1804. Paris: International Council of Museums.
- Verweij, E. and Hinrichs Degerblad, K. 2018, Examining and documenting architectural finishes and surfaces of built heritage in *Book of Proceedings of the International Colour Association (AIC) Conference* 2018, 25-29 September 2018, Lisbon, Portugal, pp. 595-600.
- Hedenstierna-Jonson, C. et al. (2017), A female Viking warrior confirmed by genomics in *Am. J. Phys. Anthropol*. 164(4):853-860.
- Karl-Magnus Melin; Gunnar Almevik (2016), Conservation Theory for Enhanced Craft Practice, https://gup.ub.gu.se/file/206648
- John W. Williams, Eric C. Grimm, Jessica L. Blois, et al. [24 authors incl. Philip I. Buckland], The Neotoma Paleoecology Database, a multiproxy, international, community-curated data resource in *Quaternary Research* (2018), 89, 156–177. DOI: 10.1017/qua.2017.105.

Relevant previous projects or activities

- Current international engagements at the Department of Conservation, Swedish National Heritage Board: CEN standardization on integrated pest management; CEN standardization on architectural paint research; EU-project Adapt Northern Heritage.

- The directors of ADF are Mattias Jakobsson, Professor at the Department of Organismal Biology, Uppsala University, Sweden, and Anders Götherström, Professor at the Department of Archaeology and Classical Studies, Stockholm University, Sweden. The directors have research groups that perform state-of-the-art ancient DNA analysis. Results include determining that modern humans diverged 350,000 to 260,000 years ago; that agriculture came to Scandinavia through migration; how surprisingly cosmopolitan Viking-age Sweden was; describing the population development of stone-age Scandinavian hunter-gatherers and farmers; and that there were female Viking warriors.
- Ongoing projects at the Craft Laboratory at Gothenburg University are "Reconstruction as scientific method in Heritage Craft Science", "Empathy and Craft" and "The epistemology and ontology of Know How" where researchers from different scientific fields and institutions are involved.
- Research hosted at, or in partnership with, MAL ranges from the development of new mobile methods for using spectroscopy to investigate sediments and archaeological materials, to the use of fossil beetles for reconstructing past environments and climates. We also lead the development of two research database infrastructures (SEAD and BugsCEP) and are involved in related work internationally (primarily Neotoma and CyberNABO).

A description of any significant infrastructure and/or any major items of technical equipment

Heritage Science Sweden (HSS), a network of universities, heritage institutions and companies that bring together potential collaborators, pool resources on research calls, create better utilization of existing technical and laboratory equipment and make available competencies and expertise for heritage science.

FIXLAB.se-1

https://www.raa.se/in-english/cultural-heritage/heritage-laboratory/

The Department for Conservation at the Swedish National Heritage Board is situated in Visby, Gotland and includes two resource facilities - the heritage laboratory and the exhibition workshop.

The Heritage Laboratory of the Swedish National Heritage Board is a central facility for the development and application of heritage science, including conservation science, archaeometry and art historical research. We foster implementation of best practice and collaboration on a national and international level. We use experimental and analytical techniques to examine, document and identify materials and to study their ageing and characteristic properties.

The Exhibition Workshop of the Swedish National Heritage Board offers technique and method support to museums for the development of exhibition solutions. The exhibition workshop is a resource for non-profit and publicly funded museums and cultural heritage actors. The workshop has an advanced machine park for exhibition production, as well as a wide range of expertise in the area.

Services offered by FIXLAB.se-1:

The heritage laboratory and exhibition workshop are geared towards flexibility to accommodate different projects and meetings. In order to ensure a high level of quality for analyses and documentation we work according to good laboratory practice (GLP).

All laboratory spaces have particle filtered clean air and are fully climate controlled at 50% ±5% relative humidity and 21°C ± 3°C. A separate space for mechanical material analysis is available, permitting even more stringent climate control. Many of the analytical and monitoring instruments are portable and also allow for non-invasive analyses.

The laboratory includes conservation equipment for a variety of purposes available for research and development, including large-scale freezing down to -30°C, air abrasion, desalination, vacuum and anoxia packing, textile washing and dyeing machines, metal working, etc. The heritage laboratory also has archival space for reference collections consisting of paint, pigment and other material samples, as well as short term secure storage spaces with adjustable climate control.

20. Zavod za varstvo kulturne dediščine Slovenije (ZVKDS)

www.zvkds.si - (SL)

ZVKDS represents the Slovenian node and has 1 linked party (UL).

Description of the legal entity

The Institute for the Protection of Cultural Heritage of Slovenia (ZVKDS) mission is to perform public

services that cover a variety of administrative and professional duties relating to the protection of immovable and movable cultural heritage and of the living cultural heritage associated with it. IPSHS is the founding member of E-RIHS Slovenia (MoU signed in 2018). The core research activities are concentrated at its Conservation Centre, with three units: the Restoration Centre, the Centre for Preventive Archaeology, and the Research Institute. The latter was funded in 2011, with a scientific equipment set-up designed to investigate cultural heritage or other objects at micro or non-invasive level, employing cross-disciplinary team. Heritage Science is its primary focus of research and is mainly linked to the preliminary investigation of monuments, investigation of the environmental impact on different types of materials in terms of chemical and biological alterations, development of new methodologies for safe conservation – restoration, and development of new analytical tools and methods for investigation of cultural heritage objects. The special focus of Research institute is analysis of macromolecular materials, and offers access in their characterisation within IPERION HS.

Main tasks in the project

ZVKDS will take part in the TNA within WP3 FIXLAB by offering the research within Heritage Macromolecular Lab for macromolecular materials characterisation. ZVKDS will also collaborate in WP6 tasks and lead Task 6.2, and collaborate within JRA WP5.1 task related to preventive conservation, and organise one project meeting within WP8.

Profiles of key persons

Polonca Ropret (female) Ph.D. in Chemistry, University of Ljubljana, Faculty for Chemistry and Chemical Technology. Since the year 2000 she has been employed at the ZVKDS. Since 2011 she has been leading the Research Institute of ZVKDS. Main expertise: vibrational spectroscopy (Raman and FTIR). She is also involved in the study program of the Faculty for Chemistry and Chemical Technology within the course Characterisation and stability of materials of Cultural Heritage.

Klara Retko (female) Ph.D. in Chemistry at Faculty of Chemistry and Chemical Technology, University of Ljubljana. Her research focused on development of novel surface-enhanced Raman spectroscopy (SERS) substrates based on silver nanoparticles and on the optimisation of the SERS technique for the characterisation of organic colourants present on cultural heritage objects. She started to work at Research Institute of ZVKDS in 2013.

Lea Legan (female) B.Sc. in Chemistry, University of Ljubljana, Faculty of Chemistry and Chemical Technology. Since the year 2011 she works as a researcher at the ZVKDS Research Institute. Her main research lies in the application of non-invasive FTIR spectroscopy for the investigation of the material composition, ageing processes and the effects of conservation procedures on cultural heritage objects.

Janez Kosel (male) Ph.D. in Biotechnology, University of Ljubljana, Biotechnical Faculty. He has an extensive research repertoire in the fields of fungi characterisation. Most importantly, his research laid ground for the basic idea of the European Research Council (ERC) grand proposal, which was with his help successfully approved in 2017. Since 1.1.2019 he has been employed at the Research Institute, ZVKDS.

Maša Kavčič (female) received a B.A. degree in Art Conservation and Restoration from Academy of Fine Arts and Design of the University of Ljubljana, Slovenia. For her student work, she was awarded Prešeren Award for Students in 2005. Since 2014 she is employed at the Research institute, ZVKDS. Her main expertise is conservation and restoration of easel and wall paintings, polychromed wood, with emphases on cleaning treatments, and wide knowledge on paintings' technology and technical art history.

Relevant publications and/or products, services

- Retko, K, Ropret, P, Cerc K, Romana, Sanchez-Cortes, S, Cañamares, M. Vega, 'Characterization of HPC-based photoreduced SERS substrates and detection of different organic dyes', in *Journal of Raman spectroscopy*, ISSN 0377-0486, 2018, vol. 49, issue 6, pp. 1288-1300, doi: 10.1002/jrs.5394.
- Špec, T, Peljhan, S, Vidič, J, Lendero K, N, Fonović, M, Tavzes, Č, Ropret, P., 'CIM [registered sign] monolith chromatography-enhanced ELISA Detection of proteins in Artists' paints: Ovalbumin as a case study', in *Microchemical journal*, ISSN 0026-265X. [Print ed.], 2016, vol.127, pp. 102-112, doi: 10.1016/j.microc.2016.02.004.
- Ropret, P, Miliani, C, Centeno, S, A., 'Raman mapping in the scientific investigations of works of art', in *ZOUBIR, Arnaud. (ed) Raman imaging: techniques and applications, (Springer series in optical sciences*, ISSN 0342-4111, vol. 168). Heidelberg ... [etc.]: Springer. 2012, pp. 189-217
- Ropret, P, Legan, L, Retko, K, Špec, T, Pondelak, A, Škrlep, L, Sever Š, Andrijana, 'Evaluation of vibrational spectroscopic techniques for consolidants' penetration depth determination, in *Journal of cultural*

heritage, ISSN 1296-2074, 2017, vol. 23, pp. 148-156, illustr. http://www.sciencedirect.com/science/article/pii/S1296207416301327, doi: 10.1016/j.culher.2016.07.004

- Legan, L, Retko, K, Ropret, P, 'Vibrational spectroscopic study on degradation of alizarin carmine', in *Microchemical journal*, ISSN 0026-265X. [Print ed.], 2016, vol. 127, pp. 36-45, doi: 10.1016/j.microc.2016.02.002

Relevant previous projects or activities

- FP7: SYDDARTA (System for Digitisation and Diagnosis in ART Applications, GA No: 265151; 2011-2014FP7
- HEROMAT www.heromat.com/ (protection of cultural HERitage Objects with multifunctional advanced MATerials, GA No: 282992; 2011 – 2015
- E-RIHS PP - The European Research Infrastructure for Heritage Science Preparatory Phase / Horizon 2020 (2017-2019), http://www.e-rihs.eu/
- L6-4217: Research on new technologies for conservation – restoration of baroque easel paintings (2011 – 2014): Case studies of Slovenian Baroque paintings were investigated by Raman and FTIR microscopies. Within the project also new SERS substrates were developed for traditional organic pigments and dyes characterisation, as well as the improved ELISA procedures.
- J7-4208: Microbiological and structural investigations of biologically damaged textiles from Slovenian museums (2011 – 2014): In addition to microbiological studies Raman and FTIR were used for coloured textiles characterisation.

A description of any significant infrastructure and/or any major items of technical equipment

FIXLAB.si-1

Heritage macromolecular Lab www.fkkt.uni-lj.si

The Slovenian national hub proposes to collaborate in access within IPERION HS through the national coordinator Research Institute, Institute for the Protection for Cultural Heritage of Slovenia (ZVKDS-RI) and University of Ljubljana, Faculty of Chemistry and Chemical Technology (UL, FCCT) as the linked third party. The offered scientific expertise and research infrastructure is in the jointly established Heritage Macromolecular Lab, mainly dealing with characterisation of natural and synthetic macromolecules. The uniqueness of the access is in the combination of analytical techniques (listed below) that can offer full characterisation of natural and synthetic polymers, such as cellulose, silk, parchment, leather, as well as characterisation of organic complex paint systems – from complex pigments, such as synthetic organic pigments, traditional organic pigments and dyes, logwood inks, to complex binding media, such as polymers – from natural proteins to modern synthetic. Some of the proposed techniques have not been used within IPERION CH project, such as hyphenated chromatographic systems, Thermogravimetric and Dynamic Mechanical Analysis, and Enzyme-Linked Immuno-Sorbent Assays. However, in cases of heterogeneous materials, where the mentioned methods suffer from difficulties in the results interpretation (e.g. modern or traditional organic paint layers) several microscopic techniques (IFM, FTIR micro imaging, and Raman) will be additionally utilised in order to assure correct interpretation of results and provide position of the identified compounds in a sample (cross-section). By the access offer of our Heritage Macromolecular Lab new user communities dealing with characterisation of modern and contemporary art and design will be attracted. Furthermore, the proposed techniques can also be utilised for degradation studies of complex natural and synthetic macromolecular materials, which will enable also studies for preventive conservation. The knowledge and gained equipment was built on previous international and national projects. The advantage of the proposed Heritage Macromolecular Lab is also in the cross-disciplinary team, composed of chemists, physics biotechnologists and conservators-restorers.

Services offered by FIXLAB.si-1:

The Slovenian national hub proposes to collaborate in access within IPERION HS through the national coordinator Research Institute, Institute for the Protection for Cultural Heritage of Slovenia (ZVKDS-RI) and University of Ljubljana, Faculty of Chemistry and Chemical Technology (UL, FCCT) as the third party. The offered scientific expertise and research infrastructure is in the jointly established Heritage Macromolecular Lab, mainly dealing with characterisation of natural and synthetic macromolecules. The uniqueness of the access is in the combination of analytical techniques (listed below) that can offer full characterisation of natural and synthetic polymers, such as cellulose, silk, parchment, leather, as well as characterisation of organic complex paint systems – from complex pigments, such as synthetic organic pigments, traditional organic pigments and dyes, logwood inks, to complex binding media, such as polymers – from natural

proteins to modern synthetic. Some of the proposed techniques have not been used within IPERION CH project, such as hyphenated chromatographic systems, Thermogravimetric and Dynamic Mechanical Analysis, and Enzyme-Linked Immuno-Sorbent Assays. However, in cases of heterogeneous materials, where the mentioned methods suffer from difficulties in the results interpretation (e.g. modern or traditional organic paint layers) several microscopic techniques (IFM, FTIR micro imaging, and Raman) will be additionally utilised in order to assure correct interpretation of results and provide position of the identified compounds in a sample (cross-section). By the access offer of our Heritage Macromolecular Lab new user communities dealing with characterisation of modern and contemporary art and design will be attracted. Furthermore, the proposed techniques can also be utilised for degradation studies of complex natural and synthetic macromolecular materials, which will enable also studies for preventive conservation. The knowledge and gained equipment was built on previous international and national projects. The advantage of the proposed Heritage Macromolecular Lab is also in the cross-disciplinary team, composed of chemists, physics biotechnologists and conservators-restorers.

- Characterisation of complex organic pigments (synthetic or natural organic pigments and dyes), logwood inks, as well as inorganic pigments and fillers by Fourier Transform (FT) and dispersive Raman microscopy:
- Characterisation of organic binding media in cross-sections of samples by FTIR micro-imaging
- Characterisation of proteins by Enzyme-Linked Immuno-Sorbent Assays (ELISA)
- Characterisation of proteins in cross-sections, their degradation and observation of their eventual migration towards the surface by Immunofluorescence microscopy (IFM)

UL-FCCT

- Characterisation of complex natural and synthetic macromolecules with hyphenated chromatographic systems:
    - 2D size-exclusion/liquid chromatography
    - Pyrolysis-Gas chromatography/mass spectrometry
    - Ion chromatography

and other techniques:

- Viscometry
- Thermogravimetric and Dynamic Mechanical Analysis
- Degradation studies of complex natural and synthetic macromolecular materials:
    - Photo degradation
    - Thermal degradation with controlled relative humidity
    - Degradation in the presence of pollutants.

21. University College London (UCL)

www.ucl.ac.uk - (UK)

UCL represents the UK node and has 5 third parties (HEL, NG, BM, ADS-University of York, NTU-ISAAC).

Description of the legal entity

University College London was established in 1826. More than 5,000 academic and research staff at UCL are dedicated to research and teaching of the highest standards to a nearly 29,000-strong student community coming from more than 150 different countries. UCL’s mission to create and disseminate new knowledge is supported by the latest scientific and IT infrastructure, creative learning spaces and diverse museums and collections – all underpinned by the UK's greatest concentration of professors. UCL Institute for Sustainable Heritage has a cross-disciplinary team of academic staff whose research spans sustainable heritage management and cutting-edge heritage science. The excellence of ISH research has been recognized at an international level, for example, in 2010, with others, it was awarded the Europa Nostra Grand Prix for Research, for the Noah’s Ark project studying the effects of climate change on heritage buildings and sites. The ISH has built strong relationships with numerous heritage institutions and policy bodies, to ensure that its research addresses real-life heritage problems, and is targeted towards the needs of end-users. UCL Institute for Sustainable Heritage has been appointed as the National Coordinator of E-RIHS.UK, with 13 founding Parties.

To UCL, the following third Parties will provide contributions in kind: The British Museum, The National Gallery (London), Historic Buildings and Monuments Commission for England (Historic England), Nottingham Trent University and University of York.

Main tasks in the project

UCL will lead WP7 developing training and engagement activities. This will involve the development of training events (T7.1), of a user forum and organization (T7.2), as well as engagement activities for specific user communities. UCL will lead research into innovation in heritage science (T6.1), as well as contribute to tasks 6.2 and 6.3. UCL will also contribute to communication and dissemination of IPERION HS (T8.3, T8.4, T8.6) and to coordination (T1.3). Access will be provided to the UCL Preventive Conservation Lab (T3.2). In the JRA, UCL will predominantly focus on preventive conservation research (T5.1), but also archaeology, palaeontology and digital research (T5.2, T5.3, T5.5).

Profiles of key persons

May Cassar (female) is Professor of Sustainable Heritage, is Director of UCL Institute for Sustainable Heritage, Vice-Dean (Public Policy) of the Bartlett Faculty of the Built Environment, Director of the UK AHRC/EPSRC Science and Heritage Programme and Director of the UK EPSRC Centre for Doctoral Training in Science and Engineering in Arts, Heritage & Archaeology. As the Director fo the Science and Heritage Programme and as Special Adviser to the House of Lords Science and Technnology Committee Inquiry on Science and Heritage, she has led the resurgence of heritage science activity in the UK over the last decade, for which she has been recognized by the Royal Warrant Holders' Association with the award of the Plowden Gold Medal in 2012. Until 2015, she was the founding Chairperson of the UK National Heritage Science Forum and is currently a member of the UK Department of Culture, Media and Sport Science Advisory Council.

Josep Grau-Bove (male) is Lecturer in Science and Engineering in Arts Heritage and Archaeology at UCL Institute for Sustainable Heritage. His research focuses on the application of building information modelling, citizen science and system dynamics in heritage science, and collaborates with the National Trust, UCL Museums, the Smithsonian Conservation Institute, the Amsterdam City Archives, English Heritage, Historic England, Royal Historic Palaces and the Mary Rose Trust. Josep is the UCL Preventive Conservation Lab lead.

Relevant publications and/or products, services

- PAS 198:2012: "Specification for managing environmental conditions for cultural collections", British Standardisation Institute, 2012 (contributed as Steering and Working Group members)
- Strategic Research Agenda of the Joint Proramming Initiative Cultural Heritage and Global Change, 2014 (contributed as Expert and Scientific Group members)
- C. Dillon, N. Bell, K. Fouseki, P. Laurenson, A. Thompson, M. Strlič: "Mind the gap: Rigour and relevance in collaborative heritage science research", Heritage Science 2 (2014) no. 11.
- M. Strlič, D. Thickett, J. Taylor, M. Cassar: "Damage functions in heritage science", Stud. Conserv., 58 (2013) 80-87.
- L. Cséfalvayová, M. Strlič, H. Karjalainen: "Quantitative NIR chemical imaging in heritage science", Anal. Chem., 83 (2011), 5101-5106.

Relevant previous projects or activities

- E-RIHS PP – European Research Infrastructure for Heritage Science – Preparatory Phase, 2017-2019 (H2020), http://www.e-rihs.eu/
- APACHE - Active & intelligent PAckaging materials and display cases as a tool for preventive conservation of Cultural Heritage, 2019-2022 (H2020).
- NANORESTART-NANOmaterials for the REStoration of works of ART, 2015-2018 (H2020), www.nanorestart.eu
- UK EPSRC Doctoral Training Centre "Science and Engineering in Art, Heritage and Archaeology", 2014-2022, www.seaha-cdt.ac.uk
- TEACH-Technologies and tools to prioritize Assessment and diagnosis of air pollution impact on immovable and movable Cultural Heritage, 2008-2012 (EU 7FP).

A description of any significant infrastructure and/or any major items of technical equipment

UCL ISH - www.ucl.ac.uk/bartlett/heritage/

UCL ISH has extensive environmental research lab facilities as well as heritage materials research facilities, and a mobile heritage laboratory to carry out field research and monitoring. The facilities include GC/MS using thermal desorption and SPME autosamplers, pollutant data loggers (SO2, NOx, O3, HCHO), as well as a range of techniques to characterise and monitor degradation of real objects using spectroscopy (IR, NIR, hyperspectral imaging, profilometry, colour etc.) as well as other techniques, from particle counting, thermal techniques to viscometry (for MW determination of cellulose).
UCL ISH has a number of accelerated degradation setups that will be used for the project, in which T, RH, light and pollutant/atmosphere composition can be controlled. In addition, UCL ISH has excellent access to modelling expertise and software, e.g. Fluent and Matlab, which we will use in the project.

FIXLAB.uk-3 - https://www.ucl.ac.uk/archaeology/about-us/facilities/conservation
The UCL Preventive Conservation Lab consists of fixed and mobile laboratory facilities, as well as online tools and expertise that assist users in the development of preventive conservation strategies for heritage buildings and collections.
UCL has been leading the development of preventive conservation standards for the past few decades and a wealth of tools have become available for access and further development, e.g. for modelling of indoor pollution, particulate matter deposition, collection degradation and damage development and for modelling of building behaviour, energy consumption and associated costs. In addition, the associated expertise involves building physics and engineering, sustainable management of collections, value assessment.

Services offered by FIXLAB.uk-3:
The facility covers a range of preventive conservation applications including (but not exclusively):
- Monitoring, visualisation and modelling of indoor environments, e.g. temperature and relative humidity as well as modelling of environmental scenarios using software tools such as Energy+ or WUFI to understand building behaviour and the impact of climate change
- Monitoring, visualisation and modelling of pollution, e.g. volatile organic compounds, traffic generated pollutants and particulate matter, their interactions with collections and buildings as well as transport phenomena, using tools such as IMPACT and CFD, to understand the susceptibility of collections to pollution damage and the evaluation of filtration and other pollution mitigating tools and strategies.
- Monitoring, visualisation and modelling of degradation and damage to cultural heritage materials and collections using collection management tools e.g. COLLECTION DEMOGRAPHY, in order to devise scenarios of the effect of environmental management and access management on damage accumulation in collections.
- Monitoring, visualisation and modelling of light and the effect of light (daylight or artificial) on buildings and indoor environments, using architectural modelling tools
- Other facilities to support the above, including H-BIM (heritage building information modelling), and other modelling tools, e.g. based on epidemiology, agent-based and systems modelling.
- Laboratory facilities to support the above, e.g. gas chromatography, pollution modelling using NOx, SO2 and O3 data loggers, CO2 logging and monitoring, particulate matter monitoring and logging, thermal cameras, systems for air exchange measurement, monitoring of water and moisture in buildings etc.

Potential applications include all aspects of preventive conservation, including the development of new strategies for collection and building management, either in the immediate or far future, taking into account aspects of climate change, funding and policy change.

22. The J. Paul Getty Trust – The Getty Conservation Institute (GCI)
www.getty.edu/conservation - (US, West)

GCI represents the Western US node and has no linked parties.

Description of the legal entity
The Getty Conservation Institute (GCI) is part of the J. Paul Getty Trust, an international cultural and philanthropic institution that focuses on the visual arts in all their dimensions, recognizing their capacity to inspire and strengthen humanistic values. The Getty Conservation Institute (GCI) – situated in Los Angeles – works internationally to advance the field of conservation through scientific research, field projects, education and training, and the dissemination of information in various media. In its programs, the GCI focuses on the creation and delivery of knowledge that will benefit the professionals and organizations

responsible for the conservation of the visual arts. Advancing conservation practice is the organizing principle for all of the Institute's work—which includes identifying activities that improve the way conservation treatments are carried out, pursuing research that expands conservation knowledge, and increasing access to information on conservation subjects. In all its endeavours, the Getty is committed to addressing unanswered questions and promoting the highest possible standards of conservation practice.

Main tasks in the project

The GCI has established a long-term research agenda in Heritage Science, combining scientific capability with conservation know-how. It has active projects running on technical studies, materials characterization, preventive conservation and treatment research, in both the Collections and Built Heritage sectors. The scientists that would be involved in IPERION HS are the senior team in the department, and would bring considerable expertise in the organic and inorganic analysis of works of art, imaging of works of art, research into the ageing of materials, and conservation treatment evaluations.

Profiles of key persons

Tom Learner (male) is Head of Science at the Getty Conservation Institute (GCI). He has a PhD in chemistry (University of London, 1997), and a Diploma in conservation of easel paintings (Courtauld Institute of Art, London, 1991). He moved to the GCI in 2007, first as a Senior Scientist in charge of developing a research strategy on modern and contemporary art, and became head of the department in 2014. He is currently co-ordinator for the Modern Materials and Contemporary Art working group of ICOM-CC, and sits on the Steering Committee of the International Network for the Conservation of Contemporary Art (INCCA).

Michael R. Schilling (male) is a Senior Scientist and head of Materials Characterization research at the GCI. He earned his B. S. (1983) and M.S. (1989) degrees in chemistry from California State Polytechnic University, Pomona. His notable research activities include: research on characterization of Asian and European lacquers; materials characterization of plastics and modern/traditional paint media; and wall paintings conservation projects.

Karen Trentelman (female) is a Senior Scientist and head of Technical Studies research at the GCI. She received a Ph.D. in physical chemistry from Cornell University in 1989, and BS in chemistry from the University of Utah. She joined the GCI in 2004, having worked at the Detroit Institute of Art from 1995. She has extensive experience in the application of diverse analytical techniques to study the materials and methods used for works of art, and the interpretation of that data to address questions of conservation or scientific importance.

Michal Lukomski (male) is a Senior Scientist and head of Preventive Conservation research at the GCI. He received his PhD in physics from the Jagiellonian University in Krakow, Poland, in 2003. His current area of research focuses on describing quantitatively the response of hygroscopic materials relevant to collections of fine and decorative art, in particular wood, textiles, animal glue, gesso and paints to variations of climate conditions, using several scientific methods.

Relevant publications and/or products, services

- Łukomski, M, Beltran, V, Boersma, F, Druzik, J, Freeman, A, Strojeckic, M, Learner, T, and Taylor, J, 2018, 'Monitoring acoustic emission in an epidemiological pilot study of a wooden object collection', Studies in Conservation, 63:1, pp181-186, DOI: 10.1080/00393630.2018.1471892
- Kupczak A, Jędrychowski M, Bratasz Ł, Łukomski M, Kozłowski R. 2019. 'Processing relative humidity data using discrete Fourier transform to control strain in art objects'. Strain e12311. https://doi.org/10.1111/str.12311
- Trentelman, K, Bouchard, M, Ganio, M, Namowicz, C, Patterson, C, Walton, M, 2010, 'The examination of works of art using in situ XRF line and area scans', in *X-ray spectrometry* , 39 (3), pp. 159-166
- Rychlý, J, Matisová-Rychlá, L, Csomorová, K, Janigová, I, Schilling, M, Learner**,** T, 2011, 'Non-isothermal thermogravimetry, differential scanning calorimetry and chemiluminescence in degradation of polyethylene, polypropylene, polystyrene and poly(methyl methacrylate)', in *Polymer Degradation and Stability,* 96 (9), pp. 1573-81.
- Schmidt Patterson, C, Carson, D, Phenix, A, Khanjian, H, Trentelman, K, Mass, J, Hirschmugl, C, 2013, 'Synchrotron-based imaging FTIR spectroscopy in the evaluation of painting cross-sections', in *e-Preservation Science*: 1-9, http://www.morana-rtd.com/e-preservationscience/2013/Patterson-02-06-2012.pdf

Relevant previous projects or activities

- http://www.getty.edu/conservation/our_projects/science/modcon
- MOSAIKON: A Regional Strategy for the Conservation of Mosaics in the Mediterranean, http://www.getty.edu/conservation/our_projects/education/mosaikon
- POPART-Strategy for the preservation of plastic artefacts in museum collections (EU FP7), 2008-2012, http://popart.mnhn.fr/
- RAdICAL-Recent Advances in Characterizing Asian Lacquer http://www.getty.edu/conservation/our_projects/education/radical/index.html
- SCIART: Collaborative Research into Archaeological Ceramics – High-Resolution Studies of Attic Black & Red Ceramic Slips (NSF 1041808), http://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=119082
- Managing Collection Environments http://www.getty.edu/conservation/our_projects/education/managing/index.html

A description of any significant infrastructure and/or any major items of technical equipment

The GCI possesses an exceptionally well-equipped laboratory for chemical analysis (including Fourier Transform infrared spectroscopy (FTIR), Raman spectroscopy, gas chromatography/mass spectrometry (GC/MS), pyrolysis-GC/MS, evolved gas analysis, direct temperature-resolved MS, and liquid chromatography-MS), as well as imaging techniques (environmental scanning electron microscopy, imaging FTIR, and a range of techniques (such as nanoindentation, atomic force microscopy, micromechanical testing, dynamic vapor sorption, and range of thermal analytical techniques) used to assess changes in material properties with age and/or conservation treatment.

No third parties involved

23. The Smithsonian Institution – Museum Conservation Institute – (SI MCI)

www.ai.edu/mci/ - (US, East)

SI MCI represents the Eastern US node and has no linked parties.

Description of the legal entity

"The Smithsonian Institution is a "trust instrumentality" of the United States – an organization established by the U.S. government as a public trust. Created by the US Congress on August 10, 1846, through 9 Stat. 102, the Institution carries out the bequest of James Smithson (1765-1829) to create an establishment "for the increase and diffusion of knowledge among men." Since 1846, public laws, judicial decisions, court cases, procedures of the Board of Regents, executive orders, and government reports have shaped the Institution's legal structure" (https://siarchives.si.edu/history/legal-history). The authority and responsibilities of the United States are delegated to the Smithsonian Board of Regents (https://www.si.edu/ogc/legalhistory).

Main tasks in the project

Collaboration in international activities (e.g. Pan-american symposium in The Getty Institute for Conservation in 2021). Specialized training on technical examination of cultural heritage. Access to laboratories and facilities to carry out joint research projects.

Profiles of key persons

Robert J. Koestler (male) has been director of the Smithsonian's Museum Conservation Institute since August 2004. As director, he strives to bring new technology and focus to MCI's research and conservation efforts, working closely with the Smithsonian museums to protect and conserve their collections. Koestler is known for his advancements in art conservation research, including quantification of biodeterioration and early detection systems, assessment of visual changes in material surfaces and control of insect and fungal infestations in objects. He was Editor-in-Chief of the Elsevier journal International Biodeterioration and Biodegradation 2006-2016.

Paula T. DePriest (female) is the Deputy Director of MCI. She received her Ph.D. in Botany from Duke University, her M.S. in Botany from the University of Tennessee, Knoxville, and her B.S. in Biology from Union University, Jackson, TN. She was elected a Fellow of the American Association for the Advancement of Science in 2002. Paula's biological research focuses on lichens (lichen-forming fungi), especially reindeer

lichens in the reindeer herding regions of Mongolia. Her conservation research focuses on fungal and lichen biodeterioration of outdoor monuments.

Timothy Cleland (male) is a Physical Scientist at MCI. He received a Ph.D. from North Carolina State University in Earth Sciences focusing on mass spectrometry-based characterization of fossil proteins from diverse taxa and soft tissue preservation from non-avian dinosaurs. He received a B.S. in Geosciences from Colorado State University. At MCI, Timothy specializes in protein characterization and quantification from historical and fossil bone and tissue using mass spectrometry and contributes to technical studies of other proteinaceous materials at the Smithsonian.

G. Asher Newsome (male) is a Physical Scientist at MCI. He received a Ph.D. from the University of North Carolina-Chapel Hill in Analytical Chemistry where he created novel methods and instrumentation for tandem mass spectrometry of substances ranging from aerosols to proteins. Asher held a postdoctoral fellowship at the U.S. Food and Drug Administration Center for Food Safety and Applied Nutrition where he developed a liquid chromatography-mass spectrometry assay for allergenic dairy milk protein in complex foods. At MCI, Asher designs applications for detecting small organic compounds and large biomolecules in the Smithsonian museum collections.

Caroline Solazzo (female) is a Physical Scientist at MCI. Caroline received her M.S. in Analytical Chemistry from the University of Orsay (France), and a Ph.D. in Biochemistry, Investigation of Ancient Proteins by Proteomics, from the University of Lille 1 (France) with the Highest Honours. She was the recipient of a prestigious Marie Curie fellowship, sharing time between the BioArCh group, Department of Archaeology, at the University of York and Proteins and Biomaterials, *AgResearch* Lincoln Research Centre, *New Zealand*, a group specializing in wool research. She has been a pioneer in the study of ancient proteins, a recent discipline with high potential for bioarchaeology. Her research focuses on new applications for proteomics such as identification of food residues and archaeological fibers.

E. Keats Webb (female) is the Digital Imaging Specialist at MCI. She is currently a Ph.D. candidate at the University of Brighton as part of the in UK SEAHA CDT with expected completion in 2019. Her research is investigating the optimisation of spectral and 3D imaging for cultural heritage documentation using consumer-imaging systems. Her work as an imaging specialist uses scientific and computational imaging to aid in the research and conservation of the Smithsonian collections. Her specializations include spectral imaging and image-based 3D reconstruction.

Relevant publications and/or products, services

- **Cleland, Timothy P.** and Schroeter, Elena R. 2018. A Comparison of Common Mass Spectrometry Approaches for Paleoproteomics in *Journal of Proteome Research* 17 (3):936–945.
- **Solazzo, Caroline**. 2019 in Characterizing historical textiles and clothing with proteomics, *Conservar Património* 1-18.
- **Webb, E. K.** 2017, Reflected Infrared and 3D Imaging for Object Documentation in *Journal of the American Institute for Conservation* 56:1–14.
- **Newsome, G. A.**, Kayama, Ikumi, and **Brogdon-Grantham, Shannon**. 2018, Direct analysis in real time mass spectrometry (DART-MS) of discrete sample areas without heat damage in *Analytical Methods* 10:1038–1045.
- Sledge, Jane, **Charola, A. Elena**, **DePriest, Paula T**., and **Koestler, Robert J**., eds. 2017, Conservation of the Exterior of the National Museum of the American Indian Building. Smithsonian Contributions to Museum Conservation 6 in *Washington, DC: Smithsonian Institution Scholarly Press*. 66 pages.

Relevant previous projects or activities

- Digital and Imaging Spectroscopy Program – adapting imaging from what can be seen with the naked eye down to nanoparticles, for the study of cultural heritage objects and research specimens.
- Biomolecular Mass Spectrometry Program – developing a proteomics-mass spectrometry capability to allow us to gather information from cultural heritage objects and research specimens to learn more about their materials, origins, and deterioration.
- Biodeterioration Program – solving biodeterioration problems on cultural heritage, including buildings and monuments, using environmentally safe techniques.
- Protecting Cultural Heritage Program – supporting education and technical assistance for protection of cultural heritage world-wide to improve global cultural stewardship especially in partnership with U.S. federal agencies and international organizations.

- Digital First Outreach – respond to the Smithsonian goal of reaching 1 billion people by revitalizing MCI Web pages to engage 21st-century audiences and to highlight our large, visionary, interdisciplinary research and scholarly projects.

A description of any significant infrastructure and/or any major items of technical equipment

The Smithsonian Institution is a museum and research complex of 19 museums and galleries and the National Zoological Park, as well as research facilities.
The Institution's activities include:

- operating museums in Washington, D.C. and New York City, as well as the National Zoo in Washington, D.C. representing over 400 buildings;
- maintaining its facilities to safeguard the United States' priceless collections; and
- advancing scientific research through its collections-based research (which range from paintings, to insects, artifacts, and animal reproduction) and operation of five scientific research centers.

One of the scientific research centers is the Smithsonian's Museum Conservation Institute (MCI). Its mission is to serve as the center for specialized technical collection research and conservation for all Smithsonian museums and collections. To fulfill this mission, the institute's staff members combine their knowledge of materials and the history of technology with state-of-the-art instrumentation and scientific techniques to provide technical research studies and interpretation of artistic, anthropological, biological, and historical objects.

No third parties involved

24. University of Copenaghen (UCPH)

https://www.ku.dk/english/ - DK

Description of the legal entity

Founded in 1479, UCPH is the oldest and second largest university in Denmark, and hosts over 37,000 students and 7,000 employees. A member of the International Alliance of Research Universities, its research and training expertise span the full range of academic disciplines. The university hosts about 40,000 students and 10,000 employees and consists of 6 faculties.
Built around 5 distinct research groups with expertise spanning geology to genomics, the Lundbeck Foundation GeoGenetics Centre (LFGC) provides an exceptionally dynamic research environment, and is perhaps the world's leading institute for the application of ancient proteomics techniques across a wide range of archaeological, anthropological and evolutionary biological questions.
The "Paleoproteomics" group is one of the few groups worldwide focused on ancient proteins mass spectrometry-based investigation The LFGC is a Danish Centre of Excellence for Basic Research (Grundforskningscenter) which officially opened in September 2010.
The "Paleoproteomics" group is part of the Globe institute a new interdisciplinary Institute recently founded within the faculty of Health at the University of Copenhagen. The institute operates at the intersection of natural and medical sciences and the humanities.

Main tasks in the project

UCPH is contributing to Tasks 5.3, 6.4, 7.1 and 8.3.

Profiles of key persons

Matthew Collins (**male**), Globe Institute**,** is a Niels Bohr Professor of Palaeoproteomics and group leader in the Section for Evolutionary Genomics and he is the MacDonald Chair in Palaeoproteomics at Cambridge University and he will be the Danish coordinator and principal point of contact at UCPH.
Committment: Coordinator.Provides key training, mentoring and project management.
Enrico Cappellini (**male**), Globe Institute**,** group leader of the Paleoproteomics unit cooridnates the TEMPERA and PUSSH ITNs the former focusing on the application of protemics methods to cultural heritage *Commitment*: Joint Coordinator. Provides key training, mentoring and project management.
Commitment: Members Provides key training, mentoring and project management.
Anders Hansen (**male)** is Director of the Globe Institute, and has extensive experience working with characterization of genetic material in difficult samples either being aDNA, eDNA, forensic genetics or

degraded DNA. AJH was one for the first to use DNA technology to characterize species contents in ancient environmental samples like ice and permafrost.
Kristine Bohmann (female), Globe Institute**,** is a leading exponent of environmental DNA (eDNA), coordinator of DNAmark which seeks to use eDNA for monitoring natural heritage, she leads the Danish node of a new ERC Synergy grant on its application to historical maritime records
Karina Sand (female), Globe Institute**,** is an Assoc. Prof. at the LFGC. She is leading the Molecular Geobiology Group and is recognized for her interdisciplinary approach to quantification of bio-mineral interactions. Her skill set includes flow through in-situ nano scale techniques and bond level measurements.
Eske Willerslev (**male**), Globe Institute**,** is Prince Philip Professorship in Ecology and Evolution at University of Cambridge, UK and the Lundbeck Foundation Professorship in Evolution at Copenhagen University, Denmark. He is director of the Lundbeck Foundation GeoGenetics Centre.
Kurt Kjær (**male**), Globe Institute**,** is Prof. at LFGC, Head of Anthropocene-Quaternary Research Group. He is a leading expert on palaeoenvironmental reconstructions in glacial environments.
Hannes Schroeder (male), Globe Institute**,** research focuses on the development and application of new analytical techniques in ancient DNA. In addition, he has had a long-standing interest in Caribbean Archaeology and the Archaeology of the African Diaspora.
Niels Lynnerup (**male**) is head of the Department of Forensic Pathology, Anthropological Unit, and specialises in forensic anthropology. in mummy studies and studies of historical human remains.
Eva Andersson Strand (female) is head of the Centre for Textile Research and is researches textile production; craft organisation; trade; gender; archaeology and politics; archaeology and ethics; experimental archaeology, and explore the development of novel computer applications in Archaeology.
Ken Arnold (**male**) is Director of the Medical Museion the innovative museum and research unit at the University of Copenhagen one of the leading Medical museums in the world with a dynamic research and curatorial programme.

Relevant publications and/or products, services

- Fiddyment, S., Teasdale, M. D., Vnouček, J., Lévêque, É., Binois, A., & Collins, M. J. (2019). Do you want to do biocodicology? A field guide to the biological analysis of parchment. Heritage Science, 7 (1), 35.
- Seguin-Orlando, A., Korneliussen, T. S., Sikora, M., Malaspinas, A.-S., Manica, A., Moltke, I., Willerslev, E. (2014). Paleogenomics. Genomic structure in Europeans dating back at least 36,200 years. Science, 346(6213), 1113–1118.
- Mackie, M., Rüther, P., Samodova, D., Di Gianvincenzo, F., Granzotto, C., Lyon, D., … Cappellini, E. (2018). Palaeoproteomic Profiling of Conservation Layers on a 14th Century Italian Wall Painting. Angewandte Chemie, 57(25), 7369–7374.
- Cappellini, E., Welker, F., Pandolfi, L., Ramos-Madrigal, J., Samodova, D., Rüther, P. L., Willerslev, E. (2019). Early Pleistocene enamel proteome from Dmanisi resolves Stephanorhinus phylogeny. Nature. https://doi.org/10.1038/s41586-019-1555-y

Relevant previous projects or activities

- E-RIHS PP – European Research Infrastructure for Heritage Science – Preparatory Phase, 2017-2019 (H2020), http://www.e-rihs.eu/ UCPH is the seat of the national node of the infrastructure for Denmark.
- The GLOBE institute currently hosts three Marie Curie ITNs, five ERC awards, 9 Marie Curie Fellows and 8 EU-COST PhD students.

A description of any significant infrastructure and/or any major items of technical equipment

- **Ancient DNA laboratories**: SNM houses some of the most advanced ancient DNA facilities in the world. Separate areas for DNA extraction, PCR setup and library build all contribute to eliminating cross-contamination and extracting the maximum amount of information from archaeological samples.
- **Sequencing Center**: The Sequencing Center houses several high-throughput platforms including 3 HiSeq 2500s and 1 MiSeq.
- **Bioinformatics infrastructure**: Dedicated server (1.9PB storage, 656 core clusters with 4736 Gb RAM) and high-spec desktop machines (typical Intel i7 3.2 Ghz, 16GB, 1TB storage) are all available to me.

- **Ancient proteins laboratories.** Provide facilities for extraction and analysis of ancient proteins. Analysis is conducted at the Centre for Protein Researchwhich offer world-leading instrumental platforms with high-resolution mass spectrometers.
- **Surface science labs**: The GLOBE hosts a one of a kind facility with state of the art instrumentation for characterizing the interface region of minerals from the Ångstrøm scale to the bulk scale, including the key instrumentation to conduct this study.

No third parties involved

4.2. Third parties involved in the project (including use of third party resources)

1. [1] Consiglio Nazionale delle Ricerche – National Research Council (CNR)

CNR represents the Italian node (main participant) and is linked with 4 third parties (OPD, INFN, UNIBO, UNIPG).

Does the participant envisage that part of its work is performed by linked third parties?	**Y**
*The **four** CNR linked third parties are the Opificio delle Pietre Dure (OPD), the National Institute of Nuclear Physics (Gran Sasso and Florence), the University of Bologna (UNIBO) and the University of Perugia (UNIPG).*	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)?	**Y**
CNR will subcontract Communication Activities in compliance with the national procurement rules (D. Lgls. 18 aprile 2016, n.50). *CNR's subcontractor shall be selected to comply with the principle of best value for money and absence of conflicts of interest.* *The cost of the subcontract is €40.000,00.*	

1

Opificio delle Pietre Dure (OPD)

www.opificiodellepietredure.it

OPD is a Central Institute of the Italian Ministry for Cultural Heritage and Tourism (MiBACT) founded in 1588 by the Grand Duke Ferdinando I de' Medici. Its name, "workshop for semi-precious stones", is appropriate to this unique institute, which combines a long and distinguished tradition with a modern and articulate structure. It is based in Florence but serves all over Italy either as on-site workshops or as advisory services. The Institute is one of the leading conservation and research laboratories in the world. It employs restorers, art historians, archaeologists, conservation scientists, laboratory technicians and administrators. The OPD has also a Graduate School for conservators, open to European citizens and foreigners. The OPD has responsibility at a national level of the safeguard and conservation of cultural heritage. It is linked to prominent European museums too.

Main tasks in the project

OPD will lead Task 2.2 (Access provision management within WP2 (ARCHLAB) and provide the ARCHLAB SERVICE (ARCHLAB-5).

Profile of OPD key persons

Cecilia Frosinini (female) is an Art Historian of the Ministry of Culture since 1990 at the Opificio delle Pietre Dure. She is currently director of Painting Conservation Department, Paper and Drawings Conservation Department and Mural Painting Conservation Department. She has been member of the OPD Scientific Research Committee from 2009 to 2014 and is member of the Board of Council since 2014 to present. She has been granted of several fellowships in International Institutions, specifically A. B. Mellon fellow at CASVA (Washington DC) in Spring 2012 and E. J. Safra visiting professor at CASVA (Washington DC) in Spring 2013.In partnership with INO-CNR, she has undertaken a wide length research on the underdrawing technique in Italian Medieval and Renaissance paintings, showing up as one of the few art-historians, with a traditional education, involved in the field of scientific investigations.She is author of more than 150 scientific papers.

Monica Galeotti (female) PhD in chemistry and works in the staff of the Scientific Laboratory of the Opificio delle Pietre Dure. Her expertise is focused on ceramics, metals, enamels and glazes. Her research interests range from interdisciplinary characterization of art materials and manufacturing techniques to evaluation of procedures for conservation. She is also in charge of the Preventive Conservation Department of the Opificio and lecturer at the Opificio School of Conservation. She has been taken part in many remarkable conservation projects. She has been involved in joint research projects at national (TECON@BC,

TDT Bioart, PRIMARTE) and international (CHARISMA, IPERION_CH, Scan4Reco) projects. In the EU projects CHARISMA and IPERION_CH she had a leading role in the Transnational Access activity called ARCHLAB.

A description of any significant infrastructure and/or any major items of technical equipment:
ARCHLAB.it-1 - The records of all the activities developed to date by OPD are collected in three different archives, located in central Florence:

- the Historical Archive which contains all the documentation on the history of the Opificio till the 70's;
- the Conservation Archive related to the conservation/restoration works since 1975,
- the Scientific Data Archive, founded in 1977 by its former Director Mauro Matteini.

The language used in all these three archives is Italian.
The records held by the archives refer to a wide range of objects related to the Conservation Departments activities: stone and wood sculpture, bronzes, tapestries and textiles, ceramics, wax and glass, paper, movable paintings, wall paintings, jewellery, mosaics, mainly from Middle Ages to present times. Access is offered within ARCHLAB to a huge archive of scientific and conservation reports since the 1970' and before, containing detailed information on either historical or innovative conservation processes, analytical data in the form of optical and electron microscope photos, spectra, X-rays radiographies and different kinds of images (visible light, UV, IRR). Interviews with conservators and chemists, and microscope investigation of old cross-sections are also made available. The records kept at OPD are referred to objects conserved/restored and studied by experts of Opificio. Many kinds of materials are included, stone, metals, easel paintings, textiles, tapestries, mosaics, ceramics and terracotta, glass, wall paintings, wooden sculptures. Most of the objects are of Medieval and Renaissance art, but also modern a contemporary art objects are comprised as well or archaeological items, mainly from µitalic public and private collections.

2

National Institute for Nuclear Physics (INFN)
INFN Gran Sasso https://www.lngs.infn.it/it/chimica-e-impianti-chimici The Laboratori Nazionali del Gran Sasso (LNGS) are one of the most important underground infrastructures in the world dedicated to the search of rare and low energy events in the field of astroparticle physic. The LNGS chemistry department operates a mass spectrometry laboratory suitable for the elemental measurement at the ultra-trace level. This facility plays a fundamental role for the selection of radio-pure materials to be used for the building of low background experimental apparatus. The acquired knowledge and the available equipment are also usefully exploited in interdisciplinary activities such as several applications in the field of cultural heritage.
INFN-CHNet, Firenze www.fi.infn.it/index.php/it/ LABEC is the laboratory especially dedicated to the development and the application of techniques such as Accelerator Mass Spectrometry, Ion Beam Analysis and X-ray Fluorescence to environment and Cultural Heritage. LABEC is also the leading partner of INFN-CHNet (Cultural Heritage Network), the network of INFN laboratories that are involved in studies on archaeometry and Cultural Heritage.

Main tasks in the project
INFN participates with two laboratories that will provide FIXLAB services: Gran Sasso LNGS unit (FIXLAB IT-1) and Firenze (FIXLAB IT-2).

Profile of INFN key persons
Stefano Nisi (male) worked for over 20 years as permanent staff of chemistry division of LNGS. Leading the Mass Spectrometry section for several years, like that acquiring knowledge in using and maintaining several instruments and in developing analytical method. He is involved in the selection of radio-pure materials for the experimental apparatus construction and in the precise isotope ratio measurement, applying MS to many fields and interdisciplinary projects regarding Physics, Geosciences, Food science and Archaeometry. He is a member of the scientific collaboration of several experiments installed at LNGS. Since June 2015, he is responsible for LNGS about the Cultural Heritage Network (CHNet).
Mariaelena Fedi (female) is a technologist at INFN working on the development of nuclear techniques applied to the study of Cultural Heritage for about twenty years. In particular, her expertise is focused on those techniques that are based on the use of small energy electrostatic accelerators, Ion Beam Analysis and Accelerator Mass Spectrometry. She is the person in charge of all the reasearch activities in Accelerator Mass

Spectrometry at LABEC, INFN-Firenze. She is author of more than sixty papers on internationally peer reviewed publications.

A description of any significant infrastructure and/or any major items of technical equipment:
FIXLAB.it-1 – Services offered through IPERIONHS are the measurement of the isotopic ratios of some elements, supplemented by historical and archaeological considerations, can provide information on the geographic origin. The activity of LNGS inherent in cultural heritage consists in the measurement of isotopic ratios (mainly Lead and Strontium) in paintings, metallic and biological finds. Extremely accurate and precise measurements are obtained by mass spectrometry with thermal ionisation source (TIMS). Additional information is obtained from the elemental characterization by ICP-MS analysis.
FIXLAB.it-2 Service offered through IPERIONHS is radiocarbon dating radiocarbon concentration measurements are performed exploiting the dedicated AMS (Accelerator Mass Spectrometry) beam line, installed at the 3 MV tandem accelerator of LABEC. The AMS beam line is equipped with a multi-samples ion source, based on Cs sputtering on graphite samples; with sequential injection to alternatively transmit mass 14, 12 and 13; and with magnetic-electrostatic analysis of the high energy side. Data analysis is performed thanks to home-developed tools, also using internationally renowned calibration software. The laboratory is also fully equipped to provide complete sample preparation. The laboratory is thus a complete radiocarbon facility, which can support users starting from the beginning of the measurement, from the choice and/or the collection of samples to be measured, up to the data analysis and the results interpretation in their original context. Typical areas of interest for research projects are Cultural Heritage, considering both archaeology and art history, environment and earth science.

3

University of Bologna (UNIBO)
www.unibo.it
The University of Bologna is one of the eldest university in the Western world. The presence throughout the territory, the international outlook, the research, the programme catalogue, the information services are relevant: in these and many other areas, today the Alma Mater paves the way for innovation. UNIBO comprises 5 campuses, 32 departments, 5 schools, 197 research projects funded by the European Union within H2020 and LIFE frameworks. UNIBO is the 1st University in Europe for international mobility (Erasmus+ 2018); at the UNIBO the university community of teaching and services staff is composed of 715 people. The library system offers access to 47,000 on-line journals, 190,000 e-books and 680 databases.

Main tasks in the project
UNIBO will lead Task 7.1 (Training).

Profiles of key persons
Rocco Mazzeo (male) Head of the Microchemistry and Microscopy Art Diagnostic Laboratory (M2ADL), devoted his career to science for conservation at both national and international level (Italian Ministry of cultural heritage 1981-1998 and ICCROM 1998-2002) and coordinated many national and international project among which the establishment in 1998 of the Xi'an Centre for the Restoration of Cultural Relics in China (1995-1998), the CURRIC project aimed at developing curricula for post-graduate education in science for conservation (2000-2003) and the first European PhD in Science for conservation (EPISCON project, Marie-Curie, VI Framework Programme (2005-2009). Author of numerous scientific papers published within national and international peer reviewed journals. His main research interest and expertise deal with the application of advanced molecular spectroscopies (FTIR and Raman) to the study of paintings and metal alloys.

4

University of Perugia (UNIPG)
www.unipg.it
The University operates in the field of cultural heritage principally through the Centre of Excellence SMAArt (Scientific Methodologies applied to Archaeology and Art – www.smaart.it, established in 2000 by the Ministry of University and Research (MIUR) which develops research and services. The research carried out under the Centre SMAArt involves investigation into the constituent materials of archaeological finds, aimed at their classification, origin and dating, or investigation into materials used in works of art, designed to characterize the performance techniques and to assess the state of preservation. Innovative methods of

intervention, such as the development of materials and methods for the consolidation and protection are also developed. **UNIPG** has a large experience in participation to international and national research projects, especially in programmes of RI, and has been Coordinator of the I3 projects Eu-ARTECH (FP6) and CHARISMA (FP7).

Main tasks in the project
It will be the MOLAB service (MOLAB-2) provision.

A description of any significant infrastructure and/or any major items of technical equipment:
UNIPG Perugia. The mobile lab (already operative in IPERION CH) has a recognized leadership in UV-Vis-NIR specroscopy. It offers to IPERION HS MOLAB (MOLAB.it-2) the following equipment: i) mobile spectrometer for UV-Vis spectroscopies, namely in reflection and emission (stady state and time resolved); ii) hypespectral camera operating in reflection and emission mode in the Vis range.

Profile of UNIPG key person
Aldo Romani (male) is Associate Professor at the Department of Chemistry, Biology and Biotechnology of the University of Perugia. Research activity concerns both basic and applied subjects principally involving characterization of the molecular excited states by means of the parameters that govern their radiative and non-radiative processes using spectroscopic techniques in absorption and emission. The same techniques were applied, for not destructive diagnostic purposes, in the field of the cultural heritage. From 2015 he is the President of the Excellence Centre SMAArt (Scientific Methodologies Applied to Archaeology and Art). He is the author of more than 180 papers in international journals and 8 books chapters. He is the responsible of the mobile facility at UNIPG Perugia included in the MOLAB platform.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)?	**N**
Does the participant envisage that part of the work is performed by International Partner (Article 14a of the General Model Grant Agreement)?	**N**

2. [2] Koninklijk Instituut voor het Kunstpatrimonium – Royal Institute for Cultural Heritage (KIK-IRPA)

*KIK-IRPA represents the Belgian node (main participant) and is linked with **1** third party (KMKG-MRAH).*

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**N**
Does the participant envisage that part of its work is performed by linked third parties	**Y**
*KIK-IRPA has only **1** third party: KMKG-MRAH*	

Royal Museums of Art and History (KMKG-MRAH)
www.brusselsmuseums.be/en/museums/art-history-museum
KMKG-MRAH is housed in a historic building, one of the biggest museums in Belgium and erected by former Belgian King Leopold II. A wealth of artefacts from prehistoric times over antiquity and the European applied arts to a vast collection of non-European art are available.

Services offered by the infrastructure
ARCHLAB 2
ARCHLAB access is offered to reports, images, sample collections of worldwide excavations and studies.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)?	**N**
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	**N**

3. [5] Ústav teoretické a aplikované mechaniky – The Institute of Theoretical and Applied Mechanics (ITAM)

*The Institute of Theoretical and Applied Mechanics (ITAM) of the Czech Academy of Sciences represents the Czech node and is linked with **2** third parties (IAP, IAB).*

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**N**
Does the participant envisage that part of its work is performed by linked third parties	**Y**
*ITAM has **2** linked third parties: IAP, IAB.*	

1

The Institute of Archaeology of the Czech Academy of Sciences in Prague (IAP)

IAP conducts theoretical research within the field of archaeology. With its partner institute in Brno (IAB) provides a unified archaeological research infrastructure for the CR. In 2016, AIS CR was incorporated within the Roadmap of Large Infrastructures for Research, Experimental Development and Innovation in the CR, provides a wide range of services, and makes archaeological data accessible to its users. IAP oversees the administration and development of the main information systems of the AIS CR (Archaeological Map of the CR, Archaeological Atlas of the CR, etc.), hosts its hardware infrastructure, and coordinates accompanying research activities. IAP also preserves an archive of oblique aerial images and specialised databases. IAP is linked to ITAM with a framework cooperation agreement in research.

Main tasks in the project

The IAP conducts theoretical research within the field of archaeology and is involved in providing a unified archaeological research infrastructure for the Czech Republic. With experience in managing and accessing archaeological data its experts on data management contributes to WP5, specifically to T5.4 Data management and link with EOSC.

Profile of IAP key persons

David Novák, Ph.D. (male) is head of the Department of Information Sources and Landscape Archaeology of the IAP CAS. He is a GIS and digital archaeology specialist and is involved in a number of international activities and initiatives (ARIADNE+; SEADDA; EAC). He is AIS CR's main administrator, responsible for technical and conceptual development, communication with users and ensuring its long-term sustainability. His research topics include digital landscape analysis and research on medieval and post-medieval settlement.

2

The Institute of Archaeology of the Czech Academy of Sciences in Brno (IAB)

The Institute of Archaeology of the Czech Academy of Sciences in Brno carries out basic scientific research, primarily based on archaeological sources from prehistoric and early medieval history specific to the territories of Moravia and Czech Silesia as well as the broader geographical area of the central Danube basin. Having served as a centralised information source for all authorised archaeological institutions from Moravia and Silesia since 1942, the institute currently provides and manages an extensive research infrastructure for archival sources from the areas of Moravia and Moravian Silesia as well as a specialised library for the scientific community, students and the general public. IAB coordinates the AIS CR project and collaborates with IAP on the administration, dissemination, and further development of the RI of AIS CR. IAP is linked to ITAM with a framework cooperation agreement in research.

Main tasks in the project

The IAB conducts theoretical research within the field of archaeology and is involved in providing a unified archaeological research infrastructure for the Czech Republic. With experience in managing and accessing archaeological data its experts on data management contributes to WP5, specifically to T5.4 Data management and link with EOSC.

Profile of IAB key persons

Olga Lečbychová (female) is head of the Archive of the IAB CAS. She co-manages the AIS CR project and

also collaborates on a number of other national and international projects (AIS-2, INDIHU, ARIADNE+). Since 2009, she has been in charge of digitisation of the IAB archive as well as building, managing and developing the institute's information systems. She specialises in community archaeology and has a keen interest in exploring ways of sharing the nation's archaeological heritage with the public.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	**N**
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	**N**

4. [6] Stiftung Preußischer Kulturbesitz-Staatliche Museen zu Berlin-Rathgen Forschungslabor– Rathgen Research laboratory (RF) - Prussian Cultural Heritage Foundation (SPK)

SPK represents the German node and is linked with 7 third parties (MLZ, CEZA, RWTH, CCA-BW, Doerner Institut, DAI, Fraunhofer Building Lab).

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**N**
Does the participant envisage that part of its work is performed by linked third parties	**Y**
SPK participates in IPERION HS with 7 third parties (CEZA, MLZ, RWTH, CCA-BW, Doerner Institut, DAI, Fraunhofer Building Lab).	

1

Curt-Engelhorn-Zentrum Archäometrie gGmbH (CEZA)
http://www.cez-archaeometrie.de/
FIXLAB.de-1
The Curt-Engelhorn-Zentrum Archäometrie gGmbH (CEZA) is a 100% daughter company of the Curt-Engelhorn Foundation for the support of the Reiss-Engelhorn Museums in Mannheim. It was founded in 2004 as a nonprofit company that is entitled to entitled to apply for financial support for research projects from public institutions. It also provides services based on its theoretical and methodological expertise to its partners and clients. The close association with the Reiss-Engelhorn Museums in Mannheim provides access to large collections of cultural heritage but CEZA has substantial collections of its own, like the largest collection of metal samples from prehistoric metal objects and other samples related to prehistoric metallurgy from the Ancient World, an associated data base of some 50000 analyses of prehistoric metal objects and one of the largest collections of lead and strontium isotope ratios of archaeological objects. Furthermore, it has a collection of historic textiles, a collection of some 50000 reference wood samples for dendrochronological dating as well as a data base of some 40000 radiocarbon dates.

Main tasks in the project
CEZA participates with FIXLAB.de-1.

Profile of CEZA person
Ernst Pernicka (male) CEZA. Professor. His field of research is in particular the development and application of scientific methods in archeology as well as the emergence and spread of metallurgy in the Old World. He is involved in research on the Nebra Sky Disk, Troy and Iran. Since 2013, he expresses doubts about the authenticity of the gold finds of Bernstorf. From 2006 to 2012 he was the successor of Manfred Korfmann head of the excavation in Troy, at times also in Udabno (Kakheti / Eastern Georgia). He has received several research awards: 2007 Science Award of the Province of Vorarlberg (Austria), together with R. Krause and K. Oeggl, 2012 Elected as a corresponding member abroad of the mathematical-scientific class of the Austrian Academy of Sciences, 2013 Advanced Grant of the European Research Council, the highly endowed EU research funding for outstanding achievements.

FIXLAB.de-1:

The laboratory is equipped with up with up-to-date commercial and self-developed instruments:

1) Chemical and isotope analysis:
- high resolution multi-collector mass spectrometer with inductively-coupled plasma ionisation (Thermo HR-MC-ICP-MS Neptune Plus)
- laser ablation system (Resonetics 193 nm excimer laser) coupled with a quadrupol mass spectrometer with inductively-coupled plasma ionisation (Thermo Q-ICP-MS XS II)
- Thermion mass spectrometer for negative ions (TIMS Finnigan MAT 261)
- mass spectrometer for stable isotope ratios of light elements (Elementar IsoPrime precisION)
- Elemenal analyzer (Elementar vario PYROcube)
- Stable isotopen mass spectrometer (Elementar IsoPrime 100)
- Elemental analyzer (CHN Analysator NA 2500 ThermoQuest)
- Atomic emission spectrometer with plasma ionisation (Thermo ICP-OES ICap 7200)
- 8 Alpha spectrometer
- Neutron activation analysis with 3 gamma spectrometers (HPGe Ortec)
- X-ray fluorescence analysis with energy dispersive spectrometers (EDXRF with sample changer (ARL Quant'X, Thermo), EDXRF with integrated video mikroscope and manually moveable X-Y table (Fischerscope XAN 150), µ-XRF with Si(Li) detector and capillary optics (Eagle III XXL), portable EDXRF (Niton)
- Facilities for sample preparation including a class 100 clean laboratory and a regular chemical laboratory.

2) Materialography and fiber analysis:
- Microscope for reflected and transmitted light (Zeiss Axioskop 40 A Pol) with digital image processing (Zeiss Axiovision)
- Konfocal digital microscope (Keyence VHX-600))
- Scanning electron microscope (ZEISS EVO 60 MA 25) with extra large sample chamber (Ø 42 cm, h 33 cm), variable pressure (10-400 Pa) for nonconducting samples and energy dispersive analysis with Si(Li) drift detector (SDD, resolution at least 127 eV at Mn-Kα, BRUKER Esprit 1.9.4)
- Laboratory for sample preparation equipped with instruments for automatic production of polished sections

3) Dating methods:
- Accelerator mass spectrometer (AMS-MICADAS – Mini Carbon Dating System)
- Gas ion source for AMS
- Luminescence TL/ OSL reader (Risø 20C/D) with integrated alpha- (241Am) and beta sources (90Sr)
- Gamma spectrometer for measurement of natural radionuclides
- Elemental analyser (Elementar MICROcube)
- Graphitisation system for carbon samples (IonPlus AGE 3)
- Graphitisation system (self-development)
- Autosampler for the analysis of carbonate samples (IonPlus CHS –carbonate handling system)
- Gas purification system for AMS (self-development)
- Freeze drier (Christ Alpha LD12)
- Dark-room laboratory for sample preparation for luminescence dating.

2

Technische Universität München (TUM)

The research neutron source FRM II is operated by the Technische Universität München (TUM), and, due to its compact fuel element, provides the world's best ratio of neutron flux per thermal reactor power. It usually operates 4 reactor cycles of 60 days each per year. Thermal, as well as cold and hot neutron beams are available, being an ultra-cold source under construction. In addition, a converter facility provides a unique fast neutron beam. The FRM II is located at one of the leading scientific areas in Europe i.e. the campus in Garching, with the science and engineering faculties of the TUM, institutes from the Ludwig-Maximilians-University Munich, 4 Max-Planck-Institutes, the ESO, and institutes from the Bavarian Academy of Science as well as one of the largest computing facilities in Germany at the Leibnitz computing centre LRZ.

The exploitation of the scientific use of the FRM II is organized in a close collaboration between the Technische Universität München (TUM), the Jülich Centre of Neutron Science (JCNS) of the Forschungszentrum Jülich (FZJ), and the German Engineering Materials Science Center (GEMS) of the Helmholtz Zentrum Geesthacht (HZG), within the Heinz Maier-Leibnitz Zentrum (MLZ). The complementary expertise of the three MLZ partners, together with that one of other ten associated university

groups and Max Planck Society institutes, form a powerful framework to provide an optimized and versatile facility for the benefit of scientists from the European Research Area.
The FRM II is member of the association of European Research facilities (ERF-AISBL) and engaged in research policies on national and European level. In the year 2018 the MLZ received in total 706 submitted proposals, with 17 ones in the heritage science field (2.4%). Out of the 15 accepted proposals in this area, 12 experiments were performed on 4 selected instruments, using 50 beam days of measurements. The average duration of the experiments related to cultural heritage is 4.2 days. The total number of publications registered in the MLZ database (since 2005) related to heritage science is 134.

Main tasks in the project
TUM contributes with FIXLAB.de-2.

Profiles of key persons
Flavio Carsughi (male) FZJ. He is part of the scientific staff at the Jülich Centre for Neutron Science (JCNS) - at Heinz Maier-Leibnitz Zentrum (MLZ) as a User Officer.

FIXLAB.de-2

By offering a unique suite of high-performance neutron scattering instruments, scientists are enabled to pursue state-of-the-art research in heritage science. The profound expertise from 13 years of operation and international user service as well as renowned experience in the non-destructive examination of archaeological objects and artefacts will make TUM a valuable partner for the IPERION HS consortium in providing measurement time at several instruments through TNA. Our instrument scientists will aid in selecting the proper instrument, collecting and analysis of gained data, and discussion of results.

3

Aachen University (RWTH)
http://www.rwth-aachen.de/
Chair of Macromolecular Chemistry (MC) at the Institut für Technische und Makromolekulare Chemie (ITMC) of RWTH Aachen University (RWTH).
ITMC.MC is engaged in European cultural heritage projects for more than 20 years, and has been engaged in a multitude of measurement campaigns at museums, archaeological sites and cultural-heritage buildings or monuments. ITMC.MC has unique and extensive experience in the operation of the instrumentation, the different data analysis procedures and the data interpretation. This will make ITMC.MC of RWTH an indispensable partner for the IPERION HS consortium in providing instrument time and analysis expertise for the NMR-MOUSE through TNA. Our instrument scientists will aid in selecting the proper instrument, collecting and analysing the data, and discussing the results.

Main tasks in the project
RWTH contributes with MOLAB.de-1.

Profiles of key persons

Markus Küppers (male) has been group leader since 09/2009 for NMR imaging and flow NMR at the chair of Makromolekulare Chemie (Prof. Dr. Bernhard Blümich), ITMC / RWTH Aachen University. His research areas are NMR Imaging (MRI), Flow NMR (Flow MRI), NMR in material science, NMR in production tecnic and diffusion-NMR.Between 04/2006 - 08/2009 he was Senior scientist at the chair of Makromolekulare Chemie (Prof. Dr. Bernhard Blümich), ITMC / RWTH Aachen University. Between 07/2005 - 03/2006he was postdoc at the Fraunhofer Institut for Biomedical Engineering, St. Ingbert. He defended his Ph. D. Thesis at the RWTH Aachen University in 09/2005. Between 04/2001 - 06/2005 he was a scientist at the chair of Makromolekulare Chemie (Prof. Dr. Bernhard Blümich), ITMC / RWTH Aachen University. He is responsible of the facility included in the MOLAB platform.

Services offered by MOLAB.de-1
MOLAB.de-1
The NMR-MOUSE is a mobile MRI device invented by MC and allocated in a range of different specifications to the Magnetic Resonance Centre (MARC) at ITMC. Due to its compact design and light weight, the NMR-MOUSE is a mobile instrument suitable for operation in remote regions and non-

destructive materials studies of large objects including tangible cultural heritage. The NMR-MOUSE provides depth profiles of hydrogen-rich objects non-destructively down to depth of up to 25 mm depending on the type of instrument. The recorded NMR data report material parameters like moistures saturation and elasticity.

4

University of Tübingen (EKUT)
www.cca-bw.uni-tuebingen.de
The analytical techniques of the University of Tübingen (EKUT) focus on the analysis and characterization of inorganic materials with a special emphasis on non-destructive techniques, such as X-ray diffraction and fluorescence, Raman spectroscopy and optical microscopy. Currently a flexible and mobile multimethodological analytical setup is developed which will include the before mentioned techniques.
In addition, the characterization of mechanical properties of materials and experimental ceramic processing is possible.
Particularly, the following techniques are available:

- Ambient and non-ambient powder X-ray diffraction (XRD) for structural analysis (phase/mineral identification), locally resolved non-destructive microanalysis down to spot sizes of app. 100µm on large objects (µ-XRD^2) for phase identification and textural features, non-destructive and locally resolved stationary and mobile X-ray fluorescence (µ-XRF, p-XRF) for chemical analysis.
- Mobile and stationary non-destructive and locally resolved Raman spectroscopy (µm-Range) for phase identification and structural characterization.
- Mobile 3D videomicroscope for 3D-imaging of objects, mobile laser scanning microscope for highly resolved real color 3D-imaging and quantitative characterization of surfaces, polarized light microscopes for phase analysis.
- Universal testing devices (up to 30kN) for mechanical properties (bending, tensile, compression strength, hardness, indentation fracture resistance, Weibull modulus), RFDA for Young´s modulus.
- High temperature furnaces for experimental ceramic firing up to 1600°C.

Main tasks in the project
EKUT contributes to Joint Research Activities (WP5).

Profiles of key persons
Christoph Bertold (male) is senior scientist at University of Tübingen in the Department of Geosciences and head of Competence Center Archaeometry - Baden Wuerttemberg (CCA-BW).

5

Doerner Institut, Bayerische Staatsgemäldesammlungen, München (DI)
www.doernerinstitut.de/en/
Central task of the Doerner Institut is the preservation and art technological as well as scientific research of the extensive painting collections of the Münich Pinakotheken administered by the Bayerische Staatsgemäldesammlungen (Bavarian State Painting Collections). The collections comprise more than 25.000 objects, mainly paintings but also installations or video art ranging from the 14th century to contemporary art. The Doerner Institut has a staff of c. 55 conservators, museum technicians and scientists. Through its multi-disciplinary combination of practical conservation restoration, day-to-day conservation treatments and internationally recognised scientific research, the Doerner Institut makes an important contribution to the preservation of cultural heritage. In the field of preventive conservation, i.e. the improvement and control of the conditions in galleries and depositories, the involvement of Doerner in museum design and in the conversion of historical buildings for use as museums is of importance. Since its foundation in 1937, art-technological research and the scientific analysis of historical painting methods and materials as well as the development of physical and chemical methods for examining art objects is integral part of our work. The scientific department uses a broad range of modern imaging techniques (XR, IRR, macro XRF scanning) as well as various analytical methods for in-depth characterization of artists and conservation materials of all periods (SEM/EDX, Raman microscopy, XRF, GC, GC/MS, ASA, FTIR microscopy and ATR-FTIR). The institute hosts an extensive collection of artists`s materials and artists`s estate as well as an art-technological and scientific archive with entries for c. 7.000 objects from collections

worldwide. Regular participation of the Doerner Institut in the Pinakotheken exhibitions promotes the public's involvement in the conservation, technological examination and understanding of cultural heritage. The Doerner Institut is affiliated with the conservation chair of the Technical University of Munich and participates in the training and supervision of conservation students and post-graduates. The institute also provides consultancy services and expert reports for governmental agencies, freelance conservators, the art market and private entities. Since 8 years, the institute has been partner in the EU CHARISMA and IPERION CH infrastructure projects.

Main task in the project
DI participates in the training activities (WP7).

Profiles of key persons

Heike Stege (female) is the head of natural science department of the Doerner Institut of the Bayerische Staatsgemäldesammlung Munich. She studied chemistry and is specialist of pigment analysis. She was involved in the European CHARISMA and IPERION CH programs.

6

German Archaeological Institute (DAI)
www.dainst.org/dai/meldungen
The DAI has developed the iDAI.world, a system of services for archaeological data, norm data and data analysis, including iDAI.field, an excavation documentation system, and the IANUS project for the long-term preservation of data. Data interoperability and standardization are at the core of the iDAI.world.
DAI headquarters' natural sciences unit includes the disciplines archaeozoology, archaeobotany, dendrochronology, and prehistoric anthropology. The commission's researchers investigate animal and plant remains, human skeletons, and wood findings from excavation projects of all DAI departments and commissions. It also conducts cross-disciplinary research projects on topics of archaeological natural sciences.

Main tasks in the project
DAI will contribute to the JRA activities, WP6 and T7.6.

Profiles of key persons
Reinhard Förtsch (male) is the Director of DAI's IT Department. PhD and Habilitation in classical archaeology. From 1996-2012 he was head of Cologne Digital Archaeology Laboratory. During this period he established Arachne https://en.wikipedia.org/wiki/Arachne_(archaeological_database), the Central object-database of the Research Archive for Ancient Sculpture at the University of Cologne (DAI). He built also the iDAI.world, an infrastructure system for all interests of classical studies like time and place management.
Wolfgang Schmidle (male) is a Research Associate at the DAI's IT Department. Master's in Mathematics and PhD in Computer Science. He is involved in E-RIHS PP Germany and is responsible for the design and implementation of the period gazetteer ChronOntology as part of the iDAI.world. One focus of his research is the semantic modelling of data.

Significant facilities at DAI:
iDAI.world consists of several interconnected software modules which are, wherever possible, oriented in their data on open access and in its programming in open source.
https://www.dainst.org/forschung/forschung-digital/idai.welt

7

Fraunhofer - BUILDING Lab
www.fraunhofer.de/en.html
The Fraunhofer BUILDING Lab consists of fixed and mobile laboratory facilities, as well as simulation tools. With over 200 employees in all different areas of building physics, the relevant disciplines and expertise are gathered for addressing different research questions in conservation science. The Lab provides expertise that assist users in the development of strategies for the restoration of historic buildings with special attention to adapt buildings to climate change impacts and for the preventive conservation of collections. Also material

research for archaeological and mural paintings conservation is a special focus area. Furthermore, real historic buildings are used as BUILDING Labs both in construction and material testing. Digital twins are created for simulation and development of building climate control concept.
In addition, the associated expertise involves building chemistry, microbiology and mineralogy, HVAC and energy engineering, as well as social sciences for involving stakeholders.
The Fraunhofer institute can provide:

- Determination of hygric and thermal properties of art materials and construction material to be used in hygrothermal building simulation of composite structures or whole buildings
- Climate measurements to assess the climatic stability and to develop climate control concepts compatible with historic fabric (e.g. in accordance to DIN EN 15757 standard)
- Simplified approach to air flow simulation in buildings for HVAC design, etc.
- Multi-method monitoring of historic surfaces under climatic exposure (3D microscopy, structured light scanner, high-resolution thermal imaging)
- Indoor air quality analysis and assessment of contaminations due to earlier treatments
- Analysis of mould species and their living conditions on different substrates to determine the mould risk isopleths
- Analysis of conservation mortars / development of new conservation products
- Holistic approach to preventive conservation of historic buildings and museums and development of sustainable solutions
- Durability assessment of conservation materials in outdoor testing.

Main tasks in the project
Fraunhofer will lead the T7.4 (Engagement with the built environment community).

Profiles of key persons
Ralf Kilian (male) is scientist at the Fraunhofer Institute for Building Physics IBP in charge of Cultural Heritage Research.
Johanna Leissner (female) is scientist at the Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. based in Brussels. She is the speaker of the Fraunhofer Gesellschaft for the Research Alliance Cultural heritage in Germany.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)?	**N**
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	**N**

5. [7] Agencia Estatal Consejo Superior de Investigaciones Científicas - Superior Council for Scientific Research (CSIC)

CSIC (Spanish National Research Council) represents the Spanish node and works in collaboration with 2 third parties (art. 11) (IPCE, CENIEH).

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**N**
Does the participant envisage that part of its work is performed by linked third parties?	**Y**
*CSIC is linked with **2** third parties (CENIEH and IPCE) having signed an agreement for collaboration for the establishment and development of the Spanish Node of E-RIHS.*	

1

Centro Nacional de Investigación sobre la Evolución Humana (CENIEH)
www.cenieh.es
CENIEH is a Singular Scientific and Technological Infrastructure unique in Spain in the field of Social Sciences and Humanities, distinguished by its content and performance, committed to providing services and research tools for the scientific, technological and industrial communities. The research carried out in CENIEH focuses on hominid biological and cultural evolution during the Neogene and Pleistocene, and

include collaborative projects at excavations and deposits of these periods worldwide. The research activities are organized in three multidisciplinary programs and cover Geology and Geochronology; Hominid Paleobiology, and Archaeology. As a research center, CENIEH has a wide expertise in Paleoanthropology and Paleontology and it is responsible for the conservation, restoration, management and the recording of archaeological and paleontological collections, in particular from Atapuerca. CENIEH will offer to this new infrastructure (IPERION HS) services and expertise of its scientific and techniques to cover these fields.

Main tasks in the project
CENIEH participates with FIXLAB.es-1 and it is involved in WPs related to JRA and TNA activities.

Profiles of key persons
Mohamed Sahnouni (male) is a Paleoanthropologist specializing in lithic analysis and hominid behavior. He was trained in both Europe and USA with PhD degrees in Quaternary Geology and Anthropology, respectively. He is recipient of research grants from funding agencies in the USA and Europe. He has published extensively in international peer-review journals and edited books. Currently he is Research Professor and Coordinator of the Prehistoric Technology Program at the CENIEH, he is leading paleoanthropological research projects in Africa and he is involving in two important European projects: E-RIHS (The European Research Infrastructure for Heritage Science) and ARIADNEplus (Advanced Research Infrastructure for Archaeological Data Networking in Europe – plus)
Cecilia Calvo Simal (female) has a degree in Architecture and experience in management and coordination of international projects. She is currently developing internationalization area and participation in international research projects. She is mainly working as an E-RIHS (The European Research Infrastructure for Heritage Science) Project Technician, assisting with the project and focused on the Work Package which CENIEH leads.

A description of any significant infrastructure and/or any major items of technical equipment
FIXLAB.es-1
Services offered by (FIXLAB.es-1): Geochronology and Material characterization. The main objective of the **Geochronology laboratory** is to determine the age of rocks, fossils and sediments using signatures inherent in the rocks themselves. Absolute geochronology can be accomplished through radioactive isotopes, whereas relative geochronology is provided by tools such as palaeomagnetism and stable isotope ratios. Combining multiple geochronological (and biostratigraphic) indicators the precision of the recovered age can be improved. CENIEH has the expertise and the facilities to combine different methods in the same place to improve the precision and to standardize methods with different techniques. In the CENIEH, equipment and laboratories are available to carry out the entire dating process. This includes equipment and capacity to specialists for the collection of samples in the field; preparation of sample; measurement of samples; and 4) analysis and interpretation of data. The dating methods include in this FIXLAB are: Electron Spin Resonance (ESR), Luminiscence (OSL), Uranium Series and Paleomagnetism.

2

Instituto del Patrimonio Cultural de España (IPCE)
https://ipce.culturaydeporte.gob.es/inicio.html
IPCE is the institution of the Ministry of Culture and Sports (MCD) dedicated to the research, conservation and documentation of cultural heritage. Attached to the Directorate General of Fine Arts of MCD, IPCE counts with a 100-people staff from different disciplines that face their work from the necessary transdisciplinary perspective demanded by the complex task of conserving and valorizing cultural property. Its three principal functions are: (i) the conservation and restoration of movable and immovable Spanish Cultural property; (ii) the development and implementation of conservation plans of cultural assets; (iii) establishing main lines of research in heritage conservation criteria, methodology and techniques. For IPERION HS, IPCE will provide access to its archives though ARCHLAB. The value and interest of this access is supported by the success of the TNA access already provided under IPERION CH.

Main tasks in the project
IPCE contributes mainly with ARCHLAB.es-1.

Profiles of key persons

María Martín Gil (female), PhD in Science (Doctor Europeus). Head of the Research and Training Department at IPCE. She is responsible for the establishment of the strategy and priorities of research for conservation and restoration. She is also responsible for IPCE training program, focused on interdisciplinary, specialization and quality. Coordinator of PNIC (National Research Plan in Cultural Heritage) and Cultural Institutions Node in TechnoHeritage (Science and Technology for the Conservation of Cultural Heritage Net). She is representative of the Spanish Culture Ministry in the Stakeholder Advisory Board of the project E-RIHS PP -European Research Infrastructure ON Heritage Science- and IPCE representative in the Spanish node of E-RIHS. Actively participation in national and international diffusion activities concerning Heritage Science.

Miriam Bueso (female), Bachelor of Arts, specialty of Archaeology, Graduate in Restoration specialty of Archaeology and Curator of Museums. Responsible of the Research Projects Service at IPCE Miriam Bueso manages scientific documentation generated by the Research Department. She is also Supervisor of X-ray installation with a wide experience in the application of the radiographic studies on cultural assets, and training activities in this field. Coordinator of PNIC (National Research Plan in Cultural Heritage)

ARCHLAB.es-1

Description of the infrastructure

Several databases are yet available on line, such as:
Archit. Heritage Inventory (http://ipce.mcu.es/documentacion/archivo/fondos/inventario.html), the Blueprints Library (http://ipce.mcu.es/documentacion/archivo/fondos/planoteca.html), the Historical Heritage Photo Library (http://ipce.mcu.es/documentacion/fototeca.html) and the Monument Catalogue of Spain (http://biblioteca.cchs.csic.es/digitalizacion_tnt/index.html)

Services offered by the infrastructure

Within Archlab, the following access is offered:
The proposed access is as follows:

- Unrestricted access to the General Archive, containing the documentation generated in the IPCE's conservation and restoration interventions (paintings, sculptures, archaeological objects -metal, glass, pottery, bone, organic material-, historical books and documents, textile, mural paintings and mosaics, old photographs, monuments, etc). This comprises the Conservation Restoration Project Archive and the War Archive, which had not previously been digitised. Researchers can consult this documentation at the General Archive.
- Research and Training Area Archive, containing all analytical information and studies performed with a range of innovative techniques applied to the study of the types of cultural assets available to the laboratory (micro-samples, stratigraphic cross-sections, spectrums and photographs, x-radiographs).

Unrestricted access to the IPCE Library. Researchers can consult the bibliography at the Library's facilities.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	**N**
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	**N**

6. [8] Centre National de la Recherche Scientifique – National Scientific research Centre (CNRS)

*The National Centre for Scientific Research (CNRS) represents the French node and is linked with **5** linked third parties (MC, MNHN, SOLEIL, UBx, Univ-Lille-MSAP).*

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**N**
Does the participant envisage that part of its work is performed by linked third parties	**Y**
*CNRS participates in IPERION HS with **5** third parties: French Ministry of Culture (MC), Muséum National d'Histoire Naturelle (MNHN), SOLEIL, University od Bordeaux (Ubx), University of Lille (Univ-Lille-MSAP).*	

1

French Ministry of Culture (MC)

www.c2rmf.fr and www.lrmh.fr

The French Ministry of Culture will be involved through two of its scientific departments: the C2RMF and the LRMH. They are in charge of the study, research and preservation of the French Museums and Historical Monuments and ancient materials at large. Most of their staff is composed of public agents of the MC.

Main tasks in the project

The MC personnel will be involved in all the project WPs, as WP leaders, task leaders or as contributors to coordination or scientific activities, together with the staff of their respective CNRS joint research units.

Profiles of key persons

Isabelle Pallot-Frossard (female) Ministry of Culture. **C2RMF.** General Heritage curator, Director of the C2RMF and E-RIHS France National Coordinator. Art historian, head curator of Cultural Heritage. She has been inspector of historical monuments in charge of the regions of Picardie, Champagne-Ardenne and Lorraine; director of the National Research laboratory for Historical Monuments; involved in over 10 european projects (from FP4 to H2020); a member of ICCROM Council and vice-president of the Council; President of the International Scientific Committee for the Conservation of Stained Glass (ICOMOS-Corpus Vitrearum). She gives lectures and conferences on the conservation of Cultural Heritage in France and abroad, and has written more than one hundred publications in national and international journals on conservation of tangible cultural heritage with a special focus on stained glass.

Michel Menu (male) Ministry of Culture. C2RMF. PhD and Habilitation in Physics. MCC Research Engineer, Head of the Research Department, laboratory, co-director of the IRCP (CNRS unit 8247). Current research: application of non-invasive techniques for the analysis of paintings and colours. His research interests include the chemical characterization and study of physico-mechanical properties of paintings. Former French coordinator of CHARISMA, Eu-ARTECH and IPERION CH. Member of the board of editors of Applied Physics A.

François Mirambet (male) Ministry of Culture. C2RMF. PhD and Habilitation in Chemistry. MCC Research Engineer. Deputy director of the Research Department. Physico-chemist, he is responsible for the conception, development and realization of an improved X-ray diffraction system coupled with X-ray fluorescence and his main research topic is the study of degradation mechanisms of heritage materials.

Thomas Calligaro (male) Ministry of Culture. C2RMF. PhD in nuclear physics. MCC Research Engineer. Participated in the AGLAE ion beam facility. Author of over 70 Rank A papers, three textbook sections and several catalogue chapters. Invited speaker in in international conferences on nuclear techniques and applications. Member of the international boards, e.g. Particle Induced X-ray Emission PIXE and European Conference on Accelerators Applied in Research and Technology. Consultant in nuclear science education for the International Agency of Atomic Energy. Promoter of novel radiation-based instruments and methods for CH applications. Recognized expert in the analysis of minerals in Cultural Heritage, in particular fine stones and gems.

Aline Magnien (female) Ministry of Culture. CRC. General Heritage curator, Director of LRMH since 2015. PhD in Art History. Former responsible of the collections of the Musée Rodin in Paris.

Vincent Detalle (male) Ministry of Culture. C2RMF. PhD in Physics. MCC Research Engineer. In charge of the laser laboratory and responsible for the development and management of a portable non-invasive equipment mobile platform (Raman LIBS-LIF, FLIM, OCT imaging terahertz hyperspectral camera, μ-XRD etc.). He is also responsible for the French MOLAB.

David Giovanacci (male) Ministry of Culture. LRMH. PhD in Physics. MCC Research Engineer. In charge of the development of instrumentation and responsible of the LRMH MOLAB (imaging Thz (TDS) and Stimulated Infrared Thermography.

Claire Pacheco (female) Ministry of Culture. C2RMF. PhD in chemistry. MCC Research Engineer. Head of the AGLAE unit, offering the Ion Beam Analysis (IBA) access. She is in charge of the maintenance, development and application of IBA for Cultural Heritage objects. Head of a group of 6 engineers, she is also responsible for the X-ray fluorescence devices, and the Scanning Electron Microscopes (1 low pressure, 1 FEG).

Marine Zelverte (female) Ministry of Culture. C2RMF. Heritage curator in the Ministry of Culture. Head of Archives and Documentation at the C2RMF. She has been responsible of the Culture section of the National Archives. She is also responsible for the French ARCHLAB.
Alban François (male) Ministry of Culture. CRC. Responsible for Documentary Studies at the LRMH.

A description of any significant infrastructure and/or any major items of technical equipment
The French ARCHLAB is composed of 2 documentary collections of scientific reports, pictures and scientific imagery, samples, cross sections, reference materials, databases, gathered during several decades (almost 90 years for the first and 50 for the second) by 2 public institutions dedicated to research on cultural heritage conservation, museum collections and historical buildings and sites, the Center for Research and Restoration of the Museums of France in Paris (C2RMF) in Paris and the Research Laboratory for Historical monuments (LRMH) in Champs sur Marne.

ARCHLAB.fr-1
Services offered by the infrastructure
Centre de Recherche et de Restauration des Musées de France (C2RMF) – https://c2rmf.fr/ is a national public service of the Ministry for Culture of France. The access is offered within the Department of Archives and Documentation, located at the C2RMF in the Palais du Louvre in Paris. The Department preserves all the records from the studies carried out at the laboratory since its creation in 1931. Especially on the works of the museums of France, from Prehistory to 21th Century (main categories: paintings, archaeology – ceramic, glass, stone, metal, textiles -, sculpture, graphic arts, modern and contemporary materials, decorative arts – enamel, goldsmithery, earthenware -, bio-materials). ARCHLAB access will be to the files of the laboratory, that include essentially:
- scientific reports (28,000) and analytical data
- scientific images (150,000) such as X-rays, infrared and fluorescence images, infrared reflectography, multispectral images, 3D-scanning.

Researchers will have access to the EROS multilingual database, that is not currently accessible outside the C2RMF. Developed by the Department of Archives and Documentation, the EROS database contains 69,000 references to the records kept at the C2RMF. All the works and objects that have been studied are recorded in this database, with search based on multiple criteria (historical, technical, etc.). Reports and scientific images are partly available in the database and a search engine allows full text searching in all the attached electronic reports (14,000). Reports and data, apart from those in course of publication, that are not yet available electronically will be obviously available in hard copy. Researchers will also benefit from the assistance of researchers from the C2RMF in their field of research and of the documentation staff.

FIXLAB.fr-1
Description of the infrastructure
AGLAE, the Grand Louvre Accelerator for Elemental Analysis, was first built in the Centre de recherche et de restauration des musées de France (C2RMF) in 1988 and is so far the only particle accelerator in the world fully dedicated to the physio-chemical characterisation of heritage materials. Already open to French, European, and international researchers, AGLAE featured in several European projects such as Labs-TECH, EU-ARTECH, CHARISMA, and IPERION CH. Starting from 2022, it will become one of the most significant French contribution to the European Research Infrastructure for Heritage Science (E-RIHS), where it can be a showcase facility.
In order to enable better research of heritage materials, AGLAE is now becoming NewAGLAE, with better performances and new features tailored for heritage scientists. These improvements include the automation of the line, better chemical imaging, and a newer, more sensitive, multi-detector.

Advantages:
- A database of analytical results on materials with known geochronological backgrounds and/or known authors, gathering more than 25 years of data.
- A unique geographical location in a secure museum complex.
- A specialized team with deep knowledge of ion beam analysis providing technical support and scientific expertise.

New performances:
- A fully automatic beamline for around-the-clock operation.

- A more sensitive multi-detector fit for the analysis of fragile materials such as paint layers composed with by inorganic pigments and organic binders.
- The operation of a chemical imaging system for all techniques at the micrometric scale

Services offered by FIXLAB FR-1:
The AGLAE beam is extracted in the air, enabling to study any types of objects without constraint of size or conservation state. Inorganic materials (stones, glass, ceramics, metals…) can be safely studied to search for:

- Provenance and trade routes of materials (minerals, metals, etc.).
- Manufacturing recipes and production facilities centres (glass, ceramics, metals, etc.).
- Manufacturing processes and history of techniques (sign of manufacturing parameters and/or steps of production).
- Degradation processes.
- Impact of new restoration techniques on materials (glass, ceramics, metals, etc.).

MOLAB.fr-1
The CNRS facility fully operative in IPERION CH will offer access via the IPERION HS platform. Specifically, the following equipment will be provided and integrated with the platform: i) NIR hyperspectral camera; ii) XRF/XRD; iii) Teraherz Time Domain Spectroscopy (TDS): iv) Stimulated Infrared Thermography (SIRT); v) LIBS-LIF-Raman (notably a new instrument specifically developed in IPERION CH JRA).

2

Muséum National d'Histoire Naturelle (MNHN) - Conservation Research Center (CRC)
www.mnhn.fr and www.ums2700.mnhn.fr/ast-rx
MNHN was created in the 60's and has a long experience in Heritage preservation sciences. It provides new tools and solutions to the heritage community and preservation practitioners so as to ensure optimal conservation of scientific, technical or cultural heritage. The CRC is also a partner of the IPERION CH involved in the MOLAB activities with hyperspectral imaging, thermography and terahertz analysis. The present access is in line with the creation of an analytical X-ray fluorescence platform opening in 2019. For AST-RX, two engineers are fully dedicated to the platform.

Profiles of the key persons
Christine Andraud (female) CRC**.** Professor (MNHN), PhD and in Physics. She focuses her research on light-matter interactions and on colours.
Anne Michelin (female) CRC**.** Lecturer (MNHN), PhD in Material Science.
Patricia Wils (female) MNHN**.** MNHN research engineer, PhD in Physics. She is responsible of the AST-RX micro and nano tomography platform.
Marta Bellato (female) MNHN**.** MNHN engineer. She is working on the AST-RX micro and nano tomography platform.

Main tasks in the project
The National Museum of Natural History (MNHN) will be involved along with its CNRS joint research units in the provision of FIXLAB and MOLAB transnational access and will provide its significant scientific experience on topics related to palaeontology and archaeology, as well as valuable inputs as a museum institution.

Description of the infrastructure
FIXLAB.fr-4
Access provider**:** Museum national d'Histoire naturelle (MNHN)/ CRC (Centre de Recherche sur la Conservation) - AST-RX (Scientific Access to X-Ray Tomography Imagery) – http://www.ums2700.mnhn.fr/ast-rx/presentation

Description of FIXLAB.fr-4:
The Conservation Research Center (CRC) was created in the 60's and has a long experience in Heritage preservation sciences. It provides new tools and solutions to the heritage community and preservation practitioners so as to ensure optimal conservation of scientific, technical or cultural heritage.

Services offered by FIXLAB.fr-4:
AST-RX / µFX access
Storage and security conditions of the infrastructure preferentially lean the offer towards objects from natural history collections (palaeontology, cosmology…).
Each access should be of minimum 3 days and concerns one of the two following instruments:

- The AST-RX equipment, located in Building 140, 43 rue Buffon, Paris, is dedicated to microtomography and nanotomography scanning of natural science specimens. It is open to scientists and curators wishing to perform tomographic analyses (a tomographic image is a 3D image of the density of the specimen). Its technical capabilities make possible the analysis of specimens of varying sizes (from millimeters to dozens of centimeters) and of different densities (insects, amber, present/fossilised teeth and bones, minerals, meteorites...). The equipment includes a tomograph for microfocus and nanofocus analyses ("v|tome|x L 240-180" model from GE Sensing & Inspection Technologies phoenix x|ray). Key features: two interchangeable tubes (microfocus X-ray 240kV/320W tube detectability reaching 1 µm-theoretically and nanofocus X-ray 180 kV/15W tube detectability reaching 500nm-theoretically), 400×400 mm detector 2024 pixels matrix (pixel size: 200x200 µm). The detector size (400×400 mm) limits the specimens to be scanned, as well as the objects size (maximal dimensions: height 600 mm, diameter 500 mm). Multiple acquisitions are possible, up to an acquisition field of a theoretical maximum of 800×600 mm, but they are time consuming and produce heavier data (4 to 12 times larger). The access includes preparation, acquisition, users training, and delivery of image stacks (Tiff format). Segmentation is not included and should be performed by the users.

The micro X-ray fluorescence (µXRF) scanner, located at the CRC, 36 rue Saint Hilaire, Paris, is dedicated to elemental mapping of patrimonial objects (M6 Jetstream from Bruker). It offers the possibility to identify and map the chemical composition at the surface of an object. All kinds of objects can be considered, but only relatively flat zones can be scanned to obtain the image of elemental distributions. The excitation is made by a rhodium X-ray tube at 50 kV and 600 µA. The maximum size of the scanning areas is 800 mm x 600 mm. The spot size is variable down to 100 µm. Objects can be analysed in horizontal or vertical position. The access includes preparation, acquisition, users training, and delivery of images.

3

Synchrotron SOLEIL (SOLEIL)

www.synchrotron-soleil.fr

SOLEIL is the French national synchrotron facility created by CNRS and CEA. It is a third-generation source of synchrotron radiation, and offers a unique panorama of experiments with 29 beamlines in operation, covering the far IR to the hard X-ray range. With PUMA, SOLEIL offers a hard X-ray imaging beamline optimized for the Heritage Science community.

Main tasks in the project

SOLEIL mainly contributes with FIXLAB.fr-5 and FIXLAB.fr-3.

Profile of key persons

Amina Taleb (female) is the Scientific Director for Matter Sciences of the Synchrotron SOLEIL, CNRS research director. She has supervised 6 PhDs.
Nazaré Guimard (female) is the Scientific Partnerships Officer at Synchrotron SOLEIL. PhD in Analytical Chemistry.
Solenn Reguer (female) is the Beamline scientist. PhD in Chemistry.
Thibaud Cayla (male) has a PhD in Chemistry.
Loic Bertrand (male) IPANEMA PhD and Habilitation in Physics. Since 2010, senior scientist, director of IPANEMA USR3461. Author of more than 60 publications on the development of advanced methods of material characterization in archaeology, palaeo-environments, palaeontology and cultural heritage research. Main organizer of the Scientific Symposium Frontiers in Heritage Science held inside the Institut de France, Paris, 14-15 February 2019.
Mathieu Thoury (male) IPANEMA PhD in Physics. From 2006 until 2010, he worked at the National Gallery of Art of Washington DC as Charles E. Culpeper fellow. After a one year post doc at the Centre de recherché sur la conservation des collections in 2010 at the CRCC, he now focuses his research at IPANEMA on the development of new imaging techniques at multiple spatial scales in the UV/visible/IR ranges, using both synchrotron and laboratory sources, to study properties of cultural heritage and palaeontology materials.

Serge Cohen (male) IPANEMA CNRS scientist in Mathematics. PhD in Structural Biology at EMBL Grenoble, during which he also worked for the ESRF. Post-doctorate on biophysical data processing at the NKI (Amsterdam) rewarded by a tenure track grant from NWO. At this occasion, he collaborated with DeSy. Since 2010, leading 'information extraction and analysis' scientist at IPANEMA, he focuses on theoretical statistics aspects for spectro-microscopy, and SR tomography for ancient materials.

FIXLAB.fr-5

Description of FIXLAB.fr-5:

SOLEIL is a 3rd generation source of synchrotron radiation created by CNRS and CEA, operating at energy of 2.75 GeV and stored beam currents (top-up injection) of 500mA. SOLEIL offers a unique panorama of experiments with 29 beamlines in operation, covering the far IR to the hard X-ray range, and is open to a large scientific and industrial community in a very broad range of fields from life-sciences to material science including surface, solid states and gas phase physics and chemistry. The 3rd generation of synchrotrons is characterised by a massive use of straight sections equipped with undulators and wigglers as well as by a natural very small emittance. SOLEIL undulators are tailor-made to best meet the needs of users. This leads to orders of magnitude higher brilliance than conventional bending magnets and laboratory sources. Associated with high stability and infinite lifetime (one of the strengths of SOLEIL, which works in top up mode to have a constant heat load on the optics), these exceptional characteristics allow considerable advances in the quality of the measurements.

Users are hosted on the various beamlines by a local contact (one of the beamline scientists), who will assist users in conducting the experiment at various levels: preparation of the experiment, data acquisition and data treatment.

Services offered by FIXLAB.fr -5:

SOLEIL offers a combination of advanced facilities and a very high level of expert advice/support for users. Since 2008 to 2017, SOLEIL has welcomed more than 9000 users coming from 2000 laboratories (French, Europeans and overseas). Many beamlines are involved in the study of cultural heritage materials, (see http://www.synchrotron-soleil.fr/portal/page/portal/Recherche/LignesLumiere) and provides access to the analyses of complex cultural heritage materials over all regions of the electromagnetic spectrum (infrared, UV/visible, soft X-rays, hard X-rays) and advanced structural characterization (X-ray diffraction, small-angle X-ray scattering, XAS, …) at different scales (from mm to nano).

Moreover, PUMA beamline was optimized to use hard X-ray imaging for ancient materials (https://www.synchrotron-soleil.fr/en/beamlines/puma), and is now open to users since beginning of 2019

Support to users in the field of Cultural Heritage might be provided in collaboration with the on-site IPANEMA-European ancient materials research platform (FIXLAB FR-3) following the techniques required. Here are the main requested beamlines and techniques at SOLEIL for ancient materials study and characterisation:

Beamlines	Techniques used in the field of Cultural Heritage related proposals
ANTARES	Scan Photoemission Nano-Spectroscopy nano-XPS
DIFFABS	XAS, XRD, XRF / imaging or punctual measurements
DISCO	DUV excited micro photoluminescence in full field or raster scanning mode
GALAXIES	X-ray Raman Scattering - K-edge of light elements with hard x-rays
HERMES	STXM
LUCIA	XAS, XRF
MARS	(Micro)XRF, (micro)XAS, (micro)XRD on radioactive samples
ODE	XAS
NANOSCOPIUM PSICHE	Nano-imaging and tomography Absorption and phase contrast tomography, diffraction.
PUMA	2D micro spectral imaging with XRF, XANES and powder XRD 3D computed tomography with absorption and phase contrast (in the future)
ROCK	time resolved XAS

SMIS	FTIR spectromicroscopy Confocal Raman microscopy Optical photothermal spectromicroscopy
TEMPO	XPS, NEXAFS.

FIXLAB.fr-3

Description of the infrastructure

IPANEMA is at the interface between users' community dedicated to study of ancient materials and synchrotron methods, in particular SOLEIL. IPANEMA provides access to unique instruments for the advanced photonic study of samples and artefacts prior to synchrotron analyses and statistical analysis of collected data on synchrotrons, FELs and other large-scale facilities. Throughout its collaboration, IPANEMA provides strong support to the community of users of heritage materials before, during and after the synchrotron experiment, by providing access to state of the art sample preparation taking into account the heterogeneity and reactivity of materials, latest generation of spectral-imaging techniques in the UV-visible-infrared range allowing in-depth characterization of samples, a range of instrument available for fast X-ray imaging coupled to synchrotron techniques, and novel strategies for processing multidimensional data (space, energy, time, etc.). In this respect, IPANEMA is a unique specialized scientific platform to access instruments for research on heritage materials, and to allow the development of optimized synchrotron approaches for user communities through long-term collaboration.

Services offered by FIXLAB.fr-3

IPANEMA offers an optimized access to synchrotron techniques by proposing a unique interface with user communities to facilitate and develop the use of synchrotron and advanced photonics methods in the field of ancient materials. In this context, a complete research laboratory allowing the development of optimized methods for the preparation, analysis and processing of data for the analysis of heritage materials is accessible prior and after the synchrotron experiment. The specificity of these systems, in particular their heterogeneity at multiple scales, is the source of inspiration of the implementation of dedicated instrumental set ups. A wide range of materials can be studied at IPANEMA and SOLEIL, allowing direct analysis of cultural heritage objects and works of art, archaeological artefacts, palaeontological and paleo-environmental specimens, as well as micro-samples.

4

Université de Bordeaux (UBx)

http://www.cbmn.u-bordeaux.fr/?lang=en

The University of Bordeaux (UBx) is a multidisciplinary university with 56,000 students 5,900 staff members, and including more than 6 800 international students and 1 900 PhD students. It produces 4 000 publications/year and 50 patents/year. UBx is a dynamic university offering innovative educational programs (including 40 international master and doctorate programmes) and high level of research with an international scope (160 FP7 & H2020 projects, 18 joint international laboratories). Its cutting-edge research activities are carried out in 80 research departments (Joint Research Units) associated with major research bodies (CNRS, CEA, INSERM and INRA). UBx is a top-class education and research organisation which has been rewarded the label "Campus of Excellence" by the French government (2011, confirmed in 2016).

Main tasks in the project

The University of Bordeaux will be involved in delivering FIXLAB access through their joint proteomics with the Université Lille 1 platform called "HS omics". The team of the University of Bordeaux is structured around the CBMN (CNRS – USR 3290) and specializes in the chemistry and the biology of membranes and nano-objects.

Profiles of key persons

Caroline Tokarski (female) University of Bordeaux. Professor, Member of the Institut Universitaire de France and corresponding member of the French National Academy of Pharmacy. She is head of the Proteome Platform of Bordeaux and the associated research team of The Institute of Chemistry and Biology of Membranes and Nano-objects (CBMN, UMR CNRS 5248). Her research activities are focused on the study of cultural heritage samples using high resolution mass spectrometry. She introduced proteomics in cultural heritage to identify accurately proteins, their modifications and their biological origins. She also

proposed new methods for lipids and polysaccharides characterization in art and archaeological samples. She was awarded by the Division of Analytical Chemistry of the French Chemistry Society in 2011.
Stéphane Claverol (male) University of Bordeaux. Dr Stéphane Claverol is research engineer. He is the technical head of the Proteome Platform of Bordeaux and the quality manager. He proposes robust methodological developments for highly sensitive analysis of organic macromolecules and their chemical modifications using high resolution mass spectrometry. His methodological developments are applied to biomedical field (e.g. neurology, cancer), plant research and more recently Cultural Heritage (Development 2019; J Proteomics 2018; Sci Rep 2018; J Biol Chem 2018; PLoS Pathog 2018; Cell Rep. 2018).

5

Université de Lille (Univ-Lille-MSAP)
http://msap.univ-lille1.fr/
The University of Lille is a multidisciplinary university with 67,000 students, including more than 8,000 international students and 1,800 PhD students. With 16 platforms and infrastructures, including one on proteomics, the University of Lille and research stakeholders in the region have pooled their large items of scientific equipment and infrastructure in order to make them more accessible to the academic and private sectors.

Main tasks in the project
The University of Lille will be involved in delivering FIXLAB access through their joint proteomics platform with the University of Bordeaux called "HS omics". The team of the University of Lille 1 is structured around the MSAP (CNRS- USR 3290) and specializes in mass spectrometry and proteomics.

Profiles of key persons
Fabrice Bray (male) MSAP. CNRS engineer working at the University of Lille. He is the responsible of the proteomics platform in the USR 3290 MSAP unit labeled IBiSA (Infrastructure in Biology, Health (Santé) & Agronomy). He is the local scientific contact for French FT-ICR network (FR FT-ICR, FR 3624) and for the Horizon Infra for Starting Communities EU_FT-ICR_MS network. He is specialized in the proteomics bottom-up, top-down, lipidomics and metabolomics analysis applied to Heritage Science.

Description of the infrastructure (UBx+Univ-Lille)
FIXLAB.fr-2 HS omics
Name of the infrastructure: HS omics (CBMN and MSAP) – https://proteome.cgfb.u-bordeaux.fr/; http://msap.univ-lille1.fr/?lang=en

Description of FIXLAB.fr-2:
Altogether the two platforms cover all the fields required for analyzing organic materials in Heritage Science from ancient to modern samples at high sensitivity (proteomics, lipidomics, glycomics, metabolomics, polymer analysis, MALDI imaging). Samples will be analyzed on the most adequate platform or on both platforms according to their complexity.

University of Bordeaux (CBMN)
- For analysis of Cultural Heritage samples: NanoLC (U3000 RSLC) nanoESI-Orbitrap Fusion Lumos (1 million FWHM) including ion mobility (FAIMS), UV photodissociation (UVPD), electron transfert dissociation (ETD), higher-energy collisional dissociation (HCD) and collision induced dissociation (CID) – ThermoFisher Scientific / Available end 2019-early 2020; NanoLC (U3000 RSLC) nanoESI-Orbitrap Fusion Lumos equiped with electron transfert dissociation (ETD), higher-energy collisional dissociation (HCD) and collision induced dissociation (CID) – ThermoFisher Scientific; MALDI (TRANSMIT AP SMALDI10)-Orbitrap QExactivePlus equiped with electron transfert dissociation (ETD), higher-energy collisional dissociation (HCD) and collision induced dissociation (CID) – ThermoFisher Scientific. MALDI-TOF-TOF Ultraflex III equiped with CovalX high mass detector HM2 – BrukerDaltonics
- For method optimization: NanoLC (U3000 RSLC) nanoESI-Orbitrap XL equiped with higher-energy collisional dissociation (HCD) and collision induced dissociation (CID) – ThermoFisher Scientific; NanoLC (U3000 RSLC) Q-TOF Premier – Waters Micromass; NanoLC (U3000) Q-TRAP 5500 – ABSCIEX
- Bioinformatic platform: Proteome Discoverer 2.2, PEAKS X, Prosight PC, MaxQuant, ProteinScape 3.1, Byonics and software development with the CGFB Bioinformatic Platform (next door)

+ equipments for dedicated sample preparation (extraction, purification, quantification)

University of Lille (MSAP)
FT-ICR (Fourier-transform ion cyclotron resonance) mass spectrometer 9.4 Tesla with SolariX XR cart (resolution up to 20 million at m/z 200) hyphenated with nanoLC (Liquid Chromatography) ThermoFisher U3000 RSLC. Ionisation source: nanoESI (Electrospray Ionization), MALDI (Matrix Assisted Laser Desorption Ionization). Dissociation: CID (Collision Induced Dissociation), ETD (Electron Transfer Dissociation), ECD (Electron Capture Dissociation), IRMPD (InfraRed Multiphoton Dissociation) and UV-PD (UV Photon Dissociation, available early 2020); Orbitrap mass spectrometers (resolution up to 100,000 at m/z 200) Q-Exactive+ and XL hyphenated with nanoLC (Liquid Chromatography) ThermoFisher U3000 RSLC, ABSCIEX MALDI TOF-TOF MS ABI4800+ for preliminary experiments; Data processing based on 2 48 core clusters (Linux and Windows) with both open source (for example MaxQuant suite, MS_Studio), commercial software (Mascot, Proteome Discoverer 2.2, Byonics for glycopeptide, ProSightPC for intact proteins, PEAKS X) and homemade software dedicated to the analysis of non DNA sequenced species. Wet lab for miniaturized sample handling in a clean environment equipped with one drop UV analyzer and dedicated small equipments (centrifuge, heating plate…) both for chemistry and biology.
The total value of the equipment at the University of Lille site is around 3 million euros.

Services offered by FIXLAB.fr-2
The Heritage Science Molecular Omics Platform (HS-omics Platform) offers the following service applied to Cultural Heritage samples: (i) accurate identification of proteins, lipids and polysaccharides, (ii) identification of their biological species, (iii) identification and localization of their chemical modifications, (iv) characterization of their networking and breakdowns, using the newest mass spectrometry-based methodologies; i.e. bottom up and top down "omics" methodologies. The developed methodologies are applied to trace and ultratrace amounts of Art, Archaeological and Palaeontological samples.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	**N**
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	**N**

7. [9] The Foundation for Research and Technology Hellas (FORTH)

*The Foundation for Research and Technology-Hellas (FORTH) represents the Greek node and is linked with **1** third party (Of-ADC).*

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)?	**N**
Does the participant envisage that part of its work is performed by linked third parties?	**Y**
*FORTH participates in IPERION HS with **1** linked third party: OF-ADC.*	

1

Ormylia Foundation, Art Diagnosis Center (OF-ADC)
www.ormyliafoundation.gr/en/artdiagnosis5.php
OF-ADC, via a multitude of research activities, at national and international scale, has been contributing with an interdisciplinary approach to CH studies for the past 20 years. The activities of OF-ADC focus on developing standard procedures and new analytical strategies and methodologies for the comprehensive study, documentation, conservation, long-term protection and promotion of CH objects and monuments. OF-ADC has been a founding member of the EU-ARTECH and then CHARISMA networks and an active participant of the IPERION-CH RI project, with strong presence in nationally and EU-funded projects. OF-ADC is strongly linked to FORTH within the E-RIHS.gr the only national RI in Greece concerning Heritage Science and the corresponding National Hub for E-RIHS.

Main tasks in the project
The Ormylia Foundation will a) offer one new MOLAB infrastructure (developed in part in IPERION CH), b) participate in WP5, Task 5.1 and 3) contribute to WP6, Tasks 6.4, 6.5.

Profile of OF-ADC key person
Georgios Karagiannis (male) is Electrical and Computer Engineer, PhD. Scientific and technical head of the Diagnosis Centre of the ORMYLIA Foundation, he is also scientific collaborator of ORMYLIA Foundation. Research fields: non-destructive analysis, multispectral and spectroscopic imaging, signal processing and knowledge management, and the optimize-combined use of these methods in scientific and industrial applications. Consolidated experience as coordinator and participant in EU R&D and industrial projects. He has more than 20 publications in international journals, more than 37 announcements in international conferences and 17 invited lectures. wo national patents and an international one.

Description of the infrastructure
MOLAB.gr2
OF-ADC will participate with one new MOLAB infrastructure: 3D/2D optical acoustic methods.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	**N**
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	**N**

8. [10] Atommagkutató Intézet –Institute for Nuclear Research (Atomki)

*Atomki represents the Hungarian node and is linked with **2** third parties (EK and Wigner RCP).*

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**N**
Does the participant envisage that part of its work is performed by linked third parties	**Y**
*Atomki will participate in Iperion HS with **2** linked third parties: the Centre for Energy (EK) and Wigner Research Centre for Physics (Wigner), who are also partners in the E-RIHS.hu consortium which is the national initiative in heritage science, led by Atomki.*	

1

Centre for Energy Research, Hungarian Academy of Sciences (EK)
www.energia.mta.hu/en
EK operates the Budapest Research Reactor (BRR). EK and Wigner RCP form the Budapest Neutron Centre (BNC) to sustain the neutron-based research activities at BRR. EK has been a pioneer in using neutrons in Heritage Science since the late 1990s, applying prompt gamma activation analysis (PGAA) for non-destructive elemental analysis. An instrumental NAA lab can be applied for Heritage studies, too. Since 2012, the NIPS-NORMA experimental station allows to combine neutron imaging with PGAA for analysis of inhomogeneous objects. Neutron- and X-ray imaging at the RAD station can reveal the structure of even bulky objects. EK participated in several national and international programs such as ANCIENT CHARM, CHARISMA, IPERION-CH, CERIC-ERIC, COST and IAEA projects, many times as a TNA access provider. EK is a partner in the national heritage science initiative (E-RIHS.hu). EK will provide access to its experimental stations in the Budapest Neutron Centre, as part of FIXLAB. It will also contribute to joint research.

Main tasks in the project
EK will contribute with FIXLAB.

Profiles of the key persons
Zsolt Kasztovszky (male) (EK) Physicist PhD, senior staff scientist, expert of nuclear analytics, and PGAA applications in Cultural Heritage since 1997. His research area is provenance of stone tools, ceramics, glass and metals. Leader or member of several archaeometry projects (Hungarian Scientific Research Fund, IAEA CRP, EU Ancient Charm, EU CHARISMA, EU IPERION CH). He is founding co-editor of Archaeometry Workshop.
László Szentmiklósi (male) (EK) PhD in Chemistry, senior staff scientist, head of the Nuclear Analysis and

Radiography Department at EK. He is an expert of neutron based element analysis and imaging techniques and their applications to chemistry, materials science and heritage science. Member of the Radiochemistry Committee, the k0-International Scientific Committee, the International Committee of Activation Analysis and the MLZ Panel "Imaging, Analysis, Nuclear and Particle Physics".
Zoltán Kis (male) (EK) Physicist, PhD, senior staff scientist. Expert of neutron and X-ray imaging, involved in several archaeometry related projects (IPERION-CH and national projects), as well as in EU NMI3 JRA for neutron imaging. He is the main instrument scientist at RAD.
Adél Len (female) (EK) PhD, SANS instrument responsible, expert in nanostructure research, involved in cultural heritage programme since 10 years.
Boglárka Maróti (female) (EK) She is a PhD candidate in analytical chemistry, her research area is the non-destructive characterization of metals and alloys. She is instrument scientist at two neutron facilities. She has seven years of experience in applying PGAA, neutron imaging and X-ray spectroscopy. She is involved in several Cultural Heritage science related projects. Member of the Archaeometry Subcommittee of the Hungarian Academy of Sciences.
Veronika Szinger-Szilágyi (female) (EK) Geologist, PhD. She received her PhD in ceramics archaeometry (applying microscopic petrography, mineralogical and chemical instrumental analyses). She is an expert of geosciences, and of various analytical methods applied in Heritage Science. Operator on the PGAA and NIPS facilities for 15 years and she has just started to apply NI techniques (RAD and NORMA). Member of the Archeometry Subcommittee of the Hungarian Academy of Sciences.

2

Wigner Research Centre for Physics, Hungarian Academy of Sciences (Wigner RCP)
https://wigner.mta.hu/index.php/en
Wigner RCP operates several experimental stations at the Budapest Neutron Centre (BNC) and a 5 MV single-ended Van de Graaff accelerator with ion beam facilities. Wigner RCP has been engaged in HS research since 1975 and provides access for the local and global HS community. The neutron facilities, the high-resolution time-of-flight diffractometer and the Small Angle Neutron Scattering station are highly demanded techniques in HS research. Moreover, as a unique possibility, they are combined with the ion beam and X-ray techniques, such as Particle Induced X-ray Spectroscopy, ion luminescence, micro-XRF, as well as with other neutron techniques at the research reactor. Wigner RCP has participated in several national and international programs in the HS field. It is an access provider within IPERION CH and CERIC-ERIC, which will also be its main task in the current project. Wigner RCP is a partner in the national heritage science initiative (E-RIHS.hu). The Wigner RCP will provide access to its experimental stations in the Budapest Neutron Centre, as part of FIXLAB. It will also contribute to joint research.

Main tasks in the project
Wigner will participate with the FIXLAB.

Profiles of the key persons
János Füzi (male) (Wigner RCP) PhD in magnetic materials and computing techniques. Professor at the Pécs University and Brassaw Transilvania University, Head of Neutron Spectroscopy Department. Expert in neutron optics, materials science; involved in HS related small angle neutron scattering experiments. Coordinator of various tasks in international and domestic projects.
Imre Kovács (male) (Wigner RCP) PhD in experimental solid-state physics, C.Sc. in physics, Fulbright Scholar at University of Illinois at Urbana-Champaign, Visiting Professor at University of North Texas HSC. Senior research fellow, he has experience in solid state physics technics and in physical methods applied in biophysics. He is involved with the development of ion beam technics applied for the non-destructive testing of CH objects since 1997 and participated in several CH related projects.
László Rosta (male) (Wigner RCP) PhD in condensed matter physics. He has organized the international user system at the Budapest Neutron Centre. He initiated and led the realization of the research instrument suite at the 10 MW Budapest Reactor. He has gained experience in studying the structure and dynamics of materials by various neutron and other nuclear techniques; leading the scientific activity at BNC since 1992, involved in HS related project since over 15 years.
György Káli (male) (Wigner RCP) Physicist, expert in various neutron techniques; responsible for the TOF diffractometer. Since over 15 he has been involved in HS projects; developing and using high-resolution neutron diffraction techniques for structure and phase analysis of metals and minerals, texture and strain

analysis applied to a vast sort of artefacts. He has established an important database and reference materials collection to reveal/identify structural features of HS objects.
Katalin Bajnok (female) (Wigner RCP) Master's Degree in archaeology, assistant research fellow, expert in instrumental investigation of cultural heritage objects, with specialisation of ancient ceramics research. PhD candidate at Eötvös Loránd University, Budapest, Archaeology Doctoral Program. Member of the Archeometry Subcommittee of the Hungarian Academy of Sciences.
Zoltán Szőkefalvy-Nagy (male) (Wigner RCP) D.Sc. in physics. Expert in ion beam analysis, XRF, experimental nuclear physics, biophysics; he is involved in non-destructive analysis of CH objects since 1985. Member of the International Honorary Board of PIXE, he was one of the Hungarian national representatives in COST G1 ("Ion Beam Analysis Applied in Art and Archaeology" and G8 "Non-destructive analysis and testing of museum objects" actions, PI of several CH related projects.

Description of the infrastructure
FIXLAB.hu-1 (EK+BNC-EK/WIGNER)
BNC-EK/WIGNER (FIXLAB HU-1) http://www.bnc.hu/
Budapest Neutron Centre (BNC), a consortium of Centre for Energy Research and Wigner Research Centre for Physics, offer access to a broad selection of instruments for non-destructive investigation of Cultural Heritage objects, utilizing the neutrons produced at the Budapest Research Reactor. The applied analytical and scattering methods can reveal the element composition and structure of even complex Cultural Heritage objects made of stones, ceramics, metals and glass. The analytical and structural information can be combined with 2D or 3D images obtained using neutrons of various energies or X-ray radiation.

Services offered by FIXLAB.hu-1:
The instruments listed below are operated by the Centre for Energy Research:
- Prompt Gamma Activation Analysis (PGAA) with a horizontal 1x108 cm-2s-1 intensity cold neutron beam, is applicable to determine the 'bulk' elemental composition of the historical objects, made of almost any material. Since 1997, various metals, rocks and minerals, ceramics and also glass have been studied. Co-operations with national and international research groups and museums in archaeology have been built. Significant results in provenance research of prehistoric stone tools, ceramics and semi-precious stones (such as lapis lazuli), other important results in ancient metals (bronze, iron, silver) and glass technologies were achieved.
- The NIPS-NORMA experimental station, which operates since 2012, is applicable for elemental analysis, neutron radiography, neutron tomography as well as prompt-gamma activation imaging (i.e. 3D elemental mapping, PGAI) of large objects. While PGAI gives a position sensitive distribution of the elements, NR/NT produces high-resolution 2D/3D images to survey the structure of the object.
- During Instrumental Neutron Activation Analysis (NAA), samples are irradiated with neutrons in designated vertical channels of the Budapest Research Reactor, where short and long-time irradiations are possible. Short irradiations are carried out with a pneumatic rabbit system, whereas samples for long irradiations are loaded into the rotating channel. The gamma-rays emitted from the sample after activation are counted with a gamma-spectrometer placed in low-level counting chamber to reduce the external background. From few tens of milligrams of (mostly solid) samples about 35–75 elements can be quantified, in less than 0.01 μg quantities. NAA can contribute to the provenance analysis of fine-grained ceramics, stones, glass etc.
- The imaging methods at the Neutron and X-ray Imaging / Radiography and Tomography (RAD) instrument utilize the transmission of thermal, epithermal or fast neutrons, as well as X-rays to obtain 2D or 3D visual information on the structure of a given object. Neutrons are able to pierce through several cm thickness of materials, so the inner structure of even a bulky object can be characterized in a non-destructive way. In the last 5 years, the technical features of RAD instrument have been significantly improved and advanced data evaluation workflow has been established.

The instruments listed below are operated by the Wigner Research Centre for Physics:
- Small Angle Neutron Scattering (SANS and FSANS): The Yellow Submarine instrument is used for non-destructive studies of nano-structural features (from 1 nm to 150 nm) of a broad range of materials. It gives information about the orientation, size, size-distribution, agglomeration, quantity of the nano-domains inside the sample, which can be correlated to several macroscopic characteristics of the material, such as firing temperature of clays and bricks, oriented strain or stress that affected the raw material, the fabrication procedure, deterioration degree of textiles, etc. The instrument is installed on the curved supermirror neutron guide No.2, with 4×4 cm2 beam cross-section. The beam is monochromatized by a multidisc-type velocity

selector. The minimum sample size is of several millimetres in diameter, the maximum is about half a meter, limited by thickness (because of occurrence of multiple scattering for the case of thick samples). The FSANS instrument is a recently commissioned instrument at the BNC used for non-destructive study of the nano-structural features of various materials, among them archaeological objects. The studied size range is between 10 nm and 500 nm. Because of its technical characteristics, it is complementary to the Yellow Submarine SANS Instrument.

- Time-Of-Flight Neutron Diffraction (TOF-ND): The TOF-ND is a general-purpose high-resolution time-of-flight powder diffractometer on a thermal neutron beam. It is one of the most relevant instruments to study the structure of Heritage objects on atomic scale. It covers the d-spacing ranging from 0.5 to 2.5Å (2.5 to 12.5 Å-1 Q-range) at variable band-with and resolution (Δd=0.0015-0.15Å), and has recently been equipped with a large-surface back-scattering detector bank consisting of 88 pieces of squashed 3He tube. The cross-section of the beam is 25x100 mm2. It offers unique possibilities for non-invasive phase-composition, texture and strain analysis of various metal, stone or ceramic objects, which can provide information of the raw materials and the manufacturing technique of the artefacts. Another powder diffractometer is available to study mostly amorphous/glassy structures.

Complementary techniques:
Complementary to the neutron techniques, characterization of artefacts and archaeological heritage is possible on selected spots of objects of any size and shape by means of external milli-beam Particle Induced X-ray Emission spectroscopy (PIXE) as non-destructive elemental analysis. For detecting heavier elements, XRF spectrometers with X-ray tube or radioisotope excitation offer complementing measurements. To characterize the HS objects, in addition to neutron techniques, the surface layers and surface structures composition and thickness could be also characterized. Collimated proton beam is applied to selected points of HS objects by computer controlled 3D positioning system. The PIXE measurements are performed at the 5 MV Van de Graaff Accelerator on the BNC campus.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	**N**
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	**N**

9. [14] Rijksdienst voor het Cultureel Erfgoed, Ministerie van Onderwijs, Cultuur en Wetenschap – Cultural Heritage Agency, Ministry of Education, Culture and Science (RCE)

*The Cultural Heritage Agency of the Netherlands (RCE) represents the Dutch node and has **5** linked parties (RUG, TUDelft, UVA, RMA, KNAW-DANS)*

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**N**
Does the participant envisage that part of its work is performed by linked third parties	**Y**
*RCE participates in IPERION HS with **5** linked parties belonging to the Dutch heritage science infrastructure: Groningen Institute of Archaeology (RUG-GIA), Faculty Civil Engineering and Geoscience of Technical University Delft (TUD), the Geological and Geochemical laboratory of the VU University Amsterdam (UV GGL), Rijksmuseum Amsterdam (RMA) and Data Archiving and Networked Services of the Royal Dutch Academy of Sciences (KNAW-DANS).*	

1

University of Groningen (RUG) - The Groningen Institute of Archaeology (GIA)
www.rug.nl/research/groningen-institute-of-archaeology/
RUG GIA is part of the Faculty of arts, and houses several facilities to support their archaeological research. The conservation laboratory is aimed at conservation and examination of objects and materials from excavations and fieldwork. The archaeozoological reference collection (4907 specimens) consists mainly of recent individuals of fish, reptiles, amphibians, birds and mammals. These facilities and collections will contribute to ARCHLAB.

Main tasks in the project
GIA is an ARCHLAB provider.

Profiles of key persons
Klaas-Jan van den Berg (male) Prof., PhD, Cultural Heritage Laboratory Amsterdam. Senior conservation scientist. Project leader in MOLART in charge of the development of strategies for chemical analysis of painting materials. Current main focus is the study of formulations, techniques, material changes and surface cleaning in 20th Century oil paintings. In addition, he is Professor by Special Appointment at the Faculty of Humanities of the University of Amsterdam.
Canan Çakirlar (male) Assistant Professor at the Groeningen Institute of Archaeology. He is Director of the Zooarchaeology Lab. Since 2011, he has been serving in the International Council of Archaeozoology, a society of 800 zooarchaeologists from more than 50 countries, as an elected member. I serve in the editorial boards of top Q1 journals (e.g. Journal of Field Archaeology, Documenta Praehistorica) and new, open-access journals (e.g. Open Quaternary).

A description of any significant infrastructure and/or any major items of technical equipment
ARCHLAB.nl 2
University of Groningen (RUG) Groningen Institute of Archaeology (GIA) – https://www.rug.nl/research/groningen-institute-of-archaeology/
The Groningen Institute of Archaeology (GIA) houses several facilities to support their archaeological research. They include a conservation laboratory and several reference collections (archaeozoological and archaeobotanical; the latter is not included in this call).

Services offered by the infrastructure
The conservation laboratory is aimed at conservation and examination of objects and materials from excavations and fieldwork. It is the only laboratory for archaeological conservation/restoration in The Netherlands housed in a university setting. They have ample experience with conservation of metal, ceramic, organics and stone finds. Several projects of the LCM are made public on its web-site: www.lcm.rug.nl. Teaching, conservation/restoration and analysis are possible. Any scientific involvement of the LCM requires appropriate publication of the dataset. The archaeozoological reference collection dates back to the late 19th century and consists mainly of recent individuals. Special archaeological specimens (for example aurochs) are also present. Currently, the collection includes 4907 vertebrate specimens and include fish, reptiles, amphibians, birds and mammals. The majority of the specimens consist of complete skeletons. Most taxa are endemic to Europe and the Near East. Information in the dataset vary from taxonomic identification (down to species, subspecies, even breed level), age, sex, origin, skeletal parts present. The dataset is in English, with minimal use of abbreviations and phrases in Dutch. The collection is open to Dutch and international researchers, students, and commercial users.

2

Technical University Delft (TUD) - Faculty of Civil Engineering and Geoscience
www.tudelft.nl/citg/
TUD has pioneered the use of 3-D scanning techniques (using medical CT and micro-CT scanners) in archaeological research. They have provided valuable new knowledge by scanning and analysing e.g. archaeological glass beads, clay tablets, bone and undisturbed soil samples from archaeological soil features.

Main tasks in the project
TUD will contribute their analyses and expertise to Joint Research Activity T5.2. (advancing inter-operability in archaeological and heritage sciences).

Profiles of key persons
Dominique Ngan-Tillard (female) Assistant Professor at the Faculty Civil Engineering and Geoscience of Technical University Delft. She is the coordinatoe of the MSc Geo Engineering for Applied Earth Sciences (AES) students. She is also member of the board of the education committee at AES. She lectures at BSc, MSc and PhD levels, mostly in Engineering Geology and Rock Mechanics. Her current research includes the response of wetland archaeological sites and remains to environmental changes.

VU Amsterdam (VU) - The Geological and Geochemical Laboratory (GGL)

https://science.vu.nl/en/research/earth-sciences/index.aspx

VU provides analyses of major - and trace elements (incl. REE), radiogenic isotopes (Sr, Nd, Pb, Hf), non-traditional radiogenic isotopes (e.g. Si, Mg, Li, transition metal isotopes). The lab is world leading in the analysis of small sample size using the 1013 Ohm resistors pioneered by the VU team. For heritage research, it can analyze all solids, including (but not limited to) metals, glass, ceramics and paintings/pigments. Depth profiling possible. Analyses are used to determine raw material choice and provenance. Contributes to FIXLAB. For MOLAB it contributes with the portable minimally invasive laser ablation sampling (LAS) for subsequent geochemical and isotope analyses (ICP-MS, TIMS; MC-ICPMS). One of a very limited number (<5) of PLAS world-wide specifically designed for low blank geochemical-isotopic analysis.

Main tasks in the project

The Geological and Geochemical laboratory of the VU University Amsterdam provides access to FIXLAB.nl-1.

Profiles of key persons

Gareth Davies (male) was a barrister in London before being a University Lecturer at the University of Groningen (2000-2007) and then moving to Vrije Universiteit Amsterdam (2007 to the present). In 2006, he was an Emile Noel Fellow at New York University Law School, and in 2014 a Fernand Braudel Senior Fellow at the EUI. Gareth Davies also teaches at Amsterdam University College. He is the co-author, with Damian Chalmers and Giorgio Monti of EU Law (3rd edn, Cambridge University Press, 2014). He is one of the leaders of the European Constitutionalism theme of ACCESS Europe, an Amsterdam inter-university European studies research platform (accesseurope.org).

A description of any significant infrastructure and/or any major items of technical equipment

FIXLAB.nl-1

Geological and geochemical Lab Amsterdam https://science.vu.nl/en/research/earth-sciences/laboratories/geochemical-analysis-laboratory.aspx

Geochemistry group led by Prof Davies (ERC synergy fellow) and Dr Janne Koornneef (ERC starting grant) manage the national isotope facility at the Vrije Universiteit Amsterdam. The facility is included in the current Europlanet 2020 research infrastructure and hence the team has the required support and extensive experience with hosting international visitors. The team has managed 5 ITN training networks, 100's of national visitors and supervised more than 25 PhD and 100 MSc research projects.

Services offered by FIXLAB NL:

Major-and trace elements (incl. REE), radiogenic isotopes (Sr, Nd, Pb, Hf), non-traditional radiogenic isotopes (e.g. Si, Mg, Li, transition metal isotopes). Whereas analyses of some of these isotopes are commonly available, others are not. Uniqueness lies in the combination of isotope and trace element geochemistry to better understand the isotope system and its application to cultural heritage. Moreover, the lab is world leading in the analysis of small sample size using the 10^{13} Ohm resistors pioneered by the VU team.

4

Rijksmuseum Amsterdam (RMA)

www.rijksmuseum.nl/

RMA is the national museum of the Netherlands. Its collection includes 1.1 million works of art and objects from and about the Netherlands, spanning the period from the Middle Ages up to and including the 20th century. The Rijksmuseum keeps, conserves, restores, researches, cultivates, collects, publishes and presents its collections both on its own premises and elsewhere, for a broad-based (inter-)national public. The research activities within in the Rijksmuseum aim at a better understanding, presentation and conservation of the collection with technical art history, conservation dynamics, material dynamics and diagnostics. The Rijksmuseum uses advanced instrumentation like XRF, XRD, GC/MS, ESI-MS, UHPLC-MS, Ion Chromatography, high and low vacuum SFEG-SEM/EDX, ATR-FTIR microscopy, FTIR, portable and lab-based Raman spectrophotometers, RTI, microfadeometry, colorimetry, IRR, HSI (400-2500 nm),

FORS, imaging MA-XRF, CT-X-ray imaging, artificially ageing facilities and extensive research microscopy and photography facilities.

Main tasks in the project
The Rijksmuseum will lead Joint Reseach Activity T5.1 (Methodological and instrumental developments for preventive conservation), and will contribute to T8.6 (International dimension).

Profiles of key persons
Katrien Keune (female) is Associate Professor at University of Amsterdam. She is Paintings Research Scientist at Rijksmuseum. She is responsible for carrying out and developing scientific research projects with and providing analytical support to the conservation studios.

5

Data Archiving and Networked Services of the Royal Dutch Academy of Sciences (KNAW-DANS)
www.knaw.nl/en/institutes/dans
KNAW-DANS is the Netherlands institute for permanent access to digital research resources. It is a joint institute of the Royal Netherlands Academy of Arts and Sciences and the Netherlands Organisation for Scientific Research. DANS encourages researchers to make their digital research data findable, accessible, interoperable and reusable. It does this by providing expert advice and certified services. By participating in Dutch and international projects, networks and research, DANS is helping to innovate the global scientific data infrastructure. Its philosophy is: open whenever possible, protected where necessary.

Main tasks in the project
KNAW-DANS will contribute to Joint Research Activity 5.4 (Data management and link with EOSC).

Profiles of key persons
Hella Hollander (female) is an archaeologist and the coordinator of the e-depot for Dutch at Data Archiving and Networked Services (DANS). As project manager, she works on international collaboration: ARIADNE aims to set up an archaeological European infrastructure and Parthenos empowers digital research in archaeology.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)?	**N**
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	**N**

10. [16] Uniwersytet Mikołaja Kopernika Toruń – Nicolaus Copernicus University (NCU)

*The Nicolaus Copernicus University in Toruń (NCU) represents the Polish node and has **3** linked parties (AGH, JHI, UW).*

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**N**
Does the participant envisage that part of its work is performed by linked third parties?	**Y**
*NCU participates in IPERION HS with **3** linked parties: the University of Science and Technology (AGH), the Jerzy Haber Institute of Catalysis and Surface Chemistry Polish Academy of Science (JHI) and the University of Warsaw (UW). All third parties to be involved are members of the Polish Distributed Research Consortium for Heritage Science E-RIHS.pl http://www.e-rihs.pl/index.php/english-info/ established in 2015 for, among others, preparation and coordination of access of Republic of Poland to European Research Infrastructure for Heritage Science: E-RIHS, promotion of national and pan-European scientific co-operation on physical-chemical examination of heritage objects and preparation and conduction of common research project from Heritage Science area. NCU is a leader of this consortium.*	

The AGH University of Science and Technology (AGH)

www.agh.edu.pl

Located in Kraków, AGH is one of the largest and most prestigious technical universities in Poland. The Heritage Science Laboratory (HSL) belongs to the Faculty of Material Science and Ceramics which currently holds the highest rank of scientific expertize (A+ category) in Poland. Research activities at the Faculty are focused on synthesis and study of new materials (incl. glasses and enamels, ceramics, building materials, biomaterials) as well as development of analytical methods incl. these applied in material science to study corrosion phenomena, diffusion in multicomponent systems and light induced damage. The HSL has a long-term experience in the development of analytical techniques for Heritage Science, especially in application for cellulosic materials. In the case of the microfading technique their competences allowed, in cooperation with an external partner, to implement a commercial production of the only currently available off-the-shelf MFT device with dedicated software for collecting and processing results obtained for historical objects. The device we have developed currently works in leading heritage institutions in 9 countries. The engagement of AGH will be mostly related to their expert knowledge about the application of microfading technique to preventive conservation within JRA task 5.1, especially to retrieve the kinetic data on light induced decay of CH important materials.

Main tasks in the project

The Institute of Archaeology from the Faculty of History participates mostly in task 5.2 and in networking activities.

Profiles of key persons

Jadwiga Łukaszewicz (female). Professor at the Faculty of History. Research interests: conservation of stone, bricks, ceramics, brick walls, and development of new materials and methods for conservation. She is also active as conservator-restorer of stone monuments. She has published 61 papers, including 5 books. She has undertaken more than 100 projects of conservation and restoration of historic monuments made of stone, ceramics, and artificial stone. She is a President of Polish National Committee of ICOMOS, member of Permanent Scientific Committee of International Congress on Deterioration and Conservation of Stone (2004-2016), an expert at the Ministry of Culture in cultural heritage protection (since 2001), a member of the Council for Protection of Cultural Heritage (since 2008).

Tomasz Łojewski (**male**). AGH. He received his Ph. D and dr hab. degrees from Jagiellonian University in Kraków in chemistry. His research interests concentrate on the area of conservation science, in particular on degradation of paper and silk, development of analytical tools for heritage artefacts: size exclusion chromatography applied to cellulosic materials, FTIR, multispectral imaging, methodology of accelerated ageing, development of instrumentation for microfading tests and reflectance transformation imaging.

2

The Jerzy Haber Institute of Catalysis and Surface Chemistry Polish Academy of Science (JHI)

http://www.ik-pan.krakow.pl/Main-Page.2+M52087573ab0.0.html

Located in Kraków, is a medium-size public research institute pursuing interdisciplinary studies of phenomena occurring at gas-solid, gas-liquid and liquid-solid interfaces. One of the focal points in the research carried out at JHI has been the preservation of cultural heritage with a special emphasis on monitoring of environmental parameters in historic buildings and museums, determining experimentally properties of the historic and artistic materials necessary for modelling their temperature and moisture response, time-dependent analysis of the response of cultural objects to variations in microclimate parameters with the use of the finite element method, and direct tracing of climate-induced physical damage with the use of acoustic and optical methods.

Main tasks in the project

The JHI will be involved in the development, within task 5.1, of a coordinated comprehensive platform of online, freely accessible tools for digital preventive conservation especially by integration of developed there HERIe – the online tool for the quantitative assessment of the climate-induced risk of physical damage.

Profiles of key person

Łukasz Bratasz (**male**) JHI. Associate Professor at JHI. His research focuses on the response of materials to changes in environmental parameters, tools for risk assessment and preventive conservation, physical

methods of non-invasive monitoring of museum objects, modelling stresses and strains induced in materials by impact of environmental factors, energy efficient climate control in CH institutions. He took part or coordinated 28 national and international research projects.

3

The University of Warsaw (UW)

www.uw.wsu.pl/

UW is a multidisciplinary university with, 45 500 students; 3 000 phD students and 7 300 employees. The UW encompasses 21 faculties and over 30 research units. The University's scholars participate in 1600 projects financed by national or international research programmes: European Science Foundation, European Cooperation in the Field of Scientific and Technical Research, European Economic Area and Norway Grants and other. The project will be conducted in the University of Warsaw Biological and Chemical Research Centre, a research facility dedicated to advanced research, development of new technologies in the fields of energetics, analytics, pharmaceuticals, medicine, biotechnology, new materials, conservation of environment and cultural heritage. Interdisciplinary Laboratory of Archaeometric Research (ILAR) is a research group established at the Centre dedicated for heritage science.

Main task in the project

The engagement of UW will be mostly in JRA of task 5.1 by implementation of LA-GCP-MS method especially for the detection of migrated elements in paint systems within micro samples (dynamic and spatial resolved studies). If needed, it will be also used as extremely precise and sensitive tool for tracing elemental and isotopic composition of samples and objects.

Profiles of key person

Barbara Wagner (**female**) UW. Assistant Professor at the Faculty of Chemistry UW and leader of ILAR. She graduated from the Faculty of Conservation and Restoration of Works Art of the Academy of Fine Arts in Warsaw and the Faculty of Chemistry of the University of Warsaw. She holds doctoral and DSc degrees in analytical chemistry. Her research interests focus on a phenomenon of iron-gall ink corrosion, atomic and mass spectrometry, and on the use of modern instrumental methods in micro-destructive or completely non-invasive examinations.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	**N**
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	**N**

11. [17] University of Evora (UEVORA) - Laboratorio Herança Cultural, Estudos e Salvaguarda (HERCULES)

*UEVORA represents the Portuguese node and has **1** linked party (LNEC).*

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**N**
Does the participant envisage that part of its work is performed by linked third parties?	**Y**
*The University of Evora – HERCULES participates in IPERION HS with **1** linked party: LNEC.*	

1

Laboratório Nacional de Engenharia Civil (LNEC)

www.lnec.pt

LNEC is a public research and consultancy institute encompassing virtually all branches of Civil and Materials Engineering, Architecture and Social Sciences. In the 1980s it was the first institution in Portugal to establish a research group dedicated to the conservation of stone and other materials in cultural heritage and in 2013 it was a founding partner of the Portuguese research infrastructure E-RIHS.pt. Some previous projects participated by the same team: E-RIHS PP (H2020); IPERION CH (H2020); IPERION-CH.pt-

national research infrastructure on CH (rated "Category I" and included in the Portuguese roadmap in December 2014); 7FP CHARISMA-*Cultural Heritage Advanced Research Infrastructures: Synergy for a Multidisciplinary Approach to Conservation/Restoration*; 6FP Eu-ARTECH-*Access, Research and Tecnology for the conservation of the European CH*.
In the Portuguese infrastructure E-RIHS.pt, University of Evora- HERCULES coordinates and LNEC is responsible for international relations. Both are connected by the consortium agreement that established E-RIHS.pt, both participate in H2020 Project E-RIHS PP and under the consortium agreement the activity to be developed through IPERION HS is shared by both according to their experience and availability of resources.

Main tasks in the project
LNEC participates in IPERION HS with FIXLAB.pt-1.

Profiles of key persons
Dória Rodrigues da Costa (female) is a LNEC Assistant Research Officer. Geologist by the University of Lisbon (1982), MSc (LNEC, 1998), PhD (LNEC, 2007), Geology PhD (University of Oviedo, 2015). Experienced in quality management and scientifically specializes in applied research to support consultancy on the conservation of stone. Participated in several European research projects in fields of Heritage Science: LabS-TECH; Eu-ARTECH, CHARISMA, IPERION CH, E-RIHS PP.
João-Manuel Mimoso (male) is a LNEC Principal Research Officer. He has degrees in Mech. Engineering (IST, 1975) and Management (ISCTE, 1993). Eng. PhD in Heat Transfer (LNEC, 1986), and Habilitation to Coordinate Research on the analytical certification of Reference Materials (LNEC, 1999). Former invited assistant at the University of Lisbon (1975-86). Designed, organized and managed the LNEC quality system (17 laboratories) and was its first quality manager.
Marluci Menezes (female) is a Geographer (Univ. of Brasilia/ Brazil, 1986), with Erasmus on Anthropology of Space (Univ.Florence, 1993), MSc & PhD in Anthropology (Univ. Lisbon, 1996, 2002), Assistant Research Officer LNEC, studying urban cultures of use and appropriation of space, heritage conservation, urban rehabilitation of heritage, and the interpretation of heritage by the communities. Invited member of a workgroup of the Latin American Council of Social Sciences (CLASCO).
José Delgado Rodrigues (male) is a LNEC Principal Research Officer (retired). Degree in Geology by University of Coimbra (1967). PhD in Engineering Geology by LNEC (1976) with the thesis "Rock weathering in problems of Engineering Geology"; Habilitation to coordinate research with the programme "Research on rock materials with application to rockfill structures". Author or co-author of 170 LNEC reports and over 160 papers to congresses or published in scientific journals.

A description of any significant infrastructure and/or any major items of technical equipment
FIXLAB.pt-1
Laboratory for advanced studies in heritage materials and restoration products: chemical, electro-chemical, physical and ageing characterisation and tests.

- FE-ESEM/EDS associated to digital, petrographic and metallographic microscopes. Microscopic lab is fully equipped for sample preparation.
- ICP-AES (Inductively coupled plasma atomic emission spectrometry)- micro-destructive
- GF-AAS (graphite furnace AAS with limited number of elements covered) – micro-destructive
- UV/Vis Spectroscopy.
- WD- XRF (wavelength dispersive XRF) – micro-destructive
- ED- XRF- portable, non-destructive;
- GDOES (Glow-discharge optical emission spectroscopy);
- Electrochemical lab: potentiostats, galvanostats, ZRA, SVET (Scanning Vibrating Electrode), EIS;
- AFM (Atomic Force Microscope) with nano-indentation and temperature control, C-AFM, Young's module;
- Thermal analysis Lab (for plastics and organic restoration products)-with:
- STA (Simultaneous Thermogravimetry/Differential Scanning Calorimetry);
- DMA (Dynamic Mechanical Analysis)
- DSC (Differential Scanning Calorimetry).

Services offered by FIXLAB.pt-1

- Chemical and physical characterization of material (cultural items, restoration products) for research in general and conservation purposes in particular.
- Multi-analytical capabilities under the same roof encompassing physical and chemical characterization of materials.
- Means applicable to all inorganic heritage materials: metals and alloys, including bronze statuary; glazed ceramics and majolica, lime mortars and renders, cement mortars and structural concrete, stone. Experience in all those materials including in their forms of decay. Particularly large experience in majolica, structural concrete (particularly forms of degradation and electro-chemical protection), renders, mortars, metallic materials and their forms of corrosion.

Applicable to organic materials, including restoration products and protective layers for studies on characterisation, performance, improvement and degradation.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)?	**N**
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	**N**

12. [18] Institutul National de Cercetare Dezvoltare in Optoelectronica - National Institute for Research and Development in Optoelectronic (INOE)

*The National Institute of Research and Development for Optoelectronics (INOE) represents the Romanian node and has **1** linked party (INP).*

Does the participant envisage that part of its work is performed by linked third parties	**Y**
*INOE has **1** linked third party: INP.*	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)?	**Y**
INOE will subcontract Legal consultancy to developing strategies for IPR management in compliance with the national procurement rules. *INOE's subcontractor shall be selected to comply with the principle of best value for money and absence of conflicts of interest.* *The cost of the subcontract is € 20.000,00.*	

1

National Institute of Heritage (INP)

https://patrimoniu.ro/

The Cultural Heritage Archive is the main public archive in Romania dedicated to cultural heritage. It belongs to the Romanian State and is hosted, managed and opened to researchers and the public, according to current legal provisions, by INP.

The archive brings together a wide array of resources, originating in the specific activity of several historic institutions and in the general activity dedicated to the protection of cultural heritage, covering the timeframe from 1892 to present. It is the largest cultural heritage archive in Romania, and it is operated as a public service. It contains the most comprehensive collections of documents – administrative documents, restoration projects, research and investigation records, photographs, maps, film recordings, aerial photographs – in the country, with a high relevance for territories of neighbouring countries – Ukraine, Moldova, Bulgaria and for communities that now live elsewhere in Europe – e.g. Transylvanian Saxons.

Main tasks in the project

Provision of ARCHLAB access within WP2.

Profiles of key person

Ștefan Bâlici (**male**). He is Director General of the National Institute of Heritage, Bucharest, Romania. He is associate professor at the Chair for Architecture History and Conservation of Cultural Heritage of the

"Ion Mincu" University of Architecture and Urbanism, Bucharest, teaching architecture conservation, with a focus on archaeological heritage. He has been active in several professional and civil society organisations, and is a member of ICOMOS and Europa Nostra. As a conservation architect, he has been in charge of conservation projects for several important historic monuments and sites in Romania, such as the Archaeological heritage of Ancient Callatis, nowadays Mangalia; Bran Castle, near Braşov; Alma Vii fortified church, Sibiu County; Headquarters of the National University of Arts, Bucharest.

A description of any significant infrastructure and/or any major items of technical equipment
The Archive is housed and operated on the premises of INP, and it is run by experienced professional staff.

Services offered by the infrastructure
ARCHLAB.ro-1
The Cultural Heritage Archive gathers together several national resources, most of which are in the process of being digitized and transferred on digital online platforms. These are:

- Historic archive of the Monuments Commission and of the Monuments Directorate – analogue archive, topography, photography, aerial photography and film collections;
- Archive of the National Restoration Programme – analogue and digital archive;
- Historic archive of the immovable and movable heritage inventory – analogue archive;
- National ethno-folkloric databank – analogue archive;
- National inventory of immovable heritage – database with limited access, under transformation in on-line inventory;
- Historic monuments database – database with limited access, under transformation in on-line inventory;
- National Archaeological Register – online database of archaeological sites;
- eGISpat - immovable heritage cartographic server;

Cultural Heritage Digital Library.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)?	**N**
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	**N**

13. [19] Riksantikvarieämbetet - Swedish National Heritage Board (RAA)

*RAA represents the Swedish node and has **3** linked parties (ADF, CL, MAL).*

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**N**
Does the participant envisage that part of its work is performed by linked third parties?	**Y**
*RAA participates in IPERION HS with **3** third parties: Science for Life Laboratory (ADF), the Craft Laboratory (CL) and the Environmental Archaeology Lab (MAL) at Strategic Environmental Archaeology Database (SEAD). All third parties will be linked with the participating institution through a Consortium Agreement; this is being drafted in early 2019. A Memorandum of Understanding is in place.*	

1

University of Uppsala - The SciLifeLab Ancient DNA Facility (SciLifeLab)
https://www.scilifelab.se/
It is a collaboration between Uppsala University, Stockholm University, Karolinska institute and Royal Institute of Technology in Sweden and hosts a range of technology platforms for the advancement of Life Science and related fields. It provides analysis of DNA from (pre)historical samples. Science for Life Laboratory (SciLifeLab) is a collaboration between Uppsala University, Stockholm University, Karolinska institute and Royal Institute of Technology in Sweden and hosts a range of technology platforms for the advancement of Life Science and related fields. The Ancient DNA facility have laboratories at Uppsala University and Stockholm University.

The Ancient DNA facility handle osteological samples from humans and animals in dedicated cleanroom labs to minimize contamination with modern DNA. We extract DNA from the samples and prepare DNA sequencing libraries. We perform quality control on the libraries, and then sequence the DNA in collaboration with other facilities at SciLifeLab. We perform data analysis to extract information on the quality and quantity of ancient DNA in the sample and determine species, sex, maternal ancestry (mitochondrial haplotype). If possible, we also provide additional analysis of ancestry and traits
The facility is capable of handling substantial amounts of samples, and is an important resource for heritage science in Europe. Our vision is that DNA analysis should be a widely available tool, similar to e.g. Carbon-14 or Strontium analysis. We aim at providing affordable analyses and collaborate with leading researchers in the field to develop our methods. The Lab participates as a FIXLAB provider offering analysis of DNA from (pre)historical samples.

Main tasks in the project
SciLifeLab provides access to FIXLAB.

Profile of key person
Magnus Lundgren (male) is head of the SciLifeLab Ancient DNA facility, with a PhD in molecular biology from Uppsala University and fifteen years of experience as a scientist. Before working with ancient DNA, he headed a research team investigating microbiology, genetics and gene technology. He is also also an experienced educator and has extensive experience of research management and science outreach.

A description of any significant infrastructure and/or any major items of technical equipment
FIXLAB.se-2
https://www.scilifelab.se/
The SciLifeLab Ancient DNA Facility provide analysis of DNA from (pre)historical samples. Science for Life Laboratory (SciLifeLab) is a collaboration between Uppsala University, Stockholm University, Karolinska institute and Royal Institute of Technology in Sweden and hosts a range of technology platforms for the advancement of Life Science and related fields. The Ancient DNA facility have laboratories at Uppsala University and Stockholm University.

Services offered by FIXLAB-2:
Performing a DNA analysis requires dedicated laboratories and staff skilled in genetics and computer technology. In the clean-room laboratories ancient DNA can be extracted without contamination by modern DNA. Quality and quantity of ancient DNA is determined and information about the sampled individual is generated by computational methods. Laboratory equipment needed are e.g. systems for precision liquid handling, centrifuges, incubators, DNA electrophoresis systems, equipment for performing quantitative polymerase chain reaction analysis. Computer resources required are storage solutions and facilities for high-performance computation.

2

University of Gothenburg - The Craft Laboratory (CL) (Hantverkslaboratoriet)
https://craftlab.gu.se/
CL at the University of Gothenburg is a national centre for cultural heritage craft science. The objectives of the department of Conservation, University of Gothenburg span a broad field of knowledge and issues relating to the planning and operation of practices in order to preserve, conserve, restore and develop artefacts, objects, buildings, parks, landscapes – i.e. the material heritage – but also intangible qualities, specifically craft skills. The department's approach is future oriented where the overall aim is to describe how heritage properties and qualities can be defined as environmental, cultural and societal assets for the continued development of society in local, national and global perspectives.
The objectives of the department of Conservation, University of Gothenburg span a broad field of knowledge and issues relating to the planning and operation of practices in order to preserve, conserve, restore and develop artefacts, objects, buildings, parks, landscapes – i.e. the material heritage – but also intangible qualities, specifically craft skills.

Main tasks in the project
CL participates in IPERION HS providing access to ARCHLAB.se-1.

Profile of key person
Harald Høgseth (male). He is Professor in Craft Heritage Science and Deputy Head of Department of Conservation, University of Gothenburg (GU). He has a background as an artisan and in archaeology. Research interests are related to ontological and epistemological aspects of craft. Høgseth established and directed the educational program in Building Preservation at the Norwegian University of Science and Technology (NTNU).

A description of any significant infrastructure and/or any major items of technical equipment
The Crafts Laboratory (CL) was set up in 2008 by the University of Gothenburg and the Swedish National Heritage Board in collaboration with craft companies, trade associations and heritage authorities. Our ambition is to act as a support and a knowledge bank for those who are responsible for or practically engaged in the upkeep of cultural heritage. The Laboratory offers Transnational access through ARCHLAB.

Services offered by the infrastructure
ARCHLAB.se-1
The Crafts Laboratory (CL) was set up in 2008 by the University of Gothenburg and the Swedish National Heritage Board in collaboration with craft companies, trade associations and heritage authorities. Its ambition is to act as a support and a knowledge bank for those who are responsible for or practically engaged in the upkeep of cultural heritage.

3

Umeå University - Environmental Archaeology Lab (MAL)
https://www.umu.se/en/research/infrastructure/mal
SEAD is a national research infrastructure for archaeology and an international standard database for environmental archaeology data allowing online storage, extraction, analysis and visualisation of data on past climates, environments and human impacts. SEAD is developed and managed at the **Environmental Archaeology Lab (MAL)**, in collaboration with HUMlab at Umeå University: www.sead.se/. Development and data ingestion is in partnership with The Laboratory for Ceramic Research and National laboratory for wood anatomy and dendrochronology at Lund University, and the Archaeological Research Laboratory at Stockholm University. The Environmental Archaeology Lab (MAL) at the Department of Historical, Philosophical and Religious Studies, Umeå University is an infrastructure for palaeoenvironmental science: the study of past peoples and environments through the interdisciplinary application of theories and methods from the humanities and natural sciences. MAL specialises in: Fossil insects' analysis (Paleoentomology); Geochemistry; Near Infrared Spectroscopy for sediment and soil investigation; Plant macrofossil analysis (Archaeobotany-Paleobotany); Pollen analysis (Palynology) and Wood species analysis. MAL hosts the open access Strategic Environmental Archaeology Database (SEAD) and the world's largest fossil insect database BugsCEP. MAL is also a partner in the Neotoma Paleoecology Database and Community, DataARC, and ARIADNE+.

Main tasks in the project
MAL participates in two joint research tasks in WP5 on topics relating to archaeology, palaeontology and paleoanthropology.

Profiles of key persons
Philip I. Buckland (male) is Director of The Environmental Archaeology Lab at Umeå University, is a palaeoecologist involved in R&D, consultancy and teaching in archaeology and environmental science with particular expertise in palaeoentomology - the interdisciplinary study of fossil insects in archaeology and Quaternary science. PhD in Environmental Archaeology (2007) and MA in Archaeology (2000) from Umeå University and BSc in Geography from Durham University (1994).
Johan Linderholm (male) is Co-director of The Environmental Archaeology Lab at Umeå University, is a geoarchaeologist with particular expertise in soil prospection and materials analysis. He has worked extensively with contract archaeologists in Scandinavia and is developing hyperspectral imaging methods for aiding the interpretation of materials and sediments. PhD in Environmental Archaeology (2010) and BSc in Archaeology and Chemistry (1989) from Umeå University.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	**N**
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	**N**

14. [20] Zavod za varstvo kulturne dediščine Slovenije (ZVKDS)

*ZVKDS represents the Slovenian node and has **1** linked party (UL).*

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**N**
Does the participant envisage that part of its work is performed by linked third parties	**Y**
*ZVKDS participates in IPERION HS with **1** third linked party: the University of Ljubljana (UL).*	

1

University of Ljubljana (UL)

www.uni-lj.si

UL is the largest research university in Slovenia constituted of 23 faculties and three arts academies. The Faculty of Chemistry and Chemical Technology (FCCT) and specifically the Chair of Analytical Chemistry has maintained Heritage Science as a primary focus of research for the past 20 years. FCCT is the founding member of E-RIHS Slovenia (MoU signed in 2018). The course "Characterisation and Stability of Materials from Cultural Heritage" is taught in the frame of the 2nd Cycle Study Programme of Chemistry (FCCT), along with courses "Natural Sciences in Conservation" at UL, Academy of Fine Arts and Design. FCCT is also project partner in UCL SEAHA (The EPSRC Centre for Doctoral Training in Science and Engineering in Arts, Heritage and Archaeology). FCCT specializes in non-destructive and micro-destructive methods of characterisation of organic heritage materials, monitoring of environments, specifically organic pollutants, development of new instruments and analytical methods, particularly for macromolecular materials, and offers access in total analysis of the latter within IPERION HS.

Main tasks in the project

Main tasks in the project: UL will take part in the TNA within WP3 FIXLAB by offering the research within Heritage Macromolecular Lab for macromolecular materials characterisation. ULJ will also lead Task 7.2, and collaborate within JRA WP5.1 task related to preventive conservation.

Profiles of key persons

Matija Strlič (male) is Professor of Heritage Science, is Deputy Director of UCL Institute for Sustainable Heritage, and Deputy Director of the UK EPSRC Centre for Doctoral Training in Arts, Heritage and Archaeology. In the last 20 years, he has been involved in more than 35 projects and programmes, attracting ~€25M funding for the heritage science sector. He participated in the Joint Proramming Initiative Cultural Heritage and Global Change as Expert and Scientific Group member and co-coordinated the 8th European Conference on Research for Protection, Conservation and Enhancement of Cultural Heritage in 2008. In 2015, he received the Ambassador of Science Award of the Republic of Slovenia.

Irena Kralj Cigić (female) Chemistry, UL FCCT, is Associate professor of Analytical Chemistry. Interests: separation techniques (gas and liquid chromatography) in combination with mass spectrometry of cultural heritage objects.

Helena Prosen (female) Chemistry, UL FCCT, is Professor of Analytical Chemistry. Interests: chromatographic analysis, mass spectrometry of organic compounds and sample preparation methods (novel extraction techniques, preconcentration and matrix effects).

Jernej Markelj (male) Chemistry, UL FCCT, is Assistant of Analytical Chemistry. Interests: development of novel analytical techniques for determination of VOC in air and aerosol phase (HPLC/MS/MS in GC/MS) and research of secondary organic aerosols formation (QSAR, kinetic studies).

Ida Kraševec (female) M.Sc., Chemistry, UL FCCT, is doctoral student of Analytical Chemistry. Interests: development of analytical methods including methods for analysis and characterisation of heritage materials

and environments.
Matevž Pompe (male) Chemistry, UL FCCT, is Professor of Analytical Chemistry. Interests: chromatography, separation, VOC, ozone, structural descriptors, QSPR, QSAR.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	**N**
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	**N**

15. [21] University College London (UCL)

UCL represents the UK node and has 5 third parties (HEL, NG, BM, ADS-University of York, NTU-ISAAC).

Does the participant envisage that part of its work is performed by linked third parties?	**Y**
*The **5** third parties of UCL are the British Museum (BM), the National Gallery (NG), Historic Buildings and Monuments Commission for England (HE), the Nottingham Trent University (NTU) and the University of York.*	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)?	**Y**
UCL will subcontract a consultancy report on heritage industry, based on interviews, focus group meetings and questionnaires, exploring the typical industries involved in heritage science, such as construction, heritage services, creative and media industries etc. The interviews will specifically explore the innovation chain and the particularities of industry involved, e.g. micro- and SMEs, as well as large industry, and public services. The report will feed into the development of engagement events and of a strategy for engagement with heritage industry and will be carried out in the frame of Task 6.2. *The selection procedures will be carried out in compliance with the national procurement rules and the subcontractor shall be selected to comply with the principle of best value for money and absence of conflicts of interest.* *The cost of the subcontract is €22.846,00.*	

1

The British Museum (BM)
https://www.britishmuseum.org/
BM holds in trust for the world a collection of around 8 million objects from human cultures, past and present. The Museum was founded on the principle that the collection should be put to public use and be made publicly accessible, in the expectation that this would lead to the generation of new discoveries and new knowledge, by both the learned and the general public. To support this ambition the Museum actively promotes academic research by its own staff, and supports the research of others. This research is intended to advance the care, display and public understanding of the history of humanity as represented by the objects in the British Museum's collection, and to help people learn, understand and be inspired by human history through objects. The Department of Scientific Research, along with the Department of Conservation, is responsible for the preservation, research and interpretation of the collections. Scientific Research moved, in 2014, into new purpose-built laboratories in the World Conservation and Exhibitions Centre on the British Museum site in Bloomsbury, central London. The British Museum has participated in several major Horizon 2020 programmes including IPERION-CH and has hosted numerous ARCHLAB visits. Scientific Research leads on a European Research Council Advanced Grant and is an Associate Partner in TEMPERA, a European Training Network in Palaeoproteomics.

Main tasks in this project
Participation in ARCHLAB TNA programme (WP2).

Profiles of key persons

Joanne Dyer (**female**) is a scientist: Colour Science, with expertise in multispectral imaging, polychromy in ancient art, pigment characterisation, organic binding media, FTIR, Raman, fluorescence spectroscopy and immunological methods for detection of organic binding media (ELISA);
Rebecca Stacey (**female**) is a scientist, with expertise in amorphous natural organic materials characterisation, organic residues (food/medicines/cosmetics etc.), binding media, varnishes, adhesives, resins, gums, waxes, bitumen, GC-MS; Py-GC/MS
Carl Heron (**male**) is the Director of Scientific Research, with expertise in the molecular and isotopic analysis of archaeological materials, especially amorphous organic residues associated with artefacts; innovation, dispersal and use of ceramic containers.

A description of any significant infrastructure and/or any major items of technical equipment
ARCHLAB.uk-1
ARCHLAB.uk-1 is offered within this Department located on the British Museum site in Bloomsbury, central London. The records held by the Department relate to a wide range of objects and material classes, including stone, metals, minerals, textiles, ceramics, glass, paper, paintings, basketry, gemstones, wood, enamels, etc., from every period from prehistory to the present and from most major cultures. In addition, the reports include studies of conservation materials, conservation procedures and assessments for preventive conservation purposes.

Services offered by the infrastructure
ARCHLAB.uk-1 access will be to five major types of data held by the Museum/Department:

- Merlin database: the British Museum's central curatorial database, containing records for nearly two million objects. ARCHLAB access will be to the internal version of the database, which is more comprehensive and up-to-date than that offered for general public access as 'Collections Online' through the Museum's website
- Conservation Merlin: the central database containing all records of conservation treatments to British Museum objects since the system was introduced. Older conservation records not yet transferred to the electronic system will be accessible through ARCHLAB. This database is not currently accessible outside the British Museum.
- Mellon Scientific Research Database (MRSD): a new database, created in 2009, containing electronic versions of all analytical reports and many of the project reports spanning the last seventy years. Reports that are not yet available electronically will be available in hard copy.
- Primary image and spectral data: the British Museum's central image database (Digital Assets Database) contains all digital images associated with museum objects, as well as images associated with particular projects. Access will also be offered to primary images (including micro- and macro-images, multispectral images, X-radiographs, etc. in both digital and analogue formats) and data (including Raman, IR, XRF, XRD, etc. data in a variety of formats) generated within the Department, mostly relating to the project reports held by the Department.
- Sample and reference collections: several collections of samples from museum objects and of comparative reference materials are held within the Department. Sample collections include polished and thin sections of glass, metals, wood, ceramics, stone and paint. The comparative reference collections span metallurgy, ceramic and stone petrography, environmental archaeology, and other fields relevant to the collection.

2

The National Gallery (NG)
https://www.nationalgallery.org.uk/
NG houses one of the greatest and most visited collections of Western European painting and holds UKRI Independent Research Organization (academic) status. The Scientific Department's research expertise includes the history of painting materials and techniques and their degradation, preventive conservation, development of new instruments and methods, and digital documentation for archiving, access, manipulation and dissemination of technical data from examination of works of art. NG has participated in EU-supported I3 research infrastructure projects since FP6, including IPERION-CH (Horizon2020) where NG's extensive technical documentation archive was part of ARCHLAB TNA, and as lead on the Digital Documentation Research WP.

Main tasks in this project

Participation in ARCHLAB TNA programme (T2.2) and T2.4; WP6 T3.4; WP6 task leader (interoperability and data management plan) and also involved in T6.4 and T6.5; key role in T5.4 (data management research).

Profiles of key persons

Joseph Padfield (**male**) is the principal Scientist, with expertise in data management and digital documentation systems development, preventive conservation (especially museum lighting), colour science, image processing, web development. Key roles in numerous EU-funded projects, including WP leader, "Development of digital documentation and data", in IPERION-CH, and managing NG involvement in CrossCult (H2020) and SSHOC (H2020). Formerly ResearchSpace Advisory Board member and currently has advisory role for ConservationSpace, both Andrew W. Mellon Foundation funded international projects. Interim co-director of E-RIHS DIGILAB.

Marika Spring (**female**) is the Head of Science/Head of Research, with expertise in research on the materials and techniques of old master paintings, a range of micro-analytical and imaging techniques, and development of new instruments and methods. Key roles in numerous EU-funded projects, including IPERION-CH (managing ARCHLAB-NG TNA, leading a digital documentation WP task and the Foresight Studies task). Coordinator of NG AHRC-funded Collaborative Doctoral Partnership scheme. Editor of National Gallery Technical Bulletin.

A description of any significant infrastructure and/or any major items of technical equipment

Services offered by the infrastructure

ARCHLAB.uk-2 The Scientific Department maintain scientific records of technical and analytical study of paintings in the collection, including work on pigments, layer structure, paint binding media and varnishes. These scientific records on paintings, and other Gallery documents, for example X-radiographs and IRR images, will be available to researchers through ARCHLAB access. The records are mainly not digitised. The Department also holds a large archive of paint samples and cross-sections which form the primary record of physical material from the collection. This archive of samples will also be available for consultation through ARCHLAB Transnational Access Programme.

3

Historic Buildings and Monuments Commission for England (HEL) – Fort Cumberland (FC)

https://historicengland.org.uk/

HE is the public body that helps people care for, enjoy and celebrate England's spectacular historic environment. It is charged by law with protecting, championing and saving the places that define who we are and where we've come from as a nation. HE is recognised as an Independent Research Organisation and a Public Sector Research Establishment by UK Government. It has c.100 research and technical staff, providing a national strategic centre of excellence for archaeological investigation, heritage science, and buildings conservation with specialist laboratories and reference collections at Fort Cumberland, Portsmouth.

Main tasks in this project

HE will be participating in T2.2 (ARCHLAB) and in T3.2 (FIXLAB), and leading delivery of T7.6, Engagement with the archaeology community.

Profiles of key persons

Barney Sloane (**male**) is the National Specialist Services Director, in overall charge of the archaeology, conservation and science teams, labs and collections, with expertise in archaeology and heritage management; President of the European Archaeological Council, and ERIHS.uk rep for Historic England.

Jen Heathcote (**female**) is the Head of Investigative Science, with expertise in archaeological science research into sites ranging from Palaeolithic to Post-medieval; in dry, waterlogged and inter-tidal conditions; in urban, suburban and rural contexts; and in the UK and overseas. Direct responsibility for our environmental sciences, scientific dating, archaeotechnology and archaeological conservation staff and facilities.

A description of any significant infrastructure and/or any major items of technical equipment:

Services offered by the infrastructure

ARCHLAB.uk-3

Five archaeological reference/research collections of national and international importance, as they are designed specifically to support archaeological research, are offered within ARCHLAB. These are: zooarchaeological collection, archaeobotanical collection; human skeletal collection; the

dendrochronological collection; and the archaeotechnology collection. The laboratory facilities at Fort Cumberland provide excellent staffed access to the collections and space for research. There are 14 full-time scientists supporting or working with these collections.

Services offered by FIXLAB UK-2

FIXLAB.uk-2

https://historicengland.org.uk/advice/technical-advice/archaeological-science/

The laboratory holds unique biological collections, an array of instrumentation and facilities, and a nationally respected scientific staff. The laboratory provides high quality, consistent, individually tailored advice to the sector and produces best practice guidance of international repute. It convenes a number of SIGs and carries out teaching and supervision of students and manages on-the job learning placements.

The facility provides capability in analytical and conservation work on marine archaeology, historic sites, buildings and wrecks. The laboratory has a particular expertise in the investigative conservation or marine artefacts and research into preservation of archaeological remains in-situ. It leads the way in the development and documentation of digital x-radiography in the heritage sector.

4

Nottingham Trent University (NTU) – ISAAC

https://www.ntu.ac.uk/

The Imaging & Sensing for Archaeology, Art History & Conservation (ISAAC) laboratory at Nottingham Trent University was established in 2006 to develop advanced optical imaging, spectroscopy, remote imaging and sensing instruments and the associated image processing and data science for application in archaeology, art history and conservation. ISAAC is one of the leading groups in the development of optical coherence tomography (OCT), remote 3D spectral imaging and remote spectroscopy for heritage applications and it has over 10 years of experience working with museums and heritage organisations around the world. ISAAC's mobile laboratory gives access to unique in-house developed instruments and a range of complementary non-invasive techniques for in situ analysis. The team specialises in interdisciplinary research at the interface between science and heritage, from instrument development, data science to interpretation of results for heritage applications.

Main tasks in this project

Participation in MOLAB TNA programme and Tasks 5.1, 5.2, 5.3, 5.5; Task leader for 4.3; Key role in task 5.2, as well as in other JRA tasks (T5.1, T5.3, T5.5).

Profiles of key persons

Haida Liang (**female**) is Professor of Physics and Head of ISAAC Lab. She has led over 20 projects in the field of heritage science, astronomy, optical imaging and spectroscopy funded by the UK research councils such as EPSRC, AHRC, STFC and NERC, the Royal Society, Leverhulme Trust, Innovate UK, EU H2020, Max Planck Society and various heritage organisations and industry. She has published in a broad range of topics from astrophysics, optics to heritage science. She is a Fellow of the International Institute of Conservation (IIC), a member of the editorial board of Scientific Report and chair of the SPIE Optical Metrology Conference on Optics for Arts, Architecture, and Archaeology (O3A).

A description of any significant infrastructure and/or any major items of technical equipment

Services offered by the infrastructure

MOLAB.uk-1

The Imaging & Sensing for Archaeology, Art History & Conservation (ISAAC) at Nottingham Trent will provide a unique suite of remote imaging and spectroscopy instruments including spectral imaging and various laser induced spectroscopy (e.g. Raman) that can operate at distances >3m and up to tens of metres. Specifically, NTU will contribute to the MOLAB platform with the following equipment: Remote VIS/NIR spectral imaging for rapid survey of large areas; Remote VIS/NIR/SWIR hyperspectral imaging; Remote Raman/LIF/LIBS spectroscopy. In addition, the NTU-prototyped Optical Coherence Tomography system working at 1960 nm will be included in the European platfrom to profitably complement the 800nm system operated by NCU.

5

University of York (UoY) - BioArCh

The University of York is a member of the prestigious Russell group and is ranked 25th in the world for Arts & Humanities research. In the 2014 Research Assessment the Dept of Archaeology was rated 2nd in the UK for impact and 2nd equal for its research environment. It hosts 3 world -leading laboratories: NEARR, the only UK facility for chiral amino acid analysis; BioArCh with cutting edge laboratories, instrumentation and expertise for the analysis of ancient biomolecules from archaeological remains; and PalaeoHub with state-of-the-art facilities for imaging, materials testing, and dissection. The University of York participates in IPERION HS with the BioArCh, a world-renowed facility.

Main tasks in this project
Provision of FIXLAB access in T3.2.

Profiles of key person
Oliver Craig (male) has a first degree in Biochemistry and Genetics (Nottingham), an MSc in Osteology, Palaeopathology and Funerary Archaeology (Sheffield), followed by a PhD in Organic Geochemistry at Newcastle. He has also completed a Marie Curie Fellowship at the University of Rome II, 'Tor Vergata'. Oliver was appointed at York in 2007 and was previously a Senior Lecturer and Reader. He currently directs the BioArCh facility.

A description of any significant infrastructure and/or any major items of technical equipment
FIXLAB.uk-1
https://www.york.ac.uk/archaeology/centres-facilities/bioarch/
BioArCh is a world-renowned facility that contains cutting edge laboratories, instrumentation and expertise for the analysis of ancient biomolecules from archaeological remains including bone, artefacts, molluscs, soils and plants tissues. This is a unique collaboration between Archaeology, Biologyand Chemistry Departments, at the University of York. The facility contains 4 instrumentals for light stable isotope analysis by mass spectrometery (EA-IRMS, 3x GC-C-IRMS) and is the largest of its kind in the UK dedicated to heritage science. It is one of only a few facilities worldwide to offer single compound stable isotope analysis. This allows detailed dietary information to be gained from amino acid analysis of bone collagen going beyond the state-of-the-art in this field. The archaeological chemistry laboratories are dedicated to lipid analysis from cultural artefacts to determine their use. There is a facility for proteomics analysis (prep lab and access to protein mass spectrometry facilities) allowing researchers to sequence ancient proteins trapped in dental calculus or associated with archaeological artefacts. Additionally, the labs are known internationally for the development of ZooMS; a molecular based approach used routinely to determine the species of microsamples of bone, parchment or leather. BioArch also houses an ancient DNA facility where DNA is regularly prepared for sequencing from ancient specimens of bone, dental calculus, coprolites and plant remains using stringent anti-contamination. There are five permanent faculty staff, three full-time technical staff and one administrator.

Services offered by FIXLAB.uk-1:

- **Stable isotope analysis** - to investigated diet by analysis of human and animal bone collagen and tooth dentine. To investigate provenance of animals and humans. 2 ERC projects, 3 MC fellows.
- **Ancient genomics analysis** – to investigate ancestry of ancient humans. For phylogenetic reconstruction of ancient humans, plants or animals. For phenotypic reconstruction of ancient human, plant or animals. 3 MC fellows.
- **Proteomic analysis** – to provide taxonomic information from ancient bone (ZooMS). To identify the contents of archaeological pottery. To identify microbial and food related proteins in dental calculus.
- **Organic residue analysis** – to identify the contents or function of archaeological artefacts. To identify activities on archaeological sites by in situ analysis of soils.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	**N**
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	**N**

	Personnel costs	Subcontracting	Other direct costs	Indirect costs	Special unit costs	Total costs	Maximum EU contribution	Maximum grant amount	International partners not receiving funding
1. CNR	546.500,00	40.000,00	231.570,00	194.517,50	0,00	1.012.587,50	1.012.587,50	1.002.001,07	0
- OPD	11.034,00	0,00	54.313,86	16.336,97	0,00	81.684,83	81.684,83	81.684,83	0
- INFN	36.000,00	0,00	34.400,00	17.600,00	0,00	88.000,00	88.000,00	88.000,00	0
- UNIBO	5.000,00	0,00	31.000,00	9.000,00	0,00	45.000,00	45.000,00	45.000,00	0
- UNIPG	37.800,00	0,00	24.240,00	15.510,00	0,00	77.550,00	77.550,00	77.550,00	0
Total beneficiary	**636.334,00**	**40.000,00**	**375.523,86**	**252.964,47**	**0,00**	**1.304.822,33**	**1.304.822,33**	**1.294.235,90**	**0,00**
2. KIK-IRPA	58.080,00	0,00	46.206,00	26.071,50	0,00	130.357,50	130.357,50	129.059,66	0
- KMKG- MRAH	13.194,00	0,00	10.491,00	5.921,25	0,00	29.606,25	29.606,25	29.606,25	0
Total beneficiary	**71.274,00**	**0,00**	**56.697,00**	**31.992,75**	**0,00**	**159.963,75**	**159.963,75**	**158.665,91**	**0,00**
3. UFMG	**0**	**0**	**0**	**0**	**0**	**0,00**	**0**	**0**	**33.750,00**
4. CyI	**92.743,00**		**18.000,00**	**27.685,75**	**0,00**	**138.428,75**	**138.428,75**	**94.849,16**	**0**
5. ITAM	38.200,00	0,00	37.400,00	18.900,00	0,00	94.500,00	94.500,00	93.692,73	0
- IAP	2.000,00	0,00	0,00	500,00	0,00	2.500,00	2.500,00	2.500,00	0
- IAB	2.000,00	0,00	0,00	500,00	0,00	2.500,00	2.500,00	2.500,00	0
Total beneficiary	**42.200,00**	**0,00**	**37.400,00**	**19.900,00**	**0,00**	**99.500,00**	**99.500,00**	**98.692,73**	**0,00**
6. SPK	87.734,00	0,00	18.818,40	26.638,10	0,00	133.190,50	133.190,50	124.822,36	0
- CEZA	6.000,00	0,00	3.600,00	2.400,00	0,00	12.000,00	12.000,00	12.000,00	0
- RWTH	14.400,00	0,00	14.000,00	7.100,00	0,00	35.500,00	35.500,00	35.500,00	0
- DI	0,00	0,00	1.500,00	375,00	0,00	1.875,00	1.875,00	1.875,00	0
- DAI	57.000,00	0,00	1.500,00	14.625,00	0,00	73.125,00	73.125,00	73.125,00	0
- Fraunhofer	6.000,00	0,00	14.000,00	5.000,00	0,00	25.000,00	25.000,00	25.000,00	0
- EKUT	3.000,00	0,00	0,00	750,00	0,00	3.750,00	3.750,00	3.750,00	0
- TUM	12.500,00	0,00	14.200,00	6.675,00	193.500,00	226.875,00	226.875,00	226.875,00	0
Total beneficiary	**186.634,00**	**0,00**	**67.618,40**	**63.563,10**	**193.500,00**	**511.315,50**	**511.315,50**	**502.947,36**	**0,00**
7. CSIC	148.289,00	0,00	66.133,00	53.605,50	0,00	268.027,50	268.027,50	263.356,23	0
- CENIEH	35.880,00	0,00	82.420,00	29.575,00	0,00	147.875,00	147.875,00	147.875,00	0
- IPCE	50.000,00	0,00	35.488,00	21.372,00	0,00	106.860,00	106.860,00	106.860,00	0
Total beneficiary	**234.169,00**	**0,00**	**184.041,00**	**104.552,50**	**0,00**	**522.762,50**	**522.762,50**	**518.091,23**	**0,00**
8. CNRS	312.264,10	0,00	179.461,00	122.931,28	0,00	614.656,38	614.656,38	606.549,32	0
- MC	127.809,48	0,00	0,00	31.952,37	0,00	159.761,85	159.761,85	159.761,85	0
- MNHN	24.680,38	0,00	0,00	6.170,10	0,00	30.850,48	30.850,48	30.850,48	0
- SOLEIL	0,00	0,00	18.080,00	4.520,00	151.900,00	174.500,00	174.500,00	174.500,00	0
- UBX	8.088,00	0,00	0,00	2.022,00	0,00	10.110,00	10.110,00	10.110,00	0
- ULL	7.480,00	0,00	0,00	1.870,00	0,00	9.350,00	9.350,00	9.350,00	0
Total beneficiary	**480.321,96**	**0,00**	**197.541,00**	**169.465,75**	**151.900,00**	**999.228,71**	**999.228,71**	**991.121,65**	**0,00**
9. FORTH	104.000,00	0,00	33.000,00	34.250,00	30.000,00	201.250,00	201.250,00	199.132,43	0
- Of-ADC	30.000,00	0,00	17.800,00	11.950,00	0,00	59.750,00	59.750,00	59.750,00	0
Total beneficiary	**134.000,00**	**0,00**	**50.800,00**	**46.200,00**	**30.000,00**	**261.000,00**	**261.000,00**	**258.882,43**	**0,00**
10. Atomki	10.000,00	0,00	38.640,00	12.160,00	120.000,00	180.800,00	180.800,00	177.481,66	0
- EK	10.000,00	0,00	22.416,00	8.104,00	118.800,00	159.320,00	159.320,00	159.320,00	0
- WIGNER	4.000,00	0,00	9.920,00	3.480,00	51.480,00	68.880,00	68.880,00	68.880,00	0
Total beneficiary	**24.000,00**	**0,00**	**70.976,00**	**23.744,00**	**290.280,00**	**409.000,00**	**409.000,00**	**405.681,66**	**0,00**
11. IAA	**57.100,00**	**0,00**	**29.250,00**	**21.587,50**	**0,00**	**107.937,50**	**107.937,50**	**89.269,80**	**0**
12. UOM	**34.672,00**	**0,00**	**19.570,00**	**13.560,50**	**0,00**	**67.802,50**	**67.802,50**	**59.500,80**	**0**
13. UNAM	**0**	**0**	**0**	**0**	**0**	**0,00**	**0**	**0**	**33.750,00**
14. RCE	71.735,20	0,00	17.552,80	22.322,00	0,00	111.610,00	111.610,00	109.174,59	0
- RUG	8.694,40	0,00	5.491,20	3.546,40	0,00	17.732,00	17.732,00	17.732,00	0
- TUD	32.880,45	0,00	2.500,00	8.845,11	0,00	44.225,56	44.225,56	44.225,56	0
- KNAW DANS	18.750,00	0,00	2.500,00	5.312,50	0,00	26.562,50	26.562,50	26.562,50	0
- RMA	39.781,80	0,00	8.250,00	12.007,95	0,00	60.039,75	60.039,75	60.039,75	0
- VU	0,00	0,00	9.600,00	2.400,00	28.000,00	40.000,00	40.000,00	40.000,00	0
Total beneficiary	**171.841,85**	**0,00**	**45.894,00**	**54.433,96**	**28.000,00**	**300.169,81**	**300.169,81**	**297.734,40**	**0,00**
15. UiO	**61.528,00**	**0,00**	**27.668,00**	**22.299,00**	**0,00**	**111.495,00**	**111.495,00**	**85.797,91**	**0**
16. NCU	25.000,00	0,00	31.700,00	14.175,00	0,00	70.875,00	70.875,00	69.826,92	0
- AGH	8.000,00	0,00	6.900,00	3.725,00	0,00	18.625,00	18.625,00	18.625,00	0
- JHI	10.000,00	0,00	6.900,00	4.225,00	0,00	21.125,00	21.125,00	21.125,00	0
- UW	8.000,00	0,00	6.900,00	3.725,00	0,00	18.625,00	18.625,00	18.625,00	0
Total beneficiary	**51.000,00**	**0,00**	**52.400,00**	**25.850,00**	**0,00**	**129.250,00**	**129.250,00**	**128.201,92**	**0,00**
17. UEvora	12.000,00	0,00	23.600,00	8.900,00	0,00	44.500,00	44.500,00	43.374,28	0
- LNEC	35.400,00	0,00	25.600,00	15.250,00	18.000,00	94.250,00	94.250,00	94.250,00	0
Total beneficiary	**47.400,00**	**0,00**	**49.200,00**	**24.150,00**	**18.000,00**	**138.750,00**	**138.750,00**	**137.624,28**	**0,00**
18. INOE	27.790,00	20.000,00	25.300,00	13.272,50	0,00	86.362,50	86.362,50	85.548,63	0
- INP	6.840,00	0,00	4.320,00	2.790,00	0,00	13.950,00	13.950,00	13.950,00	0
Total beneficiary	**34.630,00**	**20.000,00**	**29.620,00**	**16.062,50**	**0,00**	**100.312,50**	**100.312,50**	**99.498,63**	**0,00**
19. RAA	25.771,50	0,00	18.420,00	11.047,88	0,00	55.239,38	55.239,38	53.867,09	0
- MAL	64.782,05	0,00	3.000,00	16.945,51	0,00	84.727,56	84.727,56	84.727,50	0
- SciLifeLab	6.940,90	0,00	5.660,79	3.150,42	0,00	15.752,11	15.752,11	15.752,10	0
- CL	4.816,77	0,00	5.920,00	2.684,19	0,00	13.420,96	13.420,96	13.420,90	0
Total beneficiary	**102.311,22**	**0,00**	**33.000,79**	**33.828,00**	**0,00**	**169.140,01**	**169.140,01**	**167.767,59**	**0,00**
20. ZVKDS	44.800,00	0,00	15.200,00	15.000,00	0,00	75.000,00	75.000,00	73.787,06	0
- UL	38.080,00	0,00	21.520,00	14.900,00	0,00	74.500,00	74.500,00	74.500,00	0
Total beneficiary	**82.880,00**	**0,00**	**36.720,00**	**29.900,00**	**0,00**	**149.500,00**	**149.500,00**	**148.287,06**	**0,00**
21. UCL	86.000,00	22.846,00	20.800,00	26.700,00	0,00	156.346,00	156.346,00	156.346,00	0
- HEL-FC	21.632,46	0,00	31.385,20	13.254,42	0,00	66.272,08	66.272,08	66.272,08	0
- NG	81.792,80	0,00	18.280,00	25.018,20	0,00	125.091,00	125.091,00	125.091,00	0
- UoY	18.465,68	0,00	29.145,52	11.902,80	0,00	59.514,00	59.514,00	59.514,00	0
- NTU	89.097,00	0,00	21.500,00	27.649,25	0,00	138.246,25	138.246,25	138.246,00	0
- BM	16.743,62	0,00	13.576,17	7.579,95	0,00	37.899,74	37.899,74	37.899,70	0
Total beneficiary	**313.731,56**	**22.846,00**	**128.686,89**	**110.604,62**	**0,00**	**575.869,07**	**575.869,07**	**575.860,70**	**0,00**
22. GCI	**0**	**0**	**0**	**0**	**0**	**0,00**	**0**	**0**	**67.500,00**
23. SI MCI	**0**	**0**	**0**	**0**	**0**	**0,00**	**0**	**0**	**67.500,00**
24. UCPH	**30.000,00**	**0,00**	**10.000,00**	**10.000,00**	**0,00**	**50.000,00**	**50.000,00**	**50.000,00**	**0**
total	2.888.770,59	82.846,00	1.520.606,94	1.102.344,40	711.680,00	6.306.247,93	6.306.247,93	6.162.711,12	202.500,00

5.1 Ethics

Post-Grant Requirements
Protection of personal data

The institutions involved in IPEIRON HS confirm that they have appointed a Data Protection Officer (DPO) and the contact details of the DPO are/will be made available to all data subjects involved in the research. Detailed information on the informed consent procedures in regard to data processing must be kept on file.
Furthermore, they confirm that the templates of the informed consent forms and information sheets (in language and terms intelligible to the participants) are/will be kept on file.

For host institutions not required to appoint a DPO under the GDPR a detailed data protection policy for the project is kept on file.

Ethics self-assessment

Section 4: PROTECTION OF PERSONAL DATA Does your research involve processing of personal data? **YES**

The IPERION HS project will not raise major ethics issues. Anyway, as data collection is necessary, the project will guarantee that all beneficiaries/partners will follow EU and national regulations regarding data protection and will obtain approval from local/national authority in charge of data protection, if applicable.

Section 6: THIRD COUNTRIES

4 organisazions from 3 different Third Countries are involved in the IPERION HS projects, notably:
- Brazil;
- Mexico;
- US (2 organisations).

However, no ethical clearance is needed as:
- No research related activities are undertaken in these countries raise potential ethics issues
- No local resources are used
- No material is imported into the EU
- No material is exported to non-EU countries.

Ethics self-evaluation for IPERION HS by The SciLifeLab Ancient DNA facility:
The SciLifeLab Ancient DNA facility performs DNA analysis in samples that may contain highly fragmented DNA that is contaminated with non-endogenous DNA. The analyses proposed in as part of this application is solely done as a service to users. The facility only handle material that is classified as cultural heritage. This means that the analysis of the material and results of the analysis should not be of relevance in a medical or integrity perspective for persons alive today. We do accept analysis of samples that require ethical approval relevant for human embryos, fetuses, tissues or cells, personal data, animals, genetically modified organisms, or dual use.
We perform all laboratory procedures in appropriate and approved facilities. We adhere to Swedish work environment regulations to ensure safe handling of chemicals and lab material for the benefit of our staff. We follow Swedish environmental protection regulation to ensure that chemicals and other lab material are handled and disposed of in an approved manner. The facility ensures that results and data are handled in accordance with European regulations. The facility also requires that results and data delivered to users are handled and stored in appropriate manner.
We operate under the code of conduct specified by the European Association of Archaeologists. In Sweden, work with DNA is not covered by Kulturmiljölagen (Heritage Environment Act), but collection, handling and treatment samples predating 1850 may be covered. We require that Swedish users certifies that transport to and from the facility, handling, and invasive sampling of the material, and handling of results is approved

and in accordance with Kulturmiljölagen. For international users we require that they confirm that they adhere the user's equivalent national regulation and ethical guidelines before we accept to perform analysis of samples.

5.2 Security

Please indicate if your project will involve:

- activities or results raising security issues: **NO**
- 'EU-classified information' as background or results: **NO**

Apéndice 2: Acuerdo de Subvención:

Artículo 14 (implementación de Tareas de la Acción por terceras partes vinculadas), Artículo 18 (obligación de mantenimiento de registro y documentación de apoyo), Artículo 20 (informes), Artículo 21 (Pagos y modalidades de pagos), Artículo 22 (controles, revisiones, auditorias e investigaciones), Artículo 23 (evaluación del impacto de la acción), Artículo 35 (conflicto de intereses), Artículo 36 (confidencialidad) y Artículo 38 (promoción de la acción y visibilidad de la financiación de la UE).

EUROPEAN COMMISSION
Directorate-General for Research and Innovation

Research & Innovation Outreach
Research & Industrial Infrastructures

GRANT AGREEMENT

NUMBER 871034 — IPERION HS

This **Agreement** ('the Agreement') is **between** the following parties:

on the one part,

the **European Union** ('the EU'), represented by the European Commission ('the Commission'), represented for the purposes of signature of this Agreement by Head of Unit, Directorate-General for Research and Innovation, Innovative Administration, Financial Management & Program Support I, Pascale CID,

and

on the other part,

1. 'the coordinator':

CONSIGLIO NAZIONALE DELLE RICERCHE (CNR), established in PIAZZALE ALDO MORO 7, ROMA 00185, Italy, VAT number: IT02118311006, represented for the purposes of signing the Agreement by Director, PAOLO DE NATALE

and the following other beneficiaries, if they sign their 'Accession Form' (see Annex 3 and Article 56):

2. **Koninklijk Instituut voor het Kunstpatrimonium (KIK-IRPA)**, established in Jubelpark 1, Brussels 1000, Belgium,

*3. **UNIVERSIDADE FEDERAL DE MINAS GERAIS (UFMG)**, established in AV ANTONIO CARLOS 6627 PAMPULHA, BELO HORIZONTE MINAS GERAIS 31270 901, Brazil,* as 'beneficiary not receiving EU funding' (see Article 9),

4. **THE CYPRUS INSTITUTE (CyI)**, established in CONSTANTINOU KAVAFI 20, NICOSIA 2121, Cyprus, VAT number: CY10167225J,

5. **USTAV TEORETICKE A APLIKOVANE MECHANIKY AVCR (ITAM)**, established in PROSECKA 76, PRAHA 9 19000, Czechia, VAT number: CZ68378297,

6. **STIFTUNG PREUSSISCHER KULTURBESITZ (SPK)**, established in VON DER HEYDT STRASSE 16-18, BERLIN 10785, Germany,

7. **AGENCIA ESTATAL CONSEJO SUPERIOR DEINVESTIGACIONES CIENTIFICAS (CSIC)**, established in CALLE SERRANO 117, MADRID 28006, Spain, VAT number: ESQ2818002D,

8. **CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS (CNRS)**, established in RUE MICHEL ANGE 3, PARIS 75794, France, VAT number: FR40180089013,

9. **IDRYMA TECHNOLOGIAS KAI EREVNAS (FORTH)**, established in N PLASTIRA STR 100, IRAKLEIO 70013, Greece, VAT number: EL090101655,

10. **Magyar Tudomanyos Akademia Atommagkutato Intezete (Atomki)**, established in BEM TER 18/C, DEBRECEN H4026, Hungary, VAT number: HU15300344,

11. **Israel Antiquities Authority (IAA)**, established in Rockefeller Museum Bldg, JERUSALEM 91004, Israel,

12. **UNIVERSITA TA MALTA (UOM)**, established in University Campus, Tal-Qroqq, MSIDA 2080, Malta, VAT number: MT12894031,

*13. **UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO (UNAM)**, established in TORRE DE RECTORIA 9º. PISO, CIUDAD UNIVERSITARIA, D.F., MEXICO DISTRITO FEDERAL 04510, Mexico,* as 'beneficiary not receiving EU funding' (see Article 9),

14. **MINISTERIE VAN ONDERWIJS, CULTUUR EN WETENSCHAP (RCE)**, established in Rijnstraat 50, DEN HAAG 2500 BJ, Netherlands,

15. **UNIVERSITETET I OSLO (UiO)**, established in PROBLEMVEIEN 5-7, OSLO 0313, Norway, VAT number: NO971035854MVA,

16. **UNIWERSYTET MIKOLAJA KOPERNIKA W TORUNIU (NCU)**, established in UL. JURIJA GAGARINA 11, TORUN 87100, Poland, VAT number: PL8790177291,

17. **UNIVERSIDADE DE EVORA (UEvora)**, established in LARGO DOS COLEGIAIS 2, EVORA 7000 803, Portugal, VAT number: PT501201920,

18. **NATIONAL INSTITUTE OF RESEARCH AND DEVELOPMENT FOR OPTOELECTRONICS (INOE)**, established in ATOMISTILOR STREET 409, MAGURELE RO77125, Romania, VAT number: RO9113623,

19. **RIKSANTIKVARIEAMBETET (RAA)**, established in STORGATAN 41, STOCKHOLM 11484, Sweden, VAT number: SE202100109001,

20. **JAVNI ZAVOD REPUBLIKE SLOVENIJE ZA VARSTVO KULTURNE DEDISCINE (ZVKDS)**, established in POLIANSKA CESTA 40, LJUBLJANA 1000, Slovenia, VAT number: SI45991413,

21. **UNIVERSITY COLLEGE LONDON (UCL)**, established in GOWER STREET, LONDON WC1E 6BT, United Kingdom, VAT number: GB524371168,

*22. **THE J. PAUL GETTY TRUST (GCI)**, established in 1200 GETTY CENTER DRIVE, LOS ANGELES 90049, United States,* as 'beneficiary not receiving EU funding' (see Article 9),

23. ***SMITHSONIAN INSTITUTION (SI MCI)****, established in JEFFERSON DRIVE 1000, WASHINGTON DC 20560, United States,* as 'beneficiary not receiving EU funding' (see Article 9),

24. **KOBENHAVNS UNIVERSITET (UCPH)**, established in NORREGADE 10, KOBENHAVN 1165, Denmark, VAT number: DK29979812,

Unless otherwise specified, references to 'beneficiary' or 'beneficiaries' include the coordinator.

The parties referred to above have agreed to enter into the Agreement under the terms and conditions below.

By signing the Agreement or the Accession Form, the beneficiaries accept the grant and agree to implement it under their own responsibility and in accordance with the Agreement, with all the obligations and conditions it sets out.

The Agreement is composed of:

Terms and Conditions

Annex 1 Description of the action

Annex 2 Estimated budget for the action

2a Additional information on the estimated budget

Annex 3 Accession Forms

Annex 4 Model for the financial statements

Annex 5 Model for the certificate on the financial statements

Annex 6 Model for the certificate on the methodology

TERMS AND CONDITIONS

TABLE OF CONTENTS

CHAPTER 1 GENERAL

ARTICLE 1 — SUBJECT OF THE AGREEMENT

This Agreement sets out the rights and obligations and the terms and conditions applicable to the grant awarded to the beneficiaries for implementing the action set out in Chapter 2.

CHAPTER 2 ACTION

ARTICLE 2 — ACTION TO BE IMPLEMENTED

The grant is awarded for the action entitled '**Integrating Platforms for the European Research Infrastructure ON Heritage Science**' — '**IPERION HS**' **('action')**, as described in Annex 1.

ARTICLE 3 — DURATION AND STARTING DATE OF THE ACTION

The duration of the action will be **36 months** as of 1 April 2020 ('**starting date of the action**').

ARTICLE 4 — ESTIMATED BUDGET AND BUDGET TRANSFERS

4.1 Estimated budget

The '**estimated budget**' for the action is set out in Annex 2.

It contains the estimated eligible costs and the forms of costs, broken down by beneficiary (and linked third party) and budget category (see Articles 5, 6, and 14). It also shows the estimated costs of the beneficiaries not receiving EU funding (see Article 9).

4.2 Budget transfers

The estimated budget breakdown indicated in Annex 2 may be adjusted — without an amendment (see Article 55) — by transfers of amounts between beneficiaries, budget categories and/or forms of costs set out in Annex 2, if the action is implemented as described in Annex 1.

However, the beneficiaries may not add costs relating to subcontracts not provided for in Annex 1, unless such additional subcontracts are approved by an amendment or in accordance with Article 13.

CHAPTER 3 GRANT

ARTICLE 5 — GRANT AMOUNT, FORM OF GRANT, REIMBURSEMENT RATES AND FORMS OF COSTS

5.1 Maximum grant amount

The '**maximum grant amount**' is **EUR 6 162 711.12** (six million one hundred and sixty two thousand seven hundred and eleven EURO and twelve eurocents).

5.2 Form of grant, reimbursement rates and forms of costs

The grant reimburses **100% of the action's eligible costs** (see Article 6) (‘**reimbursement of eligible costs grant**’) (see Annex 2).

The estimated eligible costs of the action are EUR **6 313 747.93** (six million three hundred and thirteen thousand seven hundred and forty seven EURO and ninety three eurocents).

Eligible costs (see Article 6) must be declared under the following forms (**'forms of costs'**):

(a) for **direct personnel costs** (excluding direct personnel costs covered by the unit cost under Point (f)):

- as actually incurred costs (‘**actual costs**’) or
- on the basis of an amount per unit calculated by the beneficiary in accordance with its usual cost accounting practices (‘**unit costs**’).

Personnel **costs for SME owners** or **beneficiaries that are natural persons** not receiving a salary (see Article 6.2, Points A.4 and A.5) must be declared on the basis of the amount per unit set out in Annex 2a (**unit costs**);

(b) for **direct costs for subcontracting** (excluding subcontracting costs covered by the unit cost under Point (f)): as actually incurred costs (**actual costs**);

(c) for **direct costs of providing financial support to third parties** (excluding costs of financial support covered by the unit cost under Point (f)): not applicable;

(d) for **other direct costs** (excluding other direct costs covered by the unit cost under Point (f)):

- for costs of internally invoiced goods and services: on the basis of an amount per unit calculated by the beneficiary in accordance with its usual cost accounting practices (‘**unit costs**’);
- for all other costs: as actually incurred costs (**actual costs**);

(e) for **indirect costs** (excluding indirect costs covered by the unit cost under Point (f)): on the basis of a flat-rate applied as set out in Article 6.2, Point E (‘**flat-rate costs**’);

(f) for **‘Costs for providing trans-national access to research infrastructure’**: on the basis of the amount(s) per unit set out in Annex 2a (**unit costs**).

5.3 Final grant amount — Calculation

The ‘**final grant amount**’ depends on the actual extent to which the action is implemented in accordance with the Agreement’s terms and conditions.

This amount is calculated by the Commission — when the payment of the balance is made (see Article 21.4) — in the following steps:

Step 1 — Application of the reimbursement rates to the eligible costs

Step 2 — Limit to the maximum grant amount

Step 3 — Reduction due to the no-profit rule

Step 4 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations

5.3.1 Step 1 — Application of the reimbursement rates to the eligible costs

The reimbursement rate(s) (see Article 5.2) are applied to the eligible costs (actual costs, unit costs and flat-rate costs; see Article 6) declared by the beneficiaries and linked third parties (see Article 20) and approved by the Commission (see Article 21).

5.3.2 Step 2 — Limit to the maximum grant amount

If the amount obtained following Step 1 is higher than the maximum grant amount set out in Article 5.1, it will be limited to the latter.

5.3.3 Step 3 — Reduction due to the no-profit rule

The grant must not produce a profit.

'**Profit**' means the surplus of the amount obtained following Steps 1 and 2 plus the action's total receipts, over the action's total eligible costs.

The '**action's total eligible costs**' are the consolidated total eligible costs approved by the Commission.

The '**action's total receipts**' are the consolidated total receipts generated during its duration (see Article 3).

The following are considered **receipts**:

(a) income generated by the action; if the income is generated from selling equipment or other assets purchased under the Agreement, the receipt is up to the amount declared as eligible under the Agreement;

(b) financial contributions given by third parties to the beneficiary or to a linked third party specifically to be used for the action, and

(c) in-kind contributions provided by third parties free of charge and specifically to be used for the action, if they have been declared as eligible costs.

The following are however not considered receipts:

(a) income generated by exploiting the action's results (see Article 28);

(b) financial contributions by third parties, if they may be used to cover costs other than the eligible costs (see Article 6);

(c) financial contributions by third parties with no obligation to repay any amount unused at the end of the period set out in Article 3.

If there is a profit, it will be deducted from the amount obtained following Steps 1 and 2.

5.3.4 Step 4 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations — Reduced grant amount — Calculation

If the grant is reduced (see Article 43), the Commission will calculate the reduced grant amount by deducting the amount of the reduction (calculated in proportion to the seriousness of the errors, irregularities or fraud or breach of obligations, in accordance with Article 43.2) from the maximum grant amount set out in Article 5.1.

The final grant amount will be the lower of the following two:

- the amount obtained following Steps 1 to 3 or
- the reduced grant amount following Step 4.

5.4 Revised final grant amount — Calculation

If — after the payment of the balance (in particular, after checks, reviews, audits or investigations; see Article 22) — the Commission rejects costs (see Article 42) or reduces the grant (see Article 43), it will calculate the '**revised final grant amount**' for the beneficiary concerned by the findings.

This amount is calculated by the Commission on the basis of the findings, as follows:

- in case of **rejection of costs**: by applying the reimbursement rate to the revised eligible costs approved by the Commission for the beneficiary concerned;
- in case of **reduction of the grant**: by calculating the concerned beneficiary's share in the grant amount reduced in proportion to the seriousness of the errors, irregularities or fraud or breach of obligations (see Article 43.2).

In case of **rejection of costs and reduction of the grant**, the revised final grant amount for the beneficiary concerned will be the lower of the two amounts above.

ARTICLE 6 — ELIGIBLE AND INELIGIBLE COSTS

6.1 General conditions for costs to be eligible

'**Eligible costs**' are costs that meet the following criteria:

(a) for **actual costs**:

(i) they must be actually incurred by the beneficiary;

(ii) they must be incurred in the period set out in Article 3, with the exception of costs relating to the submission of the periodic report for the last reporting period and the final report (see Article 20);

(iii) they must be indicated in the estimated budget set out in Annex 2;

(iv) they must be incurred in connection with the action as described in Annex 1 and necessary for its implementation;

(v) they must be identifiable and verifiable, in particular recorded in the beneficiary's accounts in accordance with the accounting standards applicable in the country where the beneficiary is established and with the beneficiary's usual cost accounting practices;

(vi) they must comply with the applicable national law on taxes, labour and social security, and

(vii) they must be reasonable, justified and must comply with the principle of sound financial management, in particular regarding economy and efficiency;

(b) for **unit costs**:

(i) they must be calculated as follows:

{amounts per unit set out in Annex 2a or calculated by the beneficiary in accordance with its usual cost accounting practices (see Article 6.2, Point A and Article 6.2.D.5)

multiplied by

the number of actual units};

(ii) the number of actual units must comply with the following conditions:

- the units must be actually used or produced in the period set out in Article 3;
- the units must be necessary for implementing the action or produced by it, and
- the number of units must be identifiable and verifiable, in particular supported by records and documentation (see Article 18);

(c) for **flat-rate costs**:

(i) they must be calculated by applying the flat-rate set out in Annex 2, and

(ii) the costs (actual costs or unit costs) to which the flat-rate is applied must comply with the conditions for eligibility set out in this Article.

6.2 Specific conditions for costs to be eligible

Costs are eligible if they comply with the general conditions (see above) and the specific conditions set out below for each of the following budget categories:

A. direct personnel costs;
B. direct costs of subcontracting;
C. not applicable;
D. other direct costs;
E. indirect costs;
F. 'Costs for providing trans-national access to research infrastructure'.

'Direct costs' are costs that are directly linked to the action implementation and can therefore be attributed to it directly. They must not include any indirect costs (see Point E below).

'Indirect costs' are costs that are not directly linked to the action implementation and therefore cannot be attributed directly to it.

A. Direct personnel costs (not covered by Point F)

<u>Types of eligible personnel costs</u>

A.1 Personnel costs are eligible, if they are related to personnel working for the beneficiary under an employment contract (or equivalent appointing act) and assigned to the action ('**costs for employees (or equivalent)**'). They must be limited to salaries (including during parental leave), social security contributions, taxes and other costs included in the **remuneration**, if they arise from national law or the employment contract (or equivalent appointing act).

Beneficiaries that are non-profit legal entities[1] may also declare as personnel costs **additional remuneration** for personnel assigned to the action (including payments on the basis of supplementary contracts regardless of their nature), if:

(a) it is part of the beneficiary's usual remuneration practices and is paid in a consistent manner whenever the same kind of work or expertise is required;

(b) the criteria used to calculate the supplementary payments are objective and generally applied by the beneficiary, regardless of the source of funding used.

'Additional remuneration' means any part of the remuneration which exceeds what the person would be paid for time worked in projects funded by national schemes.

Additional remuneration for personnel assigned to the action is eligible up to the following amount:

(a) if the person works full time and exclusively on the action during the full year: up to EUR 8 000;

(b) if the person works exclusively on the action but not full-time or not for the full year: up to the corresponding pro-rata amount of EUR 8 000, or

(c) if the person does not work exclusively on the action: up to a pro-rata amount calculated as follows:

{{EUR 8 000

divided by

the number of annual productive hours (see below)},

multiplied by

the number of hours that the person has worked on the action during the year}.

A.2 The **costs for natural persons working under a direct contract** with the beneficiary other than an employment contract are eligible personnel costs, if:

(a) the person works under conditions similar to those of an employee (in particular regarding the way the work is organised, the tasks that are performed and the premises where they are performed);

(b) the result of the work carried out belongs to the beneficiary (unless exceptionally agreed otherwise), and

[1] For the definition, see Article 2.1(14) of the Rules for Participation Regulation No 1290/2013: '**non-profit legal entity**' means a legal entity which by its legal form is non-profit-making or which has a legal or statutory obligation not to distribute profits to its shareholders or individual members.

(c) the costs are not significantly different from those for personnel performing similar tasks under an employment contract with the beneficiary.

A.3 The **costs of personnel seconded by a third party against payment** are eligible personnel costs, if the conditions in Article 11.1 are met.

A.4 **Costs of owners** of beneficiaries that are small and medium-sized enterprises ('**SME owners**') who are working on the action and who do not receive a salary are eligible personnel costs, if they correspond to the amount per unit set out in Annex 2a multiplied by the number of actual hours worked on the action.

A.5 **Costs of 'beneficiaries that are natural persons'** not receiving a salary are eligible personnel costs, if they correspond to the amount per unit set out in Annex 2a multiplied by the number of actual hours worked on the action.

A.6 **Personnel costs for providing trans-national access to research infrastructure** are eligible only if also the conditions set out in Article 16.1.1 are met.

Calculation

Personnel costs must be calculated by the beneficiaries as follows:

{{hourly rate

multiplied by

the number of actual hours worked on the action},

plus

for non-profit legal entities: additional remuneration to personnel assigned to the action under the conditions set out above (Point A.1)}.

The number of actual hours declared for a person must be identifiable and verifiable (see Article 18).

The total number of hours declared in EU or Euratom grants, for a person for a year, cannot be higher than the annual productive hours used for the calculations of the hourly rate. Therefore, the maximum number of hours that can be declared for the grant are:

{number of annual productive hours for the year (see below)

minus

total number of hours declared by the beneficiary, for that person in that year, for other EU or Euratom grants}.

The '**hourly rate**' is one of the following:

(a) for personnel costs declared as **actual costs** (i.e. budget categories A.1, A.2, A.3 and A.6): the hourly rate is calculated *per full financial year*, as follows:

{actual annual personnel costs (excluding additional remuneration) for the person

divided by

number of annual productive hours}.

using the personnel costs and the number of productive hours for each full financial year covered by the reporting period concerned. If a financial year is not closed at the end of the reporting period, the beneficiaries must use the hourly rate of the last closed financial year available.

For the 'number of annual productive hours', the beneficiaries may choose one of the following:

(i) 'fixed number of hours': 1 720 hours for persons working full time (or corresponding pro-rata for persons not working full time);

(ii) 'individual annual productive hours': the total number of hours worked by the person in the year for the beneficiary, calculated as follows:

{annual workable hours of the person (according to the employment contract, applicable collective labour agreement or national law)

plus

overtime worked

minus

absences (such as sick leave and special leave)}.

'Annual workable hours' means the period during which the personnel must be working, at the employer's disposal and carrying out his/her activity or duties under the employment contract, applicable collective labour agreement or national working time legislation.

If the contract (or applicable collective labour agreement or national working time legislation) does not allow to determine the annual workable hours, this option cannot be used;

(iii) 'standard annual productive hours': the 'standard number of annual hours' generally applied by the beneficiary for its personnel in accordance with its usual cost accounting practices. This number must be at least 90% of the 'standard annual workable hours'.

If there is no applicable reference for the standard annual workable hours, this option cannot be used.

For all options, the actual time spent on **parental leave** by a person assigned to the action may be deducted from the number of annual productive hours.

As an alternative, beneficiaries may calculate the hourly rate *per month*, as follows:

{actual monthly personnel cost (excluding additional remuneration) for the person

divided by

{number of annual productive hours / 12}}

using the personnel costs for each month and (one twelfth of) the annual productive hours calculated according to either option (i) or (iii) above, i.e.:

- fixed number of hours or

- standard annual productive hours.

Time spent on **parental leave** may not be deducted when calculating the hourly rate per month. However, beneficiaries may declare personnel costs incurred in periods of parental leave in proportion to the time the person worked on the action in that financial year.

If parts of a basic remuneration are generated over a period longer than a month, the beneficiaries may include only the share which is generated in the month (irrespective of the amount actually paid for that month).

Each beneficiary must use only one option (per full financial year or per month) for each full financial year;

(b) for personnel costs declared on the basis of **unit costs** (i.e. budget categories A.1, A.2, A.4, A.5 and A.6): the hourly rate is one of the following:

(i) for SME owners or beneficiaries that are natural persons: the hourly rate set out in Annex 2a (see Points A.4 and A.5 above), or

(ii) for personnel costs declared on the basis of the beneficiary's usual cost accounting practices: the hourly rate calculated by the beneficiary in accordance with its usual cost accounting practices, if:

- the cost accounting practices used are applied in a consistent manner, based on objective criteria, regardless of the source of funding;

- the hourly rate is calculated using the actual personnel costs recorded in the beneficiary's accounts, excluding any ineligible cost or costs included in other budget categories.

  The actual personnel costs may be adjusted by the beneficiary on the basis of budgeted or estimated elements. Those elements must be relevant for calculating the personnel costs, reasonable and correspond to objective and verifiable information;

and

- the hourly rate is calculated using the number of annual productive hours (see above).

B. Direct costs of subcontracting (not covered by Point F) (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible if the conditions in Article 13.1.1 are met.

Subcontracting costs **for providing trans-national access to research infrastructure** are eligible only if also the conditions set out in Article 16.1.1 are met.

C. Direct costs of providing financial support to third parties (not covered by Point F)

Not applicable

D. Other direct costs (not covered by Point F)

D.1 **Travel costs and related subsistence allowances** (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible if they are in line with the beneficiary's usual practices on travel.

Travel costs **for providing trans-national access to research infrastructure** are eligible only if also the conditions set out in Article 16.1.1 are met.

D.2 The **depreciation costs of equipment, infrastructure or other assets** (new or second-hand) as recorded in the beneficiary's accounts are eligible, if they were purchased in accordance with Article 10.1.1 and written off in accordance with international accounting standards and the beneficiary's usual accounting practices.

The **costs of renting or leasing** equipment, infrastructure or other assets (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are also eligible, if they do not exceed the depreciation costs of similar equipment, infrastructure or assets and do not include any financing fees.

The costs of equipment, infrastructure or other assets **contributed in-kind against payment** are eligible, if they do not exceed the depreciation costs of similar equipment, infrastructure or assets, do not include any financing fees and if the conditions in Article 11.1 are met.

The only portion of the costs that will be taken into account is that which corresponds to the duration of the action and rate of actual use for the purposes of the action.

As an exception, the beneficiaries must not declare such costs (i.e. costs of renting, leasing, purchasing depreciable equipment, infrastructure and other assets) for providing trans-national access to research infrastructure (see Article 16.1).

D.3 **Costs of other goods and services** (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible, if they are:

(a) purchased specifically for the action and in accordance with Article 10.1.1 or

(b) contributed in kind against payment and in accordance with Article 11.1.

Such goods and services include, for instance, consumables and supplies, dissemination (including open access), protection of results, certificates on the financial statements (if they are required by the Agreement), certificates on the methodology, translations and publications.

Costs of other goods and services **for providing trans-national access to research infrastructure** are eligible only if also the conditions set out in Article 16.1.1 are met.

D.4 **Capitalised and operating costs of 'large research infrastructure'**[2]: Not applicable

D.5 **Costs of internally invoiced goods and services** directly used for the action are eligible, if:

(a) they are declared on the basis of a unit cost calculated in accordance with the beneficiary's usual cost accounting practices;

[2] '**Large research infrastructure**' means research infrastructure of a total value of at least EUR 20 million, for a beneficiary, calculated as the sum of historical asset values of each individual research infrastructure of that beneficiary, as they appear in its last closed balance sheet before the date of the signature of the Agreement or as determined on the basis of the rental and leasing costs of the research infrastructure.

(b) the cost accounting practices used are applied in a consistent manner, based on objective criteria, regardless of the source of funding;

(c) the unit cost is calculated using the actual costs for the good or service recorded in the beneficiary's accounts, excluding any ineligible cost or costs included in other budget categories.

The actual costs may be adjusted by the beneficiary on the basis of budgeted or estimated elements. Those elements must be relevant for calculating the costs, reasonable and correspond to objective and verifiable information;

(d) the unit cost excludes any costs of items which are not directly linked to the production of the invoiced goods or service.

'Internally invoiced goods and services' means goods or services which are provided by the beneficiary directly for the action and which the beneficiary values on the basis of its usual cost accounting practices.

E. Indirect costs (not covered by Point F)

Indirect costs are eligible if they are declared on the basis of the flat-rate of 25% of the eligible direct costs (see Article 5.2 and Points A to D above), from which are excluded:

(a) costs of subcontracting and

(b) costs of in-kind contributions provided by third parties which are not used on the beneficiary's premises;

(c) not applicable;

(d) unit costs under Articles 5.2(f) and 6.2.F.

Beneficiaries receiving an operating grant[4] financed by the EU or Euratom budget cannot declare indirect costs for the period covered by the operating grant, unless they can demonstrate that the operating grant does not cover any costs of the action.

F. 'Costs for providing trans-national access to research infrastructure'

'Costs for providing trans-national access to research infrastructure' are eligible if they correspond to the amount per unit set out in Annex 2a multiplied by the actual number of units and if the conditions set out in Article 16.1 are met

6.3 Conditions for costs of linked third parties to be eligible

Costs incurred by linked third parties are eligible if they fulfil — *mutatis mutandis* — the general and specific conditions for eligibility set out in this Article (Article 6.1 and 6.2) and Article 14.1.1.

[4] For the definition, see Article 121(1)(b) of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002 ('**Financial Regulation No 966/2012**')(OJ L 218, 26.10.2012, p.1): '**operating grant**' means direct financial contribution, by way of donation, from the budget in order to finance the functioning of a body which pursues an aim of general EU interest or has an objective forming part of and supporting an EU policy.

6.4 Conditions for in-kind contributions provided by third parties free of charge to be eligible

In-kind contributions provided free of charge are eligible direct costs (for the beneficiary or linked third party), if the costs incurred by the third party fulfil — *mutatis mutandis* — the general and specific conditions for eligibility set out in this Article (Article 6.1 and 6.2) and Article 12.1.

6.5 Ineligible costs

'**Ineligible costs**' are:

(a) costs that do not comply with the conditions set out above (Article 6.1 to 6.4), in particular:

(i) costs related to return on capital;

(ii) debt and debt service charges;

(iii) provisions for future losses or debts;

(iv) interest owed;

(v) doubtful debts;

(vi) currency exchange losses;

(vii) bank costs charged by the beneficiary's bank for transfers from the Commission;

(viii) excessive or reckless expenditure;

(ix) deductible VAT;

(x) costs incurred during suspension of the implementation of the action (see Article 49);

(b) costs declared under another EU or Euratom grant (including grants awarded by a Member State and financed by the EU or Euratom budget and grants awarded by bodies other than the Commission for the purpose of implementing the EU or Euratom budget); in particular, indirect costs if the beneficiary is already receiving an operating grant financed by the EU or Euratom budget in the same period, unless it can demonstrate that the operating grant does not cover any costs of the action.

6.6 Consequences of declaration of ineligible costs

Declared costs that are ineligible will be rejected (see Article 42).

This may also lead to any of the other measures described in Chapter 6.

CHAPTER 4 RIGHTS AND OBLIGATIONS OF THE PARTIES

SECTION 1 RIGHTS AND OBLIGATIONS RELATED TO IMPLEMENTING THE ACTION

ARTICLE 7 — GENERAL OBLIGATION TO PROPERLY IMPLEMENT THE ACTION

7.1 General obligation to properly implement the action

The beneficiaries must implement the action as described in Annex 1 and in compliance with the provisions of the Agreement and all legal obligations under applicable EU, international and national law.

7.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 8 — RESOURCES TO IMPLEMENT THE ACTION — THIRD PARTIES INVOLVED IN THE ACTION

The beneficiaries must have the appropriate resources to implement the action.

If it is necessary to implement the action, the beneficiaries may:

- purchase goods, works and services (see Article 10);
- use in-kind contributions provided by third parties against payment (see Article 11);
- use in-kind contributions provided by third parties free of charge (see Article 12);
- call upon subcontractors to implement action tasks described in Annex 1 (see Article 13);
- call upon linked third parties to implement action tasks described in Annex 1 (see Article 14);
- call upon international partners to implement action tasks described in Annex 1 (see Article 14a).

In these cases, the beneficiaries retain sole responsibility towards the Commission and the other beneficiaries for implementing the action.

ARTICLE 9 — IMPLEMENTATION OF ACTION TASKS BY BENEFICIARIES NOT RECEIVING EU FUNDING

9.1 Rules for the implementation of action tasks by beneficiaries not receiving EU funding

Beneficiaries that are not eligible for EU funding (‘**beneficiaries not receiving EU funding**’) must implement the action tasks attributed to them in Annex 1 in accordance with Article 7.1.

Their costs are estimated in Annex 2 but:

- will not be reimbursed and
- will not be taken into account for the calculation of the grant (see Articles 5.2, 5.3 and 5.4, and 21).

Chapter 3, Articles 10 to 15, 18.1.2, 20.3(b), 20.4(b), 20.6, 21, 23a, 26.4, 27.2, 28.1, 28.2, 30.3, 31.5, 40, 42, 43, 44, 47 and 48 do not apply to these beneficiaries.

They will not be subject to financial checks, reviews and audits under Article 22.

Beneficiaries not receiving EU funding may provide in-kind contributions to another beneficiary. In this case, they will be considered as a third party for the purpose of Articles 11 and 12.

9.2 Consequences of non-compliance

If a beneficiary not receiving EU funding breaches any of its obligations under this Article, its participation in the Agreement may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6 that are applicable to it.

ARTICLE 10 — PURCHASE OF GOODS, WORKS OR SERVICES

10.1 Rules for purchasing goods, works or services

10.1.1 If necessary to implement the action, the beneficiaries may purchase goods, works or services.

The beneficiaries must make such purchases ensuring the best value for money or, if appropriate, the lowest price. In doing so, they must avoid any conflict of interests (see Article 35).

The beneficiaries must ensure that the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards their contractors.

10.1.2 Beneficiaries that are 'contracting authorities' within the meaning of Directive 2004/18/EC[5] (or 2014/24/EU[6]) or 'contracting entities' within the meaning of Directive 2004/17/EC[7] (or 2014/25/EU[8]) must comply with the applicable national law on public procurement.

10.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 10.1.1, the costs related to the contract concerned will be ineligible (see Article 6) and will be rejected (see Article 42).

If a beneficiary breaches any of its obligations under Article 10.1.2, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

[5] Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public work contracts, public supply contracts and public service contracts (OJ L 134, 30.04.2004, p. 114).

[6] Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC. (OJ L 94, 28.03.2014, p. 65).

[7] Directive 2004/17/EC of the European Parliament and of the Council of 31 March 2004 coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors (OJ L 134, 30.04.2004, p. 1)

[8] Directive 2014/25/EU of the European Parliament and of the Council of 26 February 2014 on procurement by entities operating in the water, energy, transport and postal services sectors and repealing Directive 2004/17/EC (OJ L 94, 28.03.2014, p. 243).

ARTICLE 11 — USE OF IN-KIND CONTRIBUTIONS PROVIDED BY THIRD PARTIES AGAINST PAYMENT

11.1 Rules for the use of in-kind contributions against payment

If necessary to implement the action, the beneficiaries may use in-kind contributions provided by third parties against payment.

The beneficiaries may declare costs related to the payment of in-kind contributions as eligible (see Article 6.1 and 6.2), up to the third parties' costs for the seconded persons, contributed equipment, infrastructure or other assets or other contributed goods and services.

The third parties and their contributions must be set out in Annex 1. The Commission may however approve in-kind contributions not set out in Annex 1 without amendment (see Article 55), if:

- they are specifically justified in the periodic technical report and
- their use does not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards the third parties.

11.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the costs related to the payment of the in-kind contribution will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 12 — USE OF IN-KIND CONTRIBUTIONS PROVIDED BY THIRD PARTIES FREE OF CHARGE

12.1 Rules for the use of in-kind contributions free of charge

If necessary to implement the action, the beneficiaries may use in-kind contributions provided by third parties free of charge.

The beneficiaries may declare costs incurred by the third parties for the seconded persons, contributed equipment, infrastructure or other assets or other contributed goods and services as eligible in accordance with Article 6.4.

The third parties and their contributions must be set out in Annex 1. The Commission may however approve in-kind contributions not set out in Annex 1 without amendment (see Article 55), if:

- they are specifically justified in the periodic technical report and
- their use does not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that the Commission, the European Court of Auditors (ECA) and the

European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards the third parties.

12.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the costs incurred by the third parties related to the in-kind contribution will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 13 — IMPLEMENTATION OF ACTION TASKS BY SUBCONTRACTORS

13.1 Rules for subcontracting action tasks

13.1.1 If necessary to implement the action, the beneficiaries may award subcontracts covering the implementation of certain action tasks described in Annex 1.

Subcontracting may cover only a limited part of the action.

The beneficiaries must award the subcontracts ensuring the best value for money or, if appropriate, the lowest price. In doing so, they must avoid any conflict of interests (see Article 35).

The tasks to be implemented and the estimated cost for each subcontract must be set out in Annex 1 and the total estimated costs of subcontracting per beneficiary must be set out in Annex 2. The Commission may however approve subcontracts not set out in Annex 1 and 2 without amendment (see Article 55), if:

- they are specifically justified in the periodic technical report and
- they do not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards their subcontractors.

13.1.2 The beneficiaries must ensure that their obligations under Articles 35, 36, 38 and 46 also apply to the subcontractors.

Beneficiaries that are ‘contracting authorities’ within the meaning of Directive 2004/18/EC (or 2014/24/EU) or ‘contracting entities’ within the meaning of Directive 2004/17/EC (or 2014/25/EU) must comply with the applicable national law on public procurement.

13.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 13.1.1, the costs related to the subcontract concerned will be ineligible (see Article 6) and will be rejected (see Article 42).

If a beneficiary breaches any of its obligations under Article 13.1.2, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 14 — IMPLEMENTATION OF ACTION TASKS BY LINKED THIRD PARTIES

14.1 Rules for calling upon linked third parties to implement part of the action

14.1.1 The following **affiliated entities**[10] and **third parties with a legal link to a beneficiary**[11] (‘**linked third parties**’) may implement the action tasks attributed to them in Annex 1:

- ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA (UNIBO), affiliated or linked to CNR
- UNIVERSITA DEGLI STUDI DI PERUGIA (UNIPG), affiliated or linked to CNR
- ISTITUTO NAZIONALE DI FISICA NUCLEARE (INFN), affiliated or linked to CNR
- OPIFICIO DELLE PIETRE DURE (OPD), affiliated or linked to CNR
- KONINKLIJKE MUSEA VOOR KUNST EN GESCHIEDENIS (KMKG-MRAH), affiliated or linked to KIK-IRPA
- ARCHEOLOGICKY USTAV AV CR BRNO VVI (IAB), affiliated or linked to ITAM
- ARCHEOLOGICKY USTAV AV CR PRAHA VVI (IAP), affiliated or linked to ITAM
- EBERHARD KARLS UNIVERSITAET TUEBINGEN (EKUT), affiliated or linked to SPK
- TECHNISCHE UNIVERSITAET MUENCHEN (TUM), affiliated or linked to SPK
- DEUTSCHES ARCHAOLOGISCHES INSTITUT (DAI), affiliated or linked to SPK
- CURT-ENGELHORN ZENTRUM ARCHAOMETRIEGGMBH-CEZA (CEZA), affiliated or linked to SPK
- RHEINISCH-WESTFAELISCHE TECHNISCHE HOCHSCHULE AACHEN (RWTH), affiliated or linked to SPK
- Doerner Institut, Bayerische Staatsgemäldesammlungen (DI), affiliated or linked to SPK

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[10] For the definition see Article 2.1(2) Rules for Participation Regulation No 1290/2013: ‘**affiliated entity**’ means any legal entity that is:
- under the direct or indirect control of a participant, or
- under the same direct or indirect control as the participant, or
- directly or indirectly controlling a participant.

‘Control’ may take any of the following forms:
(a) the direct or indirect holding of more than 50% of the nominal value of the issued share capital in the legal entity concerned, or of a majority of the voting rights of the shareholders or associates of that entity;
(b) the direct or indirect holding, in fact or in law, of decision-making powers in the legal entity concerned.

However the following relationships between legal entities shall not in themselves be deemed to constitute controlling relationships:
(a) the same public investment corporation, institutional investor or venture-capital company has a direct or indirect holding of more than 50% of the nominal value of the issued share capital or a majority of voting rights of the shareholders or associates;
(b) the legal entities concerned are owned or supervised by the same public body.

[11] ‘**Third party with a legal link to a beneficiary**’ is any legal entity which has a legal link to the beneficiary implying collaboration that is not limited to the action.

- FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V. (Fraunhofer), affiliated or linked to SPK
- CENTRO NACIONAL DE INVESTIGACION SOBRE LA EVOLUCION HUMANA (CENIEH), affiliated or linked to CSIC
- MINISTERIO DE CULTURA Y DEPORTE (IPCE), affiliated or linked to CSIC
- UNIVERSITE DE LILLE (ULL), affiliated or linked to CNRS
- UNIVERSITE DE BORDEAUX (UBX), affiliated or linked to CNRS
- SYNCHROTRON SOLEIL SOCIETE CIVILE (SOLEIL), affiliated or linked to CNRS
- MUSEUM NATIONAL D'HISTOIRE NATURELLE (MNHN), affiliated or linked to CNRS
- MINISTERE DE LA CULTURE ET DE LA COMMUNICATION (MC), affiliated or linked to CNRS
- IDRYMA ORMYLIA (Of-ADC), affiliated or linked to FORTH
- MAGYAR TUDOMANYOS AKADEMIA WIGNER FIZIKAI KUTATOKOZPONT (WIGNER), affiliated or linked to Atomki
- MAGYAR TUDOMANYOS AKADEMIA ENERGIATUDOMANYI KUTATOKOZPONT (EK), affiliated or linked to Atomki
- STICHTING VU (VU), affiliated or linked to RCE
- STICHTING HET RIJKSMUSEUM (RMA), affiliated or linked to RCE
- RIJKSUNIVERSITEIT GRONINGEN (RUG), affiliated or linked to RCE
- KONINKLIJKE NEDERLANDSE AKADEMIE VAN WETENSCHAPPEN - KNAW (KNAW DANS), affiliated or linked to RCE
- TECHNISCHE UNIVERSITEIT DELFT (TUD), affiliated or linked to RCE
- UNIWERSYTET WARSZAWSKI (UW), affiliated or linked to NCU
- INSTYTUT KATALIZY I FIZYKOCHEMII POWIERZCHNI IM. JERZEGO HABERA POLSKA AKADEMIA NAUK (JHI), affiliated or linked to NCU
- AKADEMIA GORNICZO-HUTNICZA IM. STANISLAWA STASZICA W KRAKOWIE (AGH), affiliated or linked to NCU
- LABORATORIO NACIONAL DE ENGENHARIA CIVIL (LNEC), affiliated or linked to UEvora
- INSTITUTUL NATIONAL AL PATRIMONIULUI (INP), affiliated or linked to INOE
- GOETEBORGS UNIVERSITET (CL), affiliated or linked to RAA
- UMEA UNIVERSITET (MAL), affiliated or linked to RAA

- UPPSALA UNIVERSITET (SciLifeLab), affiliated or linked to RAA
- UNIVERZA V LJUBLJANI (UL), affiliated or linked to ZVKDS
- THE UNIVERSITY OF NOTTINGHAM (NTU), affiliated or linked to UCL
- BRITISH MUSEUM (BM), affiliated or linked to UCL
- THE NATIONAL GALLERY (NG), affiliated or linked to UCL
- UNIVERSITY OF YORK (UoY), affiliated or linked to UCL
- HISTORIC BUILDINGS AND MONUMENTS COMMISSION FOR ENGLAND (HEL-FC), affiliated or linked to UCL

The linked third parties may declare as eligible the costs they incur for implementing the action tasks in accordance with Article 6.3.

The beneficiaries must ensure that the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards their linked third parties.

14.1.2 The beneficiaries must ensure that their obligations under Articles 18, 20, 35, 36 and 38 also apply to their linked third parties.

14.2 Consequences of non-compliance

If any obligation under Article 14.1.1 is breached, the costs of the linked third party will be ineligible (see Article 6) and will be rejected (see Article 42).

If any obligation under Article 14.1.2 is breached, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 14a — IMPLEMENTATION OF ACTION TASKS BY INTERNATIONAL PARTNERS

Not applicable

ARTICLE 15 — FINANCIAL SUPPORT TO THIRD PARTIES

15.1 Rules for providing financial support to third parties

Not applicable

15.2 Financial support in the form of prizes

Not applicable

15.3 Consequences of non-compliance

Not applicable

ARTICLE 16 — PROVISION OF TRANS-NATIONAL OR VIRTUAL ACCESS TO RESEARCH INFRASTRUCTURE

16.1 Rules for providing trans-national access to research infrastructure

16.1.1 '**Access providers**'[13] must provide access to research infrastructure or installations[14] in accordance with the following conditions:

(a) access which must be provided:

The access must be free of charge, trans-national access to research infrastructure or installations for selected user-groups.

This access must include the logistical, technological and scientific support and the specific training that is usually provided to external researchers using the infrastructure.

(b) categories of users that may have access:

Trans-national access must be provided to selected '**user-groups**', i.e. teams of one or more researchers (users) led by a '**user group leader**'.

The user group leader and the majority of the users must work in a country other than the country(ies) where the installation is located.

This rule does not apply:

- if access is provided by an International organisation, the Joint Research Centre (JRC), an ERIC or similar legal entities;
- in case of remote access to a set of installations located in different countries offering the same type of service.

Only user groups that are allowed to disseminate the results they have generated under the action may benefit from the access, unless the users are working for SMEs.

Access for user groups with a majority of users not working in a EU or associated country[15] is limited to 20% of the total amount of units of access provided under the grant, unless a higher percentage is foreseen in Annex 1;

(c) procedure and criteria for selecting user groups:

The user groups must request access by submitting (in writing) a description of the work that they wish to carry out and the names, nationalities and home institutions of the users.

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[13] '**Access provider**' means a beneficiary or linked third party that is in charge of providing access to one or more research infrastructures or installations, or part of them, as described in Annex 1.

[14] '**Installation**' means a part or a service of a research infrastructure that could be used independently from the rest. A research infrastructure consists of one or more installations.

[15] For the definition, see Article 2.1(3) of the Rules for Participation Regulation No 1290/2013: '**associated country**' means a third country which is party to an international agreement with the Union, as identified in Article 7 of Horizon 2020 Framework Programme Regulation No 1291/2013. Article 7 sets out the conditions for association of non-EU countries to Horizon 2020.

The user groups must be selected by a **selection panel** set up by the access providers.

The selection panel must be composed of international experts in the field, at least half of them independent from the beneficiaries, unless otherwise specified in Annex 1.

The selection panel must assess all proposals received and recommend a short-list of the user groups that should benefit from access.

The selection panel must base its selection on scientific merit, taking into account that priority should be given to user groups composed of users who:

- have not previously used the installation and
- are working in countries where no equivalent research infrastructure exist.

It will apply the principles of transparency, fairness and impartiality.

(d) other conditions:

The access provider must request written approval from the Commission (see Article 52) for the selection of user groups requiring visits to the installation(s) exceeding 3 months, unless such visits are foreseen in Annex 1.

16.1.2 In addition, the access provider must:

- advertise widely, including on a dedicated website, the access offered under the Agreement;
- promote equal opportunities in advertising the access and take into account the gender dimension when defining the support provided to users;
- ensure that users comply with the terms and conditions of this Agreement;
- ensure that its obligations under Articles 35, 36, 38 and 46 also apply to the users.

16.2 Rules for providing virtual access to research infrastructure

Not applicable

16.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Articles 16.1.1 and 16.2, the costs of access will be ineligible (see Article 6) and will be rejected (see Article 42).

If a beneficiary breaches any of its obligations under Articles 16.1.2, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

SECTION 2 RIGHTS AND OBLIGATIONS RELATED TO THE GRANT ADMINISTRATION

ARTICLE 17 — GENERAL OBLIGATION TO INFORM

17.1 General obligation to provide information upon request

The beneficiaries must provide — during implementation of the action or afterwards and in accordance with Article 41.2 — any information requested in order to verify eligibility of the costs, proper implementation of the action and compliance with any other obligation under the Agreement.

17.2 Obligation to keep information up to date and to inform about events and circumstances likely to affect the Agreement

Each beneficiary must keep information stored in the Participant Portal Beneficiary Register (via the electronic exchange system; see Article 52) up to date, in particular, its name, address, legal representatives, legal form and organisation type.

Each beneficiary must immediately inform the coordinator — which must immediately inform the Commission and the other beneficiaries — of any of the following:

(a) **events** which are likely to affect significantly or delay the implementation of the action or the EU's financial interests, in particular:

(i) changes in its legal, financial, technical, organisational or ownership situation or those of its linked third parties and

(ii) changes in the name, address, legal form, organisation type of its linked third parties;

(b) **circumstances** affecting:

(i) the decision to award the grant or

(ii) compliance with requirements under the Agreement.

17.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 18 — KEEPING RECORDS — SUPPORTING DOCUMENTATION

18.1 Obligation to keep records and other supporting documentation

The beneficiaries must — for a period of five years after the payment of the balance — keep records and other supporting documentation in order to prove the proper implementation of the action and the costs they declare as eligible.

They must make them available upon request (see Article 17) or in the context of checks, reviews, audits or investigations (see Article 22).

If there are on-going checks, reviews, audits, investigations, litigation or other pursuits of claims under

the Agreement (including the extension of findings; see Article 22), the beneficiaries must keep the records and other supporting documentation until the end of these procedures.

The beneficiaries must keep the original documents. Digital and digitalised documents are considered originals if they are authorised by the applicable national law. The Commission may accept non-original documents if it considers that they offer a comparable level of assurance.

18.1.1 Records and other supporting documentation on the scientific and technical implementation

The beneficiaries must keep records and other supporting documentation on scientific and technical implementation of the action in line with the accepted standards in the respective field.

18.1.2 Records and other documentation to support the costs declared

The beneficiaries must keep the records and documentation supporting the costs declared, in particular the following:

(a) for **actual costs**: adequate records and other supporting documentation to prove the costs declared, such as contracts, subcontracts, invoices and accounting records. In addition, the beneficiaries' usual cost accounting practices and internal control procedures must enable direct reconciliation between the amounts declared, the amounts recorded in their accounts and the amounts stated in the supporting documentation;

(b) for **unit costs**: adequate records and other supporting documentation to prove the number of units declared. This documentation must include records of the names, nationalities, and home institutions of users, as well as the nature and quantity of access provided to them. Beneficiaries do not need to identify the actual eligible costs covered or to keep or provide supporting documentation (such as accounting statements) to prove the amount per unit.

In addition, **for unit costs calculated in accordance with the beneficiary's usual cost accounting practices**, the beneficiaries must keep adequate records and documentation to prove that the cost accounting practices used comply with the conditions set out in Article 6.2.

The beneficiaries and linked third parties may submit to the Commission, for approval, a certificate (drawn up in accordance with Annex 6) stating that their usual cost accounting practices comply with these conditions ('**certificate on the methodology**'). If the certificate is approved, costs declared in line with this methodology will not be challenged subsequently, unless the beneficiaries have concealed information for the purpose of the approval.

(c) for **flat-rate costs**: adequate records and other supporting documentation to prove the eligibility of the costs to which the flat-rate is applied. The beneficiaries do not need to identify the costs covered or provide supporting documentation (such as accounting statements) to prove the amount declared at a flat-rate.

In addition, for **personnel costs** (declared as actual costs or on the basis of unit costs), the beneficiaries must keep **time records** for the number of hours declared. The time records must be in writing and approved by the persons working on the action and their supervisors, at least monthly. In the absence of reliable time records of the hours worked on the action, the Commission may accept alternative evidence supporting the number of hours declared, if it considers that it offers an adequate level of assurance.

As an exception, for **persons working exclusively on the action**, there is no need to keep time records, if the beneficiary signs a **declaration** confirming that the persons concerned have worked exclusively on the action.

For costs declared by linked third parties (see Article 14), it is the beneficiary that must keep the originals of the financial statements and the certificates on the financial statements of the linked third parties.

18.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, costs insufficiently substantiated will be ineligible (see Article 6) and will be rejected (see Article 42), and the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 19 — SUBMISSION OF DELIVERABLES

19.1 Obligation to submit deliverables

The coordinator must submit the '**deliverables**' identified in Annex 1, in accordance with the timing and conditions set out in it.

19.2 Consequences of non-compliance

If the coordinator breaches any of its obligations under this Article, the Commission may apply any of the measures described in Chapter 6.

ARTICLE 20 — REPORTING — PAYMENT REQUESTS

20.1 Obligation to submit reports

The coordinator must submit to the Commission (see Article 52) the technical and financial reports set out in this Article. These reports include requests for payment and must be drawn up using the forms and templates provided in the electronic exchange system (see Article 52).

20.2 Reporting periods

The action is divided into the following '**reporting periods**':

- RP1: from month 1 to month 18
- RP2: from month 19 to month 36

20.3 Periodic reports — Requests for interim payments

The coordinator must submit a periodic report within 60 days following the end of each reporting period.

The **periodic report** must include the following:

(a) a '**periodic technical report**' containing:

(i) an **explanation of the work carried out** by the beneficiaries;

(ii) an **overview of the progress** towards the objectives of the action, including milestones and deliverables identified in Annex 1.

This report must include explanations justifying the differences between work expected to be carried out in accordance with Annex 1 and that actually carried out.

The report must detail the exploitation and dissemination of the results and — if required in Annex 1 — an updated '**plan for the exploitation and dissemination of the results**'.

The report must indicate the communication activities.

The report must detail the access activity, indicating the members of the selection panel, the selection procedure, the exact amount of access provided to the user groups, the description of their work, and information on the users (including names, nationality and home institutions);

(iii) a **summary** for publication by the Commission;

(iv) the answers to the '**questionnaire**', covering issues related to the action implementation and the economic and societal impact, notably in the context of the Horizon 2020 key performance indicators and the Horizon 2020 monitoring requirements;

(b) a '**periodic financial report**' containing:

(i) an '**individual financial statement**' (see Annex 4) from each beneficiary and from each linked third party, for the reporting period concerned.

The individual financial statement must detail the eligible costs (actual costs, unit costs and flat-rate costs; see Article 6) for each budget category (see Annex 2).

The beneficiaries and linked third parties must declare all eligible costs, even if — for actual costs, unit costs and flat-rate costs — they exceed the amounts indicated in the estimated budget (see Annex 2). Amounts which are not declared in the individual financial statement will not be taken into account by the Commission.

If an individual financial statement is not submitted for a reporting period, it may be included in the periodic financial report for the next reporting period.

The individual financial statements of the last reporting period must also detail the **receipts of the action** (see Article 5.3.3).

Each beneficiary and each linked third party must **certify** that:

- the information provided is full, reliable and true;
- the costs declared are eligible (see Article 6);
- the costs can be substantiated by adequate records and supporting documentation (see Article 18) that will be produced upon request (see Article 17) or in the context of checks, reviews, audits and investigations (see Article 22), and

- for the last reporting period: that all the receipts have been declared (see Article 5.3.3);

(ii) an **explanation of the use of resources** and the information on subcontracting (see Article 13) and in-kind contributions provided by third parties (see Articles 11 and 12) from each beneficiary and from each linked third party, for the reporting period concerned;

(iii) not applicable;

(iv) a '**periodic summary financial statement**', created automatically by the electronic exchange system, consolidating the individual financial statements for the reporting period concerned and including — except for the last reporting period — the **request for interim payment**.

20.4 Final report — Request for payment of the balance

In addition to the periodic report for the last reporting period, the coordinator must submit the final report within 60 days following the end of the last reporting period.

The **final report** must include the following:

(a) a '**final technical report**' with a **summary** for publication containing:

(i) an overview of the results and their exploitation and dissemination;

(ii) the conclusions on the action, and

(iii) the socio-economic impact of the action;

(b) a '**final financial report**' containing:

(i) a '**final summary financial statement**', created automatically by the electronic exchange system, consolidating the individual financial statements for all reporting periods and including the **request for payment of the balance** and

(ii) a '**certificate on the financial statements**' (drawn up in accordance with Annex 5) for each beneficiary and for each linked third party, if it requests a total contribution of EUR 325 000 or more, as reimbursement of actual costs and unit costs calculated on the basis of its usual cost accounting practices (see Article 5.2 and Article 6.2).

20.5 Information on cumulative expenditure incurred

Not applicable

20.6 Currency for financial statements and conversion into euro

Financial statements must be drafted in euro.

Beneficiaries and linked third parties with accounting established in a currency other than the euro must convert the costs recorded in their accounts into euro, at the average of the daily exchange

rates published in the C series of the *Official Journal of the European Union*, calculated over the corresponding reporting period.

If no daily euro exchange rate is published in the *Official Journal of the European Union* for the currency in question, they must be converted at the average of the monthly accounting rates published on the Commission's website, calculated over the corresponding reporting period.

Beneficiaries and linked third parties with accounting established in euro must convert costs incurred in another currency into euro according to their usual accounting practices.

20.7 Language of reports

All reports (technical and financial reports, including financial statements) must be submitted in the language of the Agreement.

20.8 Consequences of non-compliance

If the reports submitted do not comply with this Article, the Commission may suspend the payment deadline (see Article 47) and apply any of the other measures described in Chapter 6.

If the coordinator breaches its obligation to submit the reports and if it fails to comply with this obligation within 30 days following a written reminder, the Commission may terminate the Agreement (see Article 50) or apply any of the other measures described in Chapter 6.

ARTICLE 21 — PAYMENTS AND PAYMENT ARRANGEMENTS

21.1 Payments to be made

The following payments will be made to the coordinator:

- one **pre-financing payment**;
- one or more **interim payments**, on the basis of the request(s) for interim payment (see Article 20), and
- one **payment of the balance**, on the basis of the request for payment of the balance (see Article 20).

21.2 Pre-financing payment — Amount — Amount retained for the Guarantee Fund

The aim of the pre-financing is to provide the beneficiaries with a float.

It remains the property of the EU until the payment of the balance.

The amount of the pre-financing payment will be EUR **4 930 168.90** (four million nine hundred and thirty thousand one hundred and sixty eight EURO and ninety eurocents).

The Commission will — except if Article 48 applies — make the pre-financing payment to the coordinator within 30 days, either from the entry into force of the Agreement (see Article 58) or from 10 days before the starting date of the action (see Article 3), whichever is the latest.

An amount of EUR **308 135.56** (three hundred and eight thousand one hundred and thirty five EURO

and fifty six eurocents), corresponding to 5% of the maximum grant amount (see Article 5.1), is retained by the Commission from the pre-financing payment and transferred into the '**Guarantee Fund**'.

21.3 Interim payments — Amount — Calculation

Interim payments reimburse the eligible costs incurred for the implementation of the action during the corresponding reporting periods.

The Commission will pay to the coordinator the amount due as interim payment within 90 days from receiving the periodic report (see Article 20.3), except if Articles 47 or 48 apply.

Payment is subject to the approval of the periodic report. Its approval does not imply recognition of the compliance, authenticity, completeness or correctness of its content.

The **amount due as interim payment** is calculated by the Commission in the following steps:

Step 1 — Application of the reimbursement rates

Step 2 — Limit to 90% of the maximum grant amount

21.3.1 Step 1 — Application of the reimbursement rates

The reimbursement rate(s) (see Article 5.2) are applied to the eligible costs (actual costs, unit costs and flat-rate costs; see Article 6) declared by the beneficiaries and the linked third parties (see Article 20) and approved by the Commission (see above) for the concerned reporting period.

21.3.2 Step 2 — Limit to 90% of the maximum grant amount

The total amount of pre-financing and interim payments must not exceed 90% of the maximum grant amount set out in Article 5.1. The maximum amount for the interim payment will be calculated as follows:

{90% of the maximum grant amount (see Article 5.1)

minus

{pre-financing and previous interim payments}}.

21.4 Payment of the balance — Amount — Calculation — Release of the amount retained for the Guarantee Fund

The payment of the balance reimburses the remaining part of the eligible costs incurred by the beneficiaries for the implementation of the action.

If the total amount of earlier payments is greater than the final grant amount (see Article 5.3), the payment of the balance takes the form of a recovery (see Article 44).

If the total amount of earlier payments is lower than the final grant amount, the Commission will pay the balance within 90 days from receiving the final report (see Article 20.4), except if Articles 47 or 48 apply.

Payment is subject to the approval of the final report. Its approval does not imply recognition of the compliance, authenticity, completeness or correctness of its content.

The **amount due as the balance** is calculated by the Commission by deducting the total amount of pre-financing and interim payments (if any) already made, from the final grant amount determined in accordance with Article 5.3:

{final grant amount (see Article 5.3)

minus

{pre-financing and interim payments (if any) made}}.

At the payment of the balance, the amount retained for the Guarantee Fund (see above) will be released and:

- if the balance is positive: the amount released will be paid in full to the coordinator together with the amount due as the balance;
- if the balance is negative (payment of the balance taking the form of recovery): it will be deducted from the amount released (see Article 44.1.2). If the resulting amount:
  - is positive, it will be paid to the coordinator
  - is negative, it will be recovered.

The amount to be paid may however be offset — without the beneficiaries' consent — against any other amount owed by a beneficiary to the Commission or an executive agency (under the EU or Euratom budget), up to the maximum EU contribution indicated, for that beneficiary, in the estimated budget (see Annex 2).

21.5 Notification of amounts due

When making payments, the Commission will formally notify to the coordinator the amount due, specifying whether it concerns an interim payment or the payment of the balance.

For the payment of the balance, the notification will also specify the final grant amount.

In the case of reduction of the grant or recovery of undue amounts, the notification will be preceded by the contradictory procedure set out in Articles 43 and 44.

21.6 Currency for payments

The Commission will make all payments in euro.

21.7 Payments to the coordinator — Distribution to the beneficiaries

Payments will be made to the coordinator.

Payments to the coordinator will discharge the Commission from its payment obligation.

The coordinator must distribute the payments between the beneficiaries without unjustified delay.

Pre-financing may however be distributed only:

(a) if the minimum number of beneficiaries set out in the call for proposals has acceded to the Agreement (see Article 56) and

(b) to beneficiaries that have acceded to the Agreement (see Article 56).

21.8 Bank account for payments

All payments will be made to the following bank account:

Name of bank: BANCA NAZIONALE DEL LAVORO S.P.A.
Full name of the account holder: CONSIGLIO NAZIONALE DELLE RICERCHE
IBAN code: IT75N0100503392000000218150

21.9 Costs of payment transfers

The cost of the payment transfers is borne as follows:

- the Commission bears the cost of transfers charged by its bank;
- the beneficiary bears the cost of transfers charged by its bank;
- the party causing a repetition of a transfer bears all costs of the repeated transfer.

21.10 Date of payment

Payments by the Commission are considered to have been carried out on the date when they are debited to its account.

21.11 Consequences of non-compliance

21.11.1 If the Commission does not pay within the payment deadlines (see above), the beneficiaries are entitled to **late-payment interest** at the rate applied by the European Central Bank (ECB) for its main refinancing operations in euros ('reference rate'), plus three and a half points. The reference rate is the rate in force on the first day of the month in which the payment deadline expires, as published in the C series of the *Official Journal of the European Union*.

If the late-payment interest is lower than or equal to EUR 200, it will be paid to the coordinator only upon request submitted within two months of receiving the late payment.

Late-payment interest is not due if all beneficiaries are EU Member States (including regional and local government authorities or other public bodies acting on behalf of a Member State for the purpose of this Agreement).

Suspension of the payment deadline or payments (see Articles 47 and 48) will not be considered as late payment.

Late-payment interest covers the period running from the day following the due date for payment (see above), up to and including the date of payment.

Late-payment interest is not considered for the purposes of calculating the final grant amount.

21.11.2 If the coordinator breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or the participation of the coordinator may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 22 — CHECKS, REVIEWS, AUDITS AND INVESTIGATIONS — EXTENSION OF FINDINGS

22.1 Checks, reviews and audits by the Commission

22.1.1 Right to carry out checks

The Commission will — during the implementation of the action or afterwards — check the proper implementation of the action and compliance with the obligations under the Agreement, including assessing deliverables and reports.

For this purpose the Commission may be assisted by external persons or bodies.

The Commission may also request additional information in accordance with Article 17. The Commission may request beneficiaries to provide such information to it directly.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

22.1.2 Right to carry out reviews

The Commission may — during the implementation of the action or afterwards — carry out reviews on the proper implementation of the action (including assessment of deliverables and reports), compliance with the obligations under the Agreement and continued scientific or technological relevance of the action.

Reviews may be started up to two years after the payment of the balance. They will be formally notified to the coordinator or beneficiary concerned and will be considered to have started on the date of the formal notification.

If the review is carried out on a third party (see Articles 10 to 16), the beneficiary concerned must inform the third party.

The Commission may carry out reviews directly (using its own staff) or indirectly (using external persons or bodies appointed to do so). It will inform the coordinator or beneficiary concerned of the identity of the external persons or bodies. They have the right to object to the appointment on grounds of commercial confidentiality.

The coordinator or beneficiary concerned must provide — within the deadline requested — any information and data in addition to deliverables and reports already submitted (including information on the use of resources). The Commission may request beneficiaries to provide such information to it directly.

The coordinator or beneficiary concerned may be requested to participate in meetings, including with external experts.

For **on-the-spot** reviews, the beneficiaries must allow access to their sites and premises, including to external persons or bodies, and must ensure that information requested is readily available.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

On the basis of the review findings, a '**review report**' will be drawn up.

The Commission will formally notify the review report to the coordinator or beneficiary concerned, which has 30 days to formally notify observations ('**contradictory review procedure**').

Reviews (including review reports) are in the language of the Agreement.

22.1.3 Right to carry out audits

The Commission may — during the implementation of the action or afterwards — carry out audits on the proper implementation of the action and compliance with the obligations under the Agreement.

Audits may be started up to two years after the payment of the balance. They will be formally notified to the coordinator or beneficiary concerned and will be considered to have started on the date of the formal notification.

If the audit is carried out on a third party (see Articles 10 to 16), the beneficiary concerned must inform the third party.

The Commission may carry out audits directly (using its own staff) or indirectly (using external persons or bodies appointed to do so). It will inform the coordinator or beneficiary concerned of the identity of the external persons or bodies. They have the right to object to the appointment on grounds of commercial confidentiality.

The coordinator or beneficiary concerned must provide — within the deadline requested — any information (including complete accounts, individual salary statements or other personal data) to verify compliance with the Agreement. The Commission may request beneficiaries to provide such information to it directly.

For **on-the-spot** audits, the beneficiaries must allow access to their sites and premises, including to external persons or bodies, and must ensure that information requested is readily available.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

On the basis of the audit findings, a '**draft audit report**' will be drawn up.

The Commission will formally notify the draft audit report to the coordinator or beneficiary concerned, which has 30 days to formally notify observations ('**contradictory audit procedure**'). This period may be extended by the Commission in justified cases.

The '**final audit report**' will take into account observations by the coordinator or beneficiary concerned. The report will be formally notified to it.

Audits (including audit reports) are in the language of the Agreement.

The Commission may also access the beneficiaries' statutory records for the periodical assessment of unit costs or flat-rate amounts.

22.2 Investigations by the European Anti-Fraud Office (OLAF)

Under Regulations No 883/2013[16] and No 2185/96[17] (and in accordance with their provisions and procedures), the European Anti-Fraud Office (OLAF) may — at any moment during implementation of the action or afterwards — carry out investigations, including on-the-spot checks and inspections, to establish whether there has been fraud, corruption or any other illegal activity affecting the financial interests of the EU.

22.3 Checks and audits by the European Court of Auditors (ECA)

Under Article 287 of the Treaty on the Functioning of the European Union (TFEU) and Article 161 of the Financial Regulation No 966/2012[18], the European Court of Auditors (ECA) may — at any moment during implementation of the action or afterwards — carry out audits.

The ECA has the right of access for the purpose of checks and audits.

22.4 Checks, reviews, audits and investigations for international organisations

Not applicable

22.5 Consequences of findings in checks, reviews, audits and investigations — Extension of findings

22.5.1 Findings in this grant

Findings in checks, reviews, audits or investigations carried out in the context of this grant may lead to the rejection of ineligible costs (see Article 42), reduction of the grant (see Article 43), recovery of undue amounts (see Article 44) or to any of the other measures described in Chapter 6.

Rejection of costs or reduction of the grant after the payment of the balance will lead to a revised final grant amount (see Article 5.4).

Findings in checks, reviews, audits or investigations may lead to a request for amendment for the modification of Annex 1 (see Article 55).

Checks, reviews, audits or investigations that find systemic or recurrent errors, irregularities, fraud or breach of obligations may also lead to consequences in other EU or Euratom grants awarded under similar conditions ('**extension of findings from this grant to other grants**').

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[16] Regulation (EU, Euratom) No 883/2013 of the European Parliament and of the Council of 11 September 2013 concerning investigations conducted by the European Anti-Fraud Office (OLAF) and repealing Regulation (EC) No 1073/1999 of the European Parliament and of the Council and Council Regulation (Euratom) No 1074/1999 (OJ L 248, 18.09.2013, p. 1).

[17] Council Regulation (Euratom, EC) No 2185/1996 of 11 November 1996 concerning on-the-spot checks and inspections carried out by the Commission in order to protect the European Communities' financial interests against fraud and other irregularities (OJ L 292, 15.11.1996, p. 2).

[18] Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002 (OJ L 298, 26.10.2012, p. 1).

Moreover, findings arising from an OLAF investigation may lead to criminal prosecution under national law.

22.5.2 Findings in other grants

The Commission may extend findings from other grants to this grant ('**extension of findings from other grants to this grant**'), if:

(a) the beneficiary concerned is found, in other EU or Euratom grants awarded under similar conditions, to have committed systemic or recurrent errors, irregularities, fraud or breach of obligations that have a material impact on this grant and

(b) those findings are formally notified to the beneficiary concerned — together with the list of grants affected by the findings — no later than two years after the payment of the balance of this grant.

The extension of findings may lead to the rejection of costs (see Article 42), reduction of the grant (see Article 43), recovery of undue amounts (see Article 44), suspension of payments (see Article 48), suspension of the action implementation (see Article 49) or termination (see Article 50).

22.5.3 Procedure

The Commission will formally notify the beneficiary concerned the systemic or recurrent errors and its intention to extend these audit findings, together with the list of grants affected.

22.5.3.1 If the findings concern **eligibility of costs**: the formal notification will include:

(a) an invitation to submit observations on the list of grants affected by the findings;

(b) the request to submit **revised financial statements** for all grants affected;

(c) the **correction rate for extrapolation** established by the Commission on the basis of the systemic or recurrent errors, to calculate the amounts to be rejected if the beneficiary concerned:

(i) considers that the submission of revised financial statements is not possible or practicable or

(ii) does not submit revised financial statements.

The beneficiary concerned has 90 days from receiving notification to submit observations, revised financial statements or to propose a duly substantiated **alternative correction method**. This period may be extended by the Commission in justified cases.

The Commission may then start a rejection procedure in accordance with Article 42, on the basis of:

- the revised financial statements, if approved;
- the proposed alternative correction method, if accepted

or

- the initially notified correction rate for extrapolation, if it does not receive any observations

or revised financial statements, does not accept the observations or the proposed alternative correction method or does not approve the revised financial statements.

22.5.3.2 If the findings concern **substantial errors**, **irregularities or fraud** or **serious breach of obligations**: the formal notification will include:

(a) an invitation to submit observations on the list of grants affected by the findings and

(b) the flat-rate the Commission intends to apply according to the principle of proportionality.

The beneficiary concerned has 90 days from receiving notification to submit observations or to propose a duly substantiated alternative flat-rate.

The Commission may then start a reduction procedure in accordance with Article 43, on the basis of:

- the proposed alternative flat-rate, if accepted

or

- the initially notified flat-rate, if it does not receive any observations or does not accept the observations or the proposed alternative flat-rate.

22.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, any insufficiently substantiated costs will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 23 — EVALUATION OF THE IMPACT OF THE ACTION

23.1 Right to evaluate the impact of the action

The Commission may carry out interim and final evaluations of the impact of the action measured against the objective of the EU programme.

Evaluations may be started during implementation of the action and up to five years after the payment of the balance. The evaluation is considered to start on the date of the formal notification to the coordinator or beneficiaries.

The Commission may make these evaluations directly (using its own staff) or indirectly (using external bodies or persons it has authorised to do so).

The coordinator or beneficiaries must provide any information relevant to evaluate the impact of the action, including information in electronic format.

23.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the Commission may apply the measures described in Chapter 6.

SECTION 3 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND AND RESULTS

SUBSECTION 1 GENERAL

ARTICLE 23a — MANAGEMENT OF INTELLECTUAL PROPERTY

23a.1 Obligation to take measures to implement the Commission Recommendation on the management of intellectual property in knowledge transfer activities

Beneficiaries that are universities or other public research organisations must take measures to implement the principles set out in Points 1 and 2 of the Code of Practice annexed to the Commission Recommendation on the management of intellectual property in knowledge transfer activities[19].

This does not change the obligations set out in Subsections 2 and 3 of this Section.

The beneficiaries must ensure that researchers and third parties involved in the action are aware of them.

23a.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the Commission may apply any of the measures described in Chapter 6.

SUBSECTION 2 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND

ARTICLE 24 — AGREEMENT ON BACKGROUND

24.1 Agreement on background

The beneficiaries must identify and agree (in writing) on the background for the action ('**agreement on background**').

'**Background**' means any data, know-how or information — whatever its form or nature (tangible or intangible), including any rights such as intellectual property rights — that:

(a) is held by the beneficiaries before they acceded to the Agreement, and

(b) is needed to implement the action or exploit the results.

24.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

[19] Commission Recommendation C(2008) 1329 of 10.4.2008 on the management of intellectual property in knowledge transfer activities and the Code of Practice for universities and other public research institutions attached to this recommendation.

ARTICLE 25 — ACCESS RIGHTS TO BACKGROUND

25.1 Exercise of access rights — Waiving of access rights — No sub-licensing

To exercise access rights, this must first be requested in writing ('**request for access**').

'**Access rights**' means rights to use results or background under the terms and conditions laid down in this Agreement.

Waivers of access rights are not valid unless in writing.

Unless agreed otherwise, access rights do not include the right to sub-license.

25.2 Access rights for other beneficiaries, for implementing their own tasks under the action

The beneficiaries must give each other access — on a royalty-free basis — to background needed to implement their own tasks under the action, unless the beneficiary that holds the background has — before acceding to the Agreement —:

(a) informed the other beneficiaries that access to its background is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel), or

(b) agreed with the other beneficiaries that access would not be on a royalty-free basis.

25.3 Access rights for other beneficiaries, for exploiting their own results

The beneficiaries must give each other access — under fair and reasonable conditions — to background needed for exploiting their own results, unless the beneficiary that holds the background has — before acceding to the Agreement — informed the other beneficiaries that access to its background is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel).

'**Fair and reasonable conditions**' means appropriate conditions, including possible financial terms or royalty-free conditions, taking into account the specific circumstances of the request for access, for example the actual or potential value of the results or background to which access is requested and/or the scope, duration or other characteristics of the exploitation envisaged.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

25.4 Access rights for affiliated entities

Unless otherwise agreed in the consortium agreement, access to background must also be given — under fair and reasonable conditions (see above; Article 25.3) and unless it is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel) — to affiliated entities[20] established in an EU Member State or '**associated country**'[21], if this is needed to exploit the results generated by the beneficiaries to which they are affiliated.

[20] For the definition, see 'affiliated entity' footnote (Article 14.1).

[21] For the definition, see Article 2.1(3) of the Rules for Participation Regulation No 1290/2013: '**associated country**' means a third country which is party to an international agreement with the Union, as identified in Article 7 of

Unless agreed otherwise (see above; Article 25.1), the affiliated entity concerned must make the request directly to the beneficiary that holds the background.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

25.5 Access rights for third parties

The access provider must — unless it is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel) — give users royalty-free access to background needed to implement the action.

The access provider must inform the users as soon as possible of any restriction which might substantially affect the granting of access rights.

25.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

SUBSECTION 3 RIGHTS AND OBLIGATIONS RELATED TO RESULTS

ARTICLE 26 — OWNERSHIP OF RESULTS

26.1 Ownership by the beneficiary that generates the results

Results are owned by the beneficiary that generates them.

'**Results**' means any (tangible or intangible) output of the action such as data, knowledge or information — whatever its form or nature, whether it can be protected or not — that is generated in the action, as well as any rights attached to it, including intellectual property rights.

26.2 Joint ownership by several beneficiaries

Two or more beneficiaries own results jointly if:

(a) they have jointly generated them and

(b) it is not possible to:

(i) establish the respective contribution of each beneficiary, or

(ii) separate them for the purpose of applying for, obtaining or maintaining their protection (see Article 27).

The joint owners must agree (in writing) on the allocation and terms of exercise of their joint ownership ('**joint ownership agreement**'), to ensure compliance with their obligations under this Agreement.

Horizon 2020 Framework Programme Regulation No 1291/2013. Article 7 sets out the conditions for association of non-EU countries to Horizon 2020.

Unless otherwise agreed in the joint ownership agreement, each joint owner may grant non-exclusive licences to third parties to exploit jointly-owned results (without any right to sub-license), if the other joint owners are given:

(a) at least 45 days advance notice and

(b) fair and reasonable compensation.

Once the results have been generated, joint owners may agree (in writing) to apply another regime than joint ownership (such as, for instance, transfer to a single owner (see Article 30) with access rights for the others).

26.3 Rights of third parties (including personnel)

If third parties (including personnel) may claim rights to the results, the beneficiary concerned must ensure that it complies with its obligations under the Agreement.

If a third party generates results, the beneficiary concerned must obtain all necessary rights (transfer, licences or other) from the third party, in order to be able to respect its obligations as if those results were generated by the beneficiary itself.

If obtaining the rights is impossible, the beneficiary must refrain from using the third party to generate the results.

26.4 EU ownership, to protect results

26.4.1 The EU may — with the consent of the beneficiary concerned — assume ownership of results to protect them, if a beneficiary intends — up to four years after the period set out in Article 3 — to disseminate its results without protecting them, except in any of the following cases:

(a) the lack of protection is because protecting the results is not possible, reasonable or justified (given the circumstances);

(b) the lack of protection is because there is a lack of potential for commercial or industrial exploitation, or

(c) the beneficiary intends to transfer the results to another beneficiary or third party established in an EU Member State or associated country, which will protect them.

Before the results are disseminated and unless any of the cases above under Points (a), (b) or (c) applies, the beneficiary must formally notify the Commission and at the same time inform it of any reasons for refusing consent. The beneficiary may refuse consent only if it can show that its legitimate interests would suffer significant harm.

If the Commission decides to assume ownership, it will formally notify the beneficiary concerned within 45 days of receiving notification.

No dissemination relating to these results may take place before the end of this period or, if the Commission takes a positive decision, until it has taken the necessary steps to protect the results.

26.4.2 The EU may — with the consent of the beneficiary concerned — assume ownership of results to protect them, if a beneficiary intends — up to four years after the period set out in Article 3 — to stop protecting them or not to seek an extension of protection, except in any of the following cases:

(a) the protection is stopped because of a lack of potential for commercial or industrial exploitation;

(b) an extension would not be justified given the circumstances.

A beneficiary that intends to stop protecting results or not seek an extension must — unless any of the cases above under Points (a) or (b) applies — formally notify the Commission at least 60 days before the protection lapses or its extension is no longer possible and at the same time inform it of any reasons for refusing consent. The beneficiary may refuse consent only if it can show that its legitimate interests would suffer significant harm.

If the Commission decides to assume ownership, it will formally notify the beneficiary concerned within 45 days of receiving notification.

26.5 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to the any of the other measures described in Chapter 6.

ARTICLE 27 — PROTECTION OF RESULTS — VISIBILITY OF EU FUNDING

27.1 Obligation to protect the results

Each beneficiary must examine the possibility of protecting its results and must adequately protect them — for an appropriate period and with appropriate territorial coverage — if:

(a) the results can reasonably be expected to be commercially or industrially exploited and

(b) protecting them is possible, reasonable and justified (given the circumstances).

When deciding on protection, the beneficiary must consider its own legitimate interests and the legitimate interests (especially commercial) of the other beneficiaries.

27.2 EU ownership, to protect the results

If a beneficiary intends not to protect its results, to stop protecting them or not seek an extension of protection, the EU may — under certain conditions (see Article 26.4) — assume ownership to ensure their (continued) protection.

27.3 Information on EU funding

Applications for protection of results (including patent applications) filed by or on behalf of a beneficiary must — unless the Commission requests or agrees otherwise or unless it is impossible — include the following:

> "The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871034".

27.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 28 — EXPLOITATION OF RESULTS

28.1 Obligation to exploit the results

Each beneficiary must — up to four years after the period set out in Article 3 — take measures aiming to ensure '**exploitation**' of its results (either directly or indirectly, in particular through transfer or licensing; see Article 30) by:

(a) using them in further research activities (outside the action);

(b) developing, creating or marketing a product or process;

(c) creating and providing a service, or

(d) using them in standardisation activities.

This does not change the security obligations in Article 37, which still apply.

28.2 Results that could contribute to European or international standards — Information on EU funding

If results are incorporated in a standard, the beneficiary concerned must — unless the Commission requests or agrees otherwise or unless it is impossible — ask the standardisation body to include the following statement in (information related to) the standard:

> "Results incorporated in this standard received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871034".

28.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced in accordance with Article 43.

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 29 — DISSEMINATION OF RESULTS — OPEN ACCESS — VISIBILITY OF EU FUNDING

29.1 Obligation to disseminate results

Unless it goes against their legitimate interests, each beneficiary must — as soon as possible — '**disseminate**' its results by disclosing them to the public by appropriate means (other than those resulting from protecting or exploiting the results), including in scientific publications (in any medium).

This does not change the obligation to protect results in Article 27, the confidentiality obligations in Article 36, the security obligations in Article 37 or the obligations to protect personal data in Article 39, all of which still apply.

A beneficiary that intends to disseminate its results must give advance notice to the other beneficiaries of — unless agreed otherwise — at least 45 days, together with sufficient information on the results it will disseminate.

Any other beneficiary may object within — unless agreed otherwise — 30 days of receiving notification, if it can show that its legitimate interests in relation to the results or background would be significantly harmed. In such cases, the dissemination may not take place unless appropriate steps are taken to safeguard these legitimate interests.

If a beneficiary intends not to protect its results, it may — under certain conditions (see Article 26.4.1) — need to formally notify the Commission before dissemination takes place.

29.2 Open access to scientific publications

Each beneficiary must ensure open access (free of charge online access for any user) to all peer-reviewed scientific publications relating to its results.

In particular, it must:

(a) as soon as possible and at the latest on publication, deposit a machine-readable electronic copy of the published version or final peer-reviewed manuscript accepted for publication in a repository for scientific publications;

Moreover, the beneficiary must aim to deposit at the same time the research data needed to validate the results presented in the deposited scientific publications.

(b) ensure open access to the deposited publication — via the repository — at the latest:

(i) on publication, if an electronic version is available for free via the publisher, or

(ii) within six months of publication (twelve months for publications in the social sciences and humanities) in any other case.

(c) ensure open access — via the repository — to the bibliographic metadata that identify the deposited publication.

The bibliographic metadata must be in a standard format and must include all of the following:

- the terms “European Union (EU)” and “Horizon 2020”;
- the name of the action, acronym and grant number;
- the publication date, and length of embargo period if applicable, and
- a persistent identifier.

29.3 Open access to research data

Regarding the digital research data generated in the action (‘**data**’), the beneficiaries must:

(a) deposit in a research data repository and take measures to make it possible for third parties to access, mine, exploit, reproduce and disseminate — free of charge for any user — the following:

(i) the data, including associated metadata, needed to validate the results presented in scientific publications, as soon as possible;

(ii) not applicable;

(iii) other data, including associated metadata, as specified and within the deadlines laid down in the 'data management plan' (see Annex 1);

(b) provide information — via the repository — about tools and instruments at the disposal of the beneficiaries and necessary for validating the results (and — where possible — provide the tools and instruments themselves).

This does not change the obligation to protect results in Article 27, the confidentiality obligations in Article 36, the security obligations in Article 37 or the obligations to protect personal data in Article 39, all of which still apply.

As an exception, the beneficiaries do not have to ensure open access to specific parts of their research data under Point (a)(i) and (iii), if the achievement of the action's main objective (as described in Annex 1) would be jeopardised by making those specific parts of the research data openly accessible. In this case, the data management plan must contain the reasons for not giving access.

29.4 Information on EU funding — Obligation and right to use the EU emblem

Unless the Commission requests or agrees otherwise or unless it is impossible, any dissemination of results (in any form, including electronic) must:

(a) display the EU emblem and

(b) include the following text:

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871034".

When displayed together with another logo, the EU emblem must have appropriate prominence.

For the purposes of their obligations under this Article, the beneficiaries may use the EU emblem without first obtaining approval from the Commission.

This does not however give them the right to exclusive use.

Moreover, they may not appropriate the EU emblem or any similar trademark or logo, either by registration or by any other means.

29.5 Disclaimer excluding Commission responsibility

Any dissemination of results must indicate that it reflects only the author's view and that the Commission is not responsible for any use that may be made of the information it contains.

29.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 30 — TRANSFER AND LICENSING OF RESULTS

30.1 Transfer of ownership

Each beneficiary may transfer ownership of its results.

It must however ensure that its obligations under Articles 26.2, 26.4, 27, 28, 29, 30 and 31 also apply to the new owner and that this owner has the obligation to pass them on in any subsequent transfer.

This does not change the security obligations in Article 37, which still apply.

Unless agreed otherwise (in writing) for specifically-identified third parties or unless impossible under applicable EU and national laws on mergers and acquisitions, a beneficiary that intends to transfer ownership of results must give at least 45 days advance notice (or less if agreed in writing) to the other beneficiaries that still have (or still may request) access rights to the results. This notification must include sufficient information on the new owner to enable any beneficiary concerned to assess the effects on its access rights.

Unless agreed otherwise (in writing) for specifically-identified third parties, any other beneficiary may object within 30 days of receiving notification (or less if agreed in writing), if it can show that the transfer would adversely affect its access rights. In this case, the transfer may not take place until agreement has been reached between the beneficiaries concerned.

30.2 Granting licenses

Each beneficiary may grant licences to its results (or otherwise give the right to exploit them), if:

(a) this does not impede the access rights under Article 31 and

(b) not applicable.

In addition to Points (a) and (b), exclusive licences for results may be granted only if all the other beneficiaries concerned have waived their access rights (see Article 31.1).

This does not change the dissemination obligations in Article 29 or security obligations in Article 37, which still apply.

30.3 Commission right to object to transfers or licensing

Not applicable

30.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 31 — ACCESS RIGHTS TO RESULTS

31.1 Exercise of access rights — Waiving of access rights — No sub-licensing

The conditions set out in Article 25.1 apply.

The obligations set out in this Article do not change the security obligations in Article 37, which still apply.

31.2 Access rights for other beneficiaries, for implementing their own tasks under the action

The beneficiaries must give each other access — on a royalty-free basis — to results needed for implementing their own tasks under the action.

31.3 Access rights for other beneficiaries, for exploiting their own results

The beneficiaries must give each other — under fair and reasonable conditions (see Article 25.3) — access to results needed for exploiting their own results.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

31.4 Access rights of affiliated entities

Unless agreed otherwise in the consortium agreement, access to results must also be given — under fair and reasonable conditions (Article 25.3) — to affiliated entities established in an EU Member State or associated country, if this is needed for those entities to exploit the results generated by the beneficiaries to which they are affiliated.

Unless agreed otherwise (see above; Article 31.1), the affiliated entity concerned must make any such request directly to the beneficiary that owns the results.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

31.5 Access rights for the EU institutions, bodies, offices or agencies and EU Member States

The beneficiaries must give access to their results — on a royalty-free basis — to EU institutions, bodies, offices or agencies, for developing, implementing or monitoring EU policies or programmes.

Such access rights are limited to non-commercial and non-competitive use.

This does not change the right to use any material, document or information received from the beneficiaries for communication and publicising activities (see Article 38.2).

31.6 Access rights for third parties

The access provider must give the users royalty-free access to the results needed to implement the action.

31.7 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

SECTION 4 OTHER RIGHTS AND OBLIGATIONS

ARTICLE 32 — RECRUITMENT AND WORKING CONDITIONS FOR RESEARCHERS

32.1 Obligation to take measures to implement the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers

The beneficiaries must take all measures to implement the principles set out in the Commission Recommendation on the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers[23], in particular regarding:

- working conditions;
- transparent recruitment processes based on merit, and
- career development.

The beneficiaries must ensure that researchers and third parties involved in the action are aware of them.

32.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the Commission may apply any of the measures described in Chapter 6.

ARTICLE 33 — GENDER EQUALITY

33.1 Obligation to aim for gender equality

The beneficiaries must take all measures to promote equal opportunities between men and women in the implementation of the action. They must aim, to the extent possible, for a gender balance at all levels of personnel assigned to the action, including at supervisory and managerial level.

33.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the Commission may apply any of the measures described in Chapter 6.

ARTICLE 34 — ETHICS AND RESEARCH INTEGRITY

34.1 Obligation to comply with ethical and research integrity principles

[23] Commission Recommendation 2005/251/EC of 11 March 2005 on the European Charter for Researchers and on a Code of Conduct for the Recruitment of Researchers (OJ L 75, 22.3.2005, p. 67).

The beneficiaries must carry out the action in compliance with:

(a) ethical principles (including the highest standards of research integrity)

and

(b) applicable international, EU and national law.

Funding will not be granted for activities carried out outside the EU if they are prohibited in all Member States or for activities which destroy human embryos (for example, for obtaining stem cells).

The beneficiaries must ensure that the activities under the action have an exclusive focus on civil applications.

The beneficiaries must ensure that the activities under the action do not:

(a) aim at human cloning for reproductive purposes;

(b) intend to modify the genetic heritage of human beings which could make such changes heritable (with the exception of research relating to cancer treatment of the gonads, which may be financed), or

(c) intend to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.

In addition, the beneficiaries must respect the fundamental principle of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity[24].

This implies compliance with the following fundamental principles:

- **reliability** in ensuring the quality of research reflected in the design, the methodology, the analysis and the use of resources;

- **honesty** in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair and unbiased way;

- **respect** for colleagues, research participants, society, ecosystems, cultural heritage and the environment;

- **accountability** for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts

and means that beneficiaries must ensure that persons carrying out research tasks follow the good research practices and refrain from the research integrity violations described in this Code.

This does not change the other obligations under this Agreement or obligations under applicable international, EU or national law, all of which still apply.

34.2 Activities raising ethical issues

[24] European Code of Conduct for Research Integrity of ALLEA (All European Academies) http://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020-ethics_code-of-conduct_en.pdf

Activities raising ethical issues must comply with the '**ethics requirements**' set out as deliverables in Annex 1.

Before the beginning of an activity raising an ethical issue, each beneficiary must have obtained:

(a) any ethics committee opinion required under national law and

(b) any notification or authorisation for activities raising ethical issues required under national and/or European law

needed for implementing the action tasks in question.

The documents must be kept on file and be submitted upon request by the coordinator to the Commission (see Article 52). If they are not in English, they must be submitted together with an English summary, which shows that the action tasks in question are covered and includes the conclusions of the committee or authority concerned (if available).

34.3 Activities involving human embryos or human embryonic stem cells

Activities involving research on human embryos or human embryonic stem cells may be carried out, in addition to Article 34.1, only if:

- they are set out in Annex 1 or
- the coordinator has obtained explicit approval (in writing) from the Commission (see Article 52).

34.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or participation of the beneficiary may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 35 — CONFLICT OF INTERESTS

35.1 Obligation to avoid a conflict of interests

The beneficiaries must take all measures to prevent any situation where the impartial and objective implementation of the action is compromised for reasons involving economic interest, political or national affinity, family or emotional ties or any other shared interest ('**conflict of interests**').

They must formally notify to the Commission without delay any situation constituting or likely to lead to a conflict of interests and immediately take all the necessary steps to rectify this situation.

The Commission may verify that the measures taken are appropriate and may require additional measures to be taken by a specified deadline.

35.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or participation of the beneficiary may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 36 — CONFIDENTIALITY

36.1 General obligation to maintain confidentiality

During implementation of the action and for four years after the period set out in Article 3, the parties must keep confidential any data, documents or other material (in any form) that is identified as confidential at the time it is disclosed ('**confidential information**').

If a beneficiary requests, the Commission may agree to keep such information confidential for an additional period beyond the initial four years.

If information has been identified as confidential only orally, it will be considered to be confidential only if this is confirmed in writing within 15 days of the oral disclosure.

Unless otherwise agreed between the parties, they may use confidential information only to implement the Agreement.

The beneficiaries may disclose confidential information to their personnel or third parties involved in the action only if they:

(a) need to know to implement the Agreement and

(b) are bound by an obligation of confidentiality.

This does not change the security obligations in Article 37, which still apply.

The Commission may disclose confidential information to its staff, other EU institutions and bodies. It may disclose confidential information to third parties, if:

(a) this is necessary to implement the Agreement or safeguard the EU's financial interests and

(b) the recipients of the information are bound by an obligation of confidentiality.

Under the conditions set out in Article 4 of the Rules for Participation Regulation No 1290/2013[25], the Commission must moreover make available information on the results to other EU institutions, bodies, offices or agencies as well as Member States or associated countries.

The confidentiality obligations no longer apply if:

(a) the disclosing party agrees to release the other party;

(b) the information was already known by the recipient or is given to him without obligation of confidentiality by a third party that was not bound by any obligation of confidentiality;

(c) the recipient proves that the information was developed without the use of confidential information;

[25] Regulation (EU) No 1290/2013 of the European Parliament and of the Council of 11 December 2013 laying down the rules for participation and dissemination in "Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020)" (OJ L 347, 20.12.2013 p.81).

(d) the information becomes generally and publicly available, without breaching any confidentiality obligation, or

(e) the disclosure of the information is required by EU or national law.

36.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 37 — SECURITY-RELATED OBLIGATIONS

37.1 Results with a security recommendation

Not applicable

37.2 Classified information

Not applicable

37.3 Activities involving dual-use goods or dangerous materials and substances

Not applicable

37.4 Consequences of non-compliance

Not applicable

ARTICLE 38 — PROMOTING THE ACTION — VISIBILITY OF EU FUNDING

38.1 Communication activities by beneficiaries

38.1.1 Obligation to promote the action and its results

The beneficiaries must promote the action and its results, by providing targeted information to multiple audiences (including the media and the public) in a strategic and effective manner.

This does not change the dissemination obligations in Article 29, the confidentiality obligations in Article 36 or the security obligations in Article 37, all of which still apply.

Before engaging in a communication activity expected to have a major media impact, the beneficiaries must inform the Commission (see Article 52).

38.1.2 Information on EU funding — Obligation and right to use the EU emblem

Unless the Commission requests or agrees otherwise or unless it is impossible, any communication activity related to the action (including in electronic form, via social media, etc.) and any infrastructure, equipment and major results funded by the grant must:

(a) display the EU emblem and

(b) include the following text:

For communication activities:

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871034".

For infrastructure, equipment and major results:

"This *[infrastructure][equipment][insert type of result]* is part of a project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871034".

When displayed together with another logo, the EU emblem must have appropriate prominence.

For the purposes of their obligations under this Article, the beneficiaries may use the EU emblem without first obtaining approval from the Commission.

This does not, however, give them the right to exclusive use.

Moreover, they may not appropriate the EU emblem or any similar trademark or logo, either by registration or by any other means.

38.1.3 Disclaimer excluding Commission responsibility

Any communication activity related to the action must indicate that it reflects only the author's view and that the Commission is not responsible for any use that may be made of the information it contains.

38.2 Communication activities by the Commission

38.2.1 Right to use beneficiaries' materials, documents or information

The Commission may use, for its communication and publicising activities, information relating to the action, documents notably summaries for publication and public deliverables as well as any other material, such as pictures or audio-visual material received from any beneficiary (including in electronic form).

This does not change the confidentiality obligations in Article 36 and the security obligations in Article 37, all of which still apply.

If the Commission's use of these materials, documents or information would risk compromising legitimate interests, the beneficiary concerned may request the Commission not to use it (see Article 52).

The right to use a beneficiary's materials, documents and information includes:

(a) **use for its own purposes** (in particular, making them available to persons working for the Commission or any other EU institution, body, office or agency or body or institutions in EU Member States; and copying or reproducing them in whole or in part, in unlimited numbers);

(b) **distribution to the public** (in particular, publication as hard copies and in electronic or digital format, publication on the internet, as a downloadable or non-downloadable file, broadcasting by any channel, public display or presentation, communicating through press information services, or inclusion in widely accessible databases or indexes);

(c) **editing or redrafting** for communication and publicising activities (including shortening, summarising, inserting other elements (such as meta-data, legends, other graphic, visual, audio or text elements), extracting parts (e.g. audio or video files), dividing into parts, use in a compilation);

(d) translation;

(e) giving **access in response to individual requests** under Regulation No 1049/2001[27], without the right to reproduce or exploit;

(f) **storage** in paper, electronic or other form;

(g) **archiving**, in line with applicable document-management rules, and

(h) the right to authorise **third parties** to act on its behalf or sub-license the modes of use set out in Points (b), (c), (d) and (f) to third parties if needed for the communication and publicising activities of the Commission.

If the right of use is subject to rights of a third party (including personnel of the beneficiary), the beneficiary must ensure that it complies with its obligations under this Agreement (in particular, by obtaining the necessary approval from the third parties concerned).

Where applicable (and if provided by the beneficiaries), the Commission will insert the following information:

> "© – [year] – [name of the copyright owner]. All rights reserved. Licensed to the European Union (EU) under conditions."

38.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 39 — PROCESSING OF PERSONAL DATA

39.1 Processing of personal data by the Commission

Any personal data under the Agreement will be processed by the Commission under Regulation No 45/2001[28] and according to the 'notifications of the processing operations' to the Data Protection Officer (DPO) of the Commission (publicly accessible in the DPO register).

Such data will be processed by the '**data controller**' of the Commission for the purposes of implementing, managing and monitoring the Agreement or protecting the financial interests of the EU or Euratom (including checks, reviews, audits and investigations; see Article 22).

[27] Regulation (EC) No 1049/2001 of the European Parliament and of the Council of 30 May 2001 regarding public access to European Parliament, Council and Commission documents, OJ L 145, 31.5.2001, p. 43.

[28] Regulation (EC) No 45/2001 of the European Parliament and of the Council of 18 December 2000 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data (OJ L 8, 12.01.2001, p. 1).

The persons whose personal data are processed have the right to access and correct their own personal data. For this purpose, they must send any queries about the processing of their personal data to the data controller, via the contact point indicated in the privacy statement(s) that are published on the Commission websites.

They also have the right to have recourse at any time to the European Data Protection Supervisor (EDPS).

39.2 Processing of personal data by the beneficiaries

The beneficiaries must process personal data under the Agreement in compliance with applicable EU and national law on data protection (including authorisations or notification requirements).

The beneficiaries may grant their personnel access only to data that is strictly necessary for implementing, managing and monitoring the Agreement.

The beneficiaries must inform the personnel whose personal data are collected and processed by the Commission. For this purpose, they must provide them with the privacy statement(s) (see above), before transmitting their data to the Commission.

39.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 39.2, the Commission may apply any of the measures described in Chapter 6.

ARTICLE 40 — ASSIGNMENTS OF CLAIMS FOR PAYMENT AGAINST THE COMMISSION

The beneficiaries may not assign any of their claims for payment against the Commission to any third party, except if approved by the Commission on the basis of a reasoned, written request by the coordinator (on behalf of the beneficiary concerned).

If the Commission has not accepted the assignment or the terms of it are not observed, the assignment will have no effect on it.

In no circumstances will an assignment release the beneficiaries from their obligations towards the Commission.

CHAPTER 5 DIVISION OF BENEFICIARIES' ROLES AND RESPONSIBILITIES — RELATIONSHIP WITH COMPLEMENTARY BENEFICIARIES — RELATIONSHIP WITH PARTNERS OF A JOINT ACTION

ARTICLE 41 — DIVISION OF BENEFICIARIES' ROLES AND RESPONSIBILITIES — RELATIONSHIP WITH COMPLEMENTARY BENEFICIARIES — RELATIONSHIP WITH PARTNERS OF A JOINT ACTION

41.1 Roles and responsibility towards the Commission

The beneficiaries have full responsibility for implementing the action and complying with the Agreement.

The beneficiaries are jointly and severally liable for the **technical implementation** of the action as described in Annex 1. If a beneficiary fails to implement its part of the action, the other beneficiaries become responsible for implementing this part (without being entitled to any additional EU funding for doing so), unless the Commission expressly relieves them of this obligation.

The **financial responsibility** of each beneficiary is governed by Article 44.

41.2 Internal division of roles and responsibilities

The internal roles and responsibilities of the beneficiaries are divided as follows:

(a) Each **beneficiary** must:

(i) keep information stored in the Participant Portal Beneficiary Register (via the electronic exchange system) up to date (see Article 17);

(ii) inform the coordinator immediately of any events or circumstances likely to affect significantly or delay the implementation of the action (see Article 17);

(iii) submit to the coordinator in good time:

- individual financial statements for itself and its linked third parties and, if required, certificates on the financial statements (see Article 20);
- the data needed to draw up the technical reports (see Article 20);
- ethics committee opinions and notifications or authorisations for activities raising ethical issues (see Article 34);
- any other documents or information required by the Commission under the Agreement, unless the Agreement requires the beneficiary to submit this information directly to the Commission.

(b) The **coordinator** must:

(i) monitor that the action is implemented properly (see Article 7);

(ii) act as the intermediary for all communications between the beneficiaries and the Commission (in particular, providing the Commission with the information described in Article 17), unless the Agreement specifies otherwise;

(iii) request and review any documents or information required by the Commission and verify their completeness and correctness before passing them on to the Commission;

(iv) submit the deliverables and reports to the Commission (see Articles 19 and 20);

(v) ensure that all payments are made to the other beneficiaries without unjustified delay (see Article 21);

(vi) inform the Commission of the amounts paid to each beneficiary, when required under the Agreement (see Articles 44 and 50) or requested by the Commission.

The coordinator may not delegate or subcontract the above-mentioned tasks to any other beneficiary or third party (including linked third parties).

41.3 Internal arrangements between beneficiaries — Consortium agreement

The beneficiaries must have internal arrangements regarding their operation and co-ordination to ensure that the action is implemented properly. These internal arrangements must be set out in a written '**consortium agreement**' between the beneficiaries, which may cover:

- internal organisation of the consortium;
- management of access to the electronic exchange system;
- distribution of EU funding;
- additional rules on rights and obligations related to background and results (including whether access rights remain or not, if a beneficiary is in breach of its obligations) (see Section 3 of Chapter 4);
- settlement of internal disputes;
- liability, indemnification and confidentiality arrangements between the beneficiaries.

The consortium agreement must not contain any provision contrary to the Agreement.

41.4 Relationship with complementary beneficiaries — Collaboration agreement

Not applicable

41.5 Relationship with partners of a joint action — Coordination agreement

Not applicable

CHAPTER 6 REJECTION OF COSTS — REDUCTION OF THE GRANT — RECOVERY — SANCTIONS — DAMAGES — SUSPENSION — TERMINATION — FORCE MAJEURE

SECTION 1 REJECTION OF COSTS — REDUCTION OF THE GRANT — RECOVERY — SANCTIONS

ARTICLE 42 — REJECTION OF INELIGIBLE COSTS

42.1 Conditions

The Commission will — after **termination of the participation of a beneficiary**, at the time of an **interim payment**, **at the payment of the balance** or **afterwards** — reject any costs which are ineligible (see Article 6), in particular following checks, reviews, audits or investigations (see Article 22).

The rejection may also be based on the **extension of findings from other grants to this grant** (see Article 22.5.2).

42.2 Ineligible costs to be rejected — Calculation — Procedure

Ineligible costs will be rejected in full.

If the rejection of costs does not lead to a recovery (see Article 44), the Commission will formally notify the coordinator or beneficiary concerned of the rejection of costs, the amounts and the reasons why (if applicable, together with the notification of amounts due; see Article 21.5). The coordinator or beneficiary concerned may — within 30 days of receiving notification — formally notify the Commission of its disagreement and the reasons why.

If the rejection of costs leads to a recovery, the Commission will follow the contradictory procedure with pre-information letter set out in Article 44.

42.3 Effects

If the Commission rejects costs at the time of an **interim payment** or **the payment of the balance**, it will deduct them from the total eligible costs declared, for the action, in the periodic or final summary financial statement (see Articles 20.3 and 20.4). It will then calculate the interim payment or payment of the balance as set out in Articles 21.3 or 21.4.

If the Commission rejects costs **after termination of the participation of a beneficiary**, it will deduct them from the costs declared by the beneficiary in the termination report and include the rejection in the calculation after termination (see Article 50.2 and 50.3).

If the Commission — **after an interim payment but before the payment of the balance** — rejects costs declared in a periodic summary financial statement, it will deduct them from the total eligible costs declared, for the action, in the next periodic summary financial statement or in the final summary financial statement. It will then calculate the interim payment or payment of the balance as set out in Articles 21.3 or 21.4.

If the Commission rejects costs **after the payment of the balance**, it will deduct the amount rejected from the total eligible costs declared, by the beneficiary, in the final summary financial statement. It will then calculate the revised final grant amount as set out in Article 5.4.

ARTICLE 43 — REDUCTION OF THE GRANT

43.1 Conditions

The Commission may — **after termination of the participation of a beneficiary**, **at the payment of the balance** or **afterwards** — reduce the grant amount (see Article 5.1), if :

(a) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed:

(i) substantial errors, irregularities or fraud or

(ii) serious breach of obligations under the Agreement or during the award procedure

(including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles) or

(b) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) has committed — in other EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2).

43.2 Amount to be reduced — Calculation — Procedure

The amount of the reduction will be proportionate to the seriousness of the errors, irregularities or fraud or breach of obligations.

Before reduction of the grant, the Commission will formally notify a '**pre-information letter**' to the coordinator or beneficiary concerned:

- informing it of its intention to reduce the grant, the amount it intends to reduce and the reasons why and

- inviting it to submit observations within 30 days of receiving notification.

If the Commission does not receive any observations or decides to pursue reduction despite the observations it has received, it will formally notify **confirmation** of the reduction (if applicable, together with the notification of amounts due; see Article 21).

43.3 Effects

If the Commission reduces the grant **after termination of the participation of a beneficiary**, it will calculate the reduced grant amount for that beneficiary and then determine the amount due to that beneficiary (see Article 50.2 and 50.3).

If the Commission reduces the grant **at the payment of the balance**, it will calculate the reduced grant amount for the action and then determine the amount due as payment of the balance (see Articles 5.3.4 and 21.4).

If the Commission reduces the grant **after the payment of the balance**, it will calculate the revised final grant amount for the beneficiary concerned (see Article 5.4). If the revised final grant amount for the beneficiary concerned is lower than its share of the final grant amount, the Commission will recover the difference (see Article 44).

ARTICLE 44 — RECOVERY OF UNDUE AMOUNTS

44.1 Amount to be recovered — Calculation — Procedure

The Commission will — after **termination of the participation of a beneficiary, at the payment of the balance** or **afterwards** — claim back any amount that was paid, but is not due under the Agreement.

Each beneficiary's financial responsibility in case of recovery is limited to its own debt (including

undue amounts paid by the Commission for costs declared by its linked third parties), except for the amount retained for the Guarantee Fund (see Article 21.4).

44.1.1 Recovery after termination of a beneficiary's participation

If recovery takes place after termination of a beneficiary's participation (including the coordinator), the Commission will claim back the undue amount from the beneficiary concerned, by formally notifying it a debit note (see Article 50.2 and 50.3). This note will specify the amount to be recovered, the terms and the date for payment.

If payment is not made by the date specified in the debit note, the Commission will **recover** the amount:

(a) by '**offsetting**' it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the Commission or an executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU's financial interests, the Commission may offset before the payment date specified in the debit note;

(b) not applicable;

(c) by **taking legal action** (see Article 57) or by **adopting an enforceable decision** under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 79(2) of the Financial Regulation No 966/2012.

If payment is not made by the date specified in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the payment date in the debit note, up to and including the date the Commission receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC[29] applies.

44.1.2 Recovery at payment of the balance

If the payment of the balance takes the form of a recovery (see Article 21.4), the Commission will formally notify a '**pre-information letter**' to the coordinator:

- informing it of its intention to recover, the amount due as the balance and the reasons why;
- specifying that it intends to deduct the amount to be recovered from the amount retained for the Guarantee Fund;
- requesting the coordinator to submit a report on the distribution of payments to the beneficiaries within 30 days of receiving notification, and

[29] Directive 2007/64/EC of the European Parliament and of the Council of 13 November 2007 on payment services in the internal market amending Directives 97/7/EC, 2002/65/EC, 2005/60/EC and 2006/48/EC and repealing Directive 97/5/EC (OJ L 319, 05.12.2007, p. 1).

- inviting the coordinator to submit observations within 30 days of receiving notification.

If no observations are submitted or the Commission decides to pursue recovery despite the observations it has received, it will **confirm recovery** (together with the notification of amounts due; see Article 21.5) and:

- pay the difference between the amount to be recovered and the amount retained for the Guarantee Fund, **if the difference is positive** or

- formally notify to the coordinator a **debit note** for the difference between the amount to be recovered and the amount retained for the Guarantee Fund, **if the difference is negative**. This note will also specify the terms and the date for payment.

If the coordinator does not repay the Commission by the date in the debit note and has not submitted the report on the distribution of payments: the Commission will **recover** the amount set out in the debit note from the coordinator (see below).

If the coordinator does not repay the Commission by the date in the debit note, but has submitted the report on the distribution of payments: the Commission will:

(a) identify the beneficiaries for which the amount calculated as follows is negative:

{{{{beneficiary's costs declared in the final summary financial statement and approved by the Commission multiplied by the reimbursement rate set out in Article 5.2 for the beneficiary concerned

plus

its linked third parties' costs declared in the final summary financial statement and approved by the Commission multiplied by the reimbursement rate set out in Article 5.2 for each linked third party concerned}

divided by

the EU contribution for the action calculated according to Article 5.3.1}

multiplied by

the final grant amount (see Article 5.3)},

minus

{pre-financing and interim payments received by the beneficiary}}.

(b) formally notify to each beneficiary identified according to point (a) a **debit note** specifying the terms and date for payment. The amount of the debit note is calculated as follows:

{{amount calculated according to point (a) for the beneficiary concerned

divided by

the sum of the amounts calculated according to point (a) for all the beneficiaries identified according to point (a)}

multiplied by

the amount set out in the debit note formally notified to the coordinator}.

If payment is not made by the date specified in the debit note, the Commission will **recover** the amount:

(a) by **offsetting** it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the Commission or an executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU's financial interests, the Commission may offset before the payment date specified in the debit note;

(b) by **drawing on the Guarantee Fund**. The Commission will formally notify the beneficiary concerned the debit note on behalf of the Guarantee Fund and recover the amount:

(i) not applicable;

(ii) by **taking legal action** (see Article 57) or by **adopting an enforceable decision** under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 79(2) of the Financial Regulation No 966/2012.

If payment is not made by the date in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the payment date in the debit note, up to and including the date the Commission receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC applies.

44.1.3 Recovery of amounts after payment of the balance

If, for a beneficiary, the revised final grant amount (see Article 5.4) is lower than its share of the final grant amount, it must repay the difference to the Commission.

The beneficiary's share of the final grant amount is calculated as follows:

{{{beneficiary's costs declared in the final summary financial statement and approved by the Commission multiplied by the reimbursement rate set out in Article 5.2 for the beneficiary concerned

plus

its linked third parties' costs declared in the final summary financial statement and approved by the Commission multiplied by the reimbursement rate set out in Article 5.2 for each linked third party concerned}

divided by

the EU contribution for the action calculated according to Article 5.3.1}

multiplied by

the final grant amount (see Article 5.3)}.

If the coordinator has not distributed amounts received (see Article 21.7), the Commission will also recover these amounts.

The Commission will formally notify a **pre-information letter** to the beneficiary concerned:

- informing it of its intention to recover, the due amount and the reasons why and
- inviting it to submit observations within 30 days of receiving notification.

If no observations are submitted or the Commission decides to pursue recovery despite the observations it has received, it will **confirm** the amount to be recovered and formally notify to the beneficiary concerned a **debit note**. This note will also specify the terms and the date for payment.

If payment is not made by the date specified in the debit note, the Commission will **recover** the amount:

(a) by **offsetting** it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the Commission or an executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU's financial interests, the Commission may offset before the payment date specified in the debit note;

(b) by **drawing on the Guarantee Fund**. The Commission will formally notify the beneficiary concerned the debit note on behalf of the Guarantee Fund and recover the amount:

(i) not applicable;

(ii) by **taking legal action** (see Article 57) or by **adopting an enforceable decision** under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 79(2) of the Financial Regulation No 966/2012.

If payment is not made by the date in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the date for payment in the debit note, up to and including the date the Commission receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC applies.

ARTICLE 45 — ADMINISTRATIVE SANCTIONS

In addition to contractual measures, the Commission may also adopt administrative sanctions under Articles 106 and 131(4) of the Financial Regulation No 966/2012 (i.e. exclusion from future procurement contracts, grants, prizes and expert contracts and/or financial penalties).

SECTION 2 LIABILITY FOR DAMAGES

ARTICLE 46 — LIABILITY FOR DAMAGES

46.1 Liability of the Commission

The Commission cannot be held liable for any damage caused to the beneficiaries or to third parties as a consequence of implementing the Agreement, including for gross negligence.

The Commission cannot be held liable for any damage caused by any of the beneficiaries or third parties involved in the action, as a consequence of implementing the Agreement.

46.2 Liability of the beneficiaries

Except in case of force majeure (see Article 51), the beneficiaries must compensate the Commission for any damage it sustains as a result of the implementation of the action or because the action was not implemented in full compliance with the Agreement.

SECTION 3 SUSPENSION AND TERMINATION

ARTICLE 47 — SUSPENSION OF PAYMENT DEADLINE

47.1 Conditions

The Commission may — at any moment — suspend the payment deadline (see Article 21.2 to 21.4) if a request for payment (see Article 20) cannot be approved because:

(a) it does not comply with the provisions of the Agreement (see Article 20);

(b) the technical or financial reports have not been submitted or are not complete or additional information is needed, or

(c) there is doubt about the eligibility of the costs declared in the financial statements and additional checks, reviews, audits or investigations are necessary.

47.2 Procedure

The Commission will formally notify the coordinator of the suspension and the reasons why.

The suspension will **take effect** the day notification is sent by the Commission (see Article 52).

If the conditions for suspending the payment deadline are no longer met, the suspension will be **lifted** — and the remaining period will resume.

If the suspension exceeds two months, the coordinator may request the Commission if the suspension will continue.

If the payment deadline has been suspended due to the non-compliance of the technical or financial reports (see Article 20) and the revised report or statement is not submitted or was submitted but is also rejected, the Commission may also terminate the Agreement or the participation of the beneficiary (see Article 50.3.1(l)).

ARTICLE 48 — SUSPENSION OF PAYMENTS

48.1 Conditions

The Commission may — at any moment — suspend payments, in whole or in part and interim payments or the payment of the balance for one or more beneficiaries, if:

(a) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) has committed or is suspected of having committed:

  (i) substantial errors, irregularities or fraud or

  (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles) or

(b) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) has committed — in other EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2).

If payments are suspended for one or more beneficiaries, the Commission will make partial payment(s) for the part(s) not suspended. If suspension concerns the payment of the balance, — once suspension is lifted — the payment or the recovery of the amount(s) concerned will be considered the payment of the balance that closes the action.

48.2 Procedure

Before suspending payments, the Commission will formally notify the coordinator or beneficiary concerned:

- informing it of its intention to suspend payments and the reasons why and
- inviting it to submit observations within 30 days of receiving notification.

If the Commission does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify **confirmation** of the suspension. Otherwise, it will formally notify that the suspension procedure is not continued.

The suspension will **take effect** the day the confirmation notification is sent by the Commission.

If the conditions for resuming payments are met, the suspension will be **lifted**. The Commission will formally notify the coordinator or beneficiary concerned.

During the suspension, the periodic report(s) for all reporting periods except the last one (see Article 20.3), must not contain any individual financial statements from the beneficiary concerned and its linked third parties. The coordinator must include them in the next periodic report after the suspension is lifted or — if suspension is not lifted before the end of the action — in the last periodic report.

The beneficiaries may suspend implementation of the action (see Article 49.1) or terminate the Agreement or the participation of the beneficiary concerned (see Article 50.1 and 50.2).

ARTICLE 49 — SUSPENSION OF THE ACTION IMPLEMENTATION

49.1 Suspension of the action implementation, by the beneficiaries

49.1.1 Conditions

The beneficiaries may suspend implementation of the action or any part of it, if exceptional circumstances — in particular *force majeure* (see Article 51) — make implementation impossible or excessively difficult.

49.1.2 Procedure

The coordinator must immediately formally notify to the Commission the suspension (see Article 52), stating:

- the reasons why and
- the expected date of resumption.

The suspension will **take effect** the day this notification is received by the Commission.

Once circumstances allow for implementation to resume, the coordinator must immediately formally notify the Commission and request an **amendment** of the Agreement to set the date on which the action will be resumed, extend the duration of the action and make other changes necessary to adapt the action to the new situation (see Article 55) — unless the Agreement or the participation of a beneficiary has been terminated (see Article 50).

The suspension will be **lifted** with effect from the resumption date set out in the amendment. This date may be before the date on which the amendment enters into force.

Costs incurred during suspension of the action implementation are not eligible (see Article 6).

49.2 Suspension of the action implementation, by the Commission

49.2.1 Conditions

The Commission may suspend implementation of the action or any part of it, if:

(a) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed or is suspected of having committed:

  (i) substantial errors, irregularities or fraud or

  (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles);

(b) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed — in other EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2), or

(c) the action is suspected of having lost its scientific or technological relevance.

49.2.2 Procedure

Before suspending implementation of the action, the Commission will formally notify the coordinator or beneficiary concerned:

- informing it of its intention to suspend the implementation and the reasons why and
- inviting it to submit observations within 30 days of receiving notification.

If the Commission does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify **confirmation** of the suspension. Otherwise, it will formally notify that the procedure is not continued.

The suspension will **take effect** five days after confirmation notification is received (or on a later date specified in the notification).

It will be **lifted** if the conditions for resuming implementation of the action are met.

The coordinator or beneficiary concerned will be formally notified of the lifting and the Agreement will be **amended** to set the date on which the action will be resumed, extend the duration of the action and make other changes necessary to adapt the action to the new situation (see Article 55) — unless the Agreement has already been terminated (see Article 50).

The suspension will be lifted with effect from the resumption date set out in the amendment. This date may be before the date on which the amendment enters into force.

Costs incurred during suspension are not eligible (see Article 6).

The beneficiaries may not claim damages due to suspension by the Commission (see Article 46).

Suspension of the action implementation does not affect the Commission's right to terminate the Agreement or participation of a beneficiary (see Article 50), reduce the grant or recover amounts unduly paid (see Articles 43 and 44).

ARTICLE 50 — TERMINATION OF THE AGREEMENT OR OF THE PARTICIPATION OF ONE OR MORE BENEFICIARIES

50.1 Termination of the Agreement, by the beneficiaries

50.1.1 Conditions and procedure

The beneficiaries may terminate the Agreement.

The coordinator must formally notify termination to the Commission (see Article 52), stating:

- the reasons why and
- the date the termination will take effect. This date must be after the notification.

If no reasons are given or if the Commission considers the reasons do not justify termination, the Agreement will be considered to have been '**terminated improperly**'.

The termination will **take effect** on the day specified in the notification.

50.1.2 Effects

The coordinator must — within 60 days from when termination takes effect — submit:

(i) a periodic report (for the open reporting period until termination; see Article 20.3) and

(ii) the final report (see Article 20.4).

If the Commission does not receive the reports within the deadline (see above), only costs which are included in an approved periodic report will be taken into account.

The Commission will **calculate** the final grant amount (see Article 5.3) and the balance (see Article 21.4) on the basis of the reports submitted. Only costs incurred until termination are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

Improper termination may lead to a reduction of the grant (see Article 43).

After termination, the beneficiaries' obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

50.2 Termination of the participation of one or more beneficiaries, by the beneficiaries

50.2.1 Conditions and procedure

The participation of one or more beneficiaries may be terminated by the coordinator, on request of the beneficiary concerned or on behalf of the other beneficiaries.

The coordinator must formally notify termination to the Commission (see Article 52) and inform the beneficiary concerned.

If the coordinator's participation is terminated without its agreement, the formal notification must be done by another beneficiary (acting on behalf of the other beneficiaries).

The notification must include:

- the reasons why;
- the opinion of the beneficiary concerned (or proof that this opinion has been requested in writing);
- the date the termination takes effect. This date must be after the notification, and
- a request for amendment (see Article 55), with a proposal for reallocation of the tasks and the estimated budget of the beneficiary concerned (see Annexes 1 and 2) and, if necessary, the addition of one or more new beneficiaries (see Article 56). If termination takes effect after the period set out in Article 3, no request for amendment must be included unless the beneficiary concerned is the coordinator. In this case, the request for amendment must propose a new coordinator.

If this information is not given or if the Commission considers that the reasons do not justify termination, the participation will be considered to have been **terminated improperly**.

The termination will **take effect** on the day specified in the notification.

50.2.2 Effects

The coordinator must — within 30 days from when termination takes effect — submit:

(i) a report on the distribution of payments to the beneficiary concerned and

(ii) if termination takes effect during the period set out in Article 3, a '**termination report**' from the beneficiary concerned, for the open reporting period until termination, containing an overview of the progress of the work, an overview of the use of resources, the individual financial statement and, if applicable, the certificate on the financial statement (see Articles 20.3 and 20.4).

The information in the termination report must also be included in the periodic report for the next reporting period (see Article 20.3).

If the request for amendment is rejected by the Commission (because it calls into question the decision awarding the grant or breaches the principle of equal treatment of applicants), the Agreement may be terminated according to Article 50.3.1(c).

If the request for amendment is accepted by the Commission, the Agreement is **amended** to introduce the necessary changes (see Article 55).

The Commission will — on the basis of the periodic reports, the termination report and the report on the distribution of payments — **calculate** the amount which is due to the beneficiary and if the (pre-financing and interim) payments received by the beneficiary exceed this amount.

The **amount which is due** is calculated in the following steps:

Step 1 — Application of the reimbursement rate to the eligible costs

The grant amount for the beneficiary is calculated by applying the reimbursement rate(s) to the total eligible costs declared by the beneficiary and its linked third parties in the termination report and approved by the Commission.

Only costs incurred by the beneficiary concerned until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

Step 2 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations

In case of a reduction (see Article 43), the Commission will calculate the reduced grant amount for the beneficiary by deducting the amount of the reduction (calculated in proportion to the seriousness of the errors, irregularities or fraud or breach of obligations, in accordance with Article 43.2) from the grant amount for the beneficiary.

If the payments received **exceed the amounts due**:

- if termination takes effect during the period set out in Article 3 and the request for amendment is accepted, the beneficiary concerned must repay to the coordinator the amount unduly received. The Commission will formally notify the amount unduly received and

request the beneficiary concerned to repay it to the coordinator within 30 days of receiving notification. If it does not repay the coordinator, the Commission will draw upon the Guarantee Fund to pay the coordinator and then notify a **debit note** on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);

- in all other cases, in particular if termination takes effect after the period set out in Article 3, the Commission will formally notify a **debit note** to the beneficiary concerned. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the Commission the amount due and the Commission will notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);

- if the beneficiary concerned is the former coordinator, it must repay the new coordinator according to the procedure above, unless:

  - termination takes effect after an interim payment and

  - the former coordinator has not distributed amounts received as pre-financing or interim payments (see Article 21.7).

  In this case, the Commission will formally notify a **debit note** to the former coordinator. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the Commission the amount due. The Commission will then pay the new coordinator and notify a debit note on behalf of the Guarantee Fund to the former coordinator (see Article 44).

If the payments received **do not exceed the amounts due**: amounts owed to the beneficiary concerned will be included in the next interim or final payment.

If the Commission does not receive the termination report within the deadline (see above), only costs included in an approved periodic report will be taken into account.

If the Commission does not receive the report on the distribution of payments within the deadline (see above), it will consider that:

- the coordinator did not distribute any payment to the beneficiary concerned and that

- the beneficiary concerned must not repay any amount to the coordinator.

Improper termination may lead to a reduction of the grant (see Article 43) or termination of the Agreement (see Article 50).

After termination, the concerned beneficiary's obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

50.3 Termination of the Agreement or the participation of one or more beneficiaries, by the Commission

50.3.1 Conditions

The Commission may terminate the Agreement or the participation of one or more beneficiaries, if:

(a) one or more beneficiaries do not accede to the Agreement (see Article 56);

(b) a change to their legal, financial, technical, organisational or ownership situation (or those

of its linked third parties) is likely to substantially affect or delay the implementation of the action or calls into question the decision to award the grant;

(c) following termination of participation for one or more beneficiaries (see above), the necessary changes to the Agreement would call into question the decision awarding the grant or breach the principle of equal treatment of applicants (see Article 55);

(d) implementation of the action is prevented by force majeure (see Article 51) or suspended by the coordinator (see Article 49.1) and either:

(i) resumption is impossible, or

(ii) the necessary changes to the Agreement would call into question the decision awarding the grant or breach the principle of equal treatment of applicants;

(e) a beneficiary is declared bankrupt, being wound up, having its affairs administered by the courts, has entered into an arrangement with creditors, has suspended business activities, or is subject to any other similar proceedings or procedures under national law;

(f) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has been found guilty of professional misconduct, proven by any means;

(g) a beneficiary does not comply with the applicable national law on taxes and social security;

(h) the action has lost scientific or technological relevance;

(i) not applicable;

(j) not applicable;

(k) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed fraud, corruption, or is involved in a criminal organisation, money laundering or any other illegal activity;

(l) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed:

(i) substantial errors, irregularities or fraud or

(ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles);

(m) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed — in other EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2);

(n) despite a specific request by the Commission, a beneficiary does not request — through the coordinator — an amendment to the Agreement to end the participation of one of its linked third parties or international partners that is in one of the situations under points (e), (f), (g), (k), (l) or (m) and to reallocate its tasks.

50.3.2 Procedure

Before terminating the Agreement or participation of one or more beneficiaries, the Commission will formally notify the coordinator or beneficiary concerned:

- informing it of its intention to terminate and the reasons why and
- inviting it, within 30 days of receiving notification, to submit observations and — in case of Point (l.ii) above — to inform the Commission of the measures to ensure compliance with the obligations under the Agreement.

If the Commission does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify to the coordinator or beneficiary concerned **confirmation** of the termination and the date it will take effect. Otherwise, it will formally notify that the procedure is not continued.

The termination will **take effect**:

- for terminations under Points (b), (c), (e), (g), (h), (j), (l.ii) and (n) above: on the day specified in the notification of the confirmation (see above);
- for terminations under Points (a), (d), (f), (i), (k), (l.i) and (m) above: on the day after the notification of the confirmation is received.

50.3.3 Effects

(a) for **termination of the Agreement**:

The coordinator must — within 60 days from when termination takes effect — submit:

(i) a periodic report (for the last open reporting period until termination; see Article 20.3) and

(ii) a final report (see Article 20.4).

If the Agreement is terminated for breach of the obligation to submit reports (see Articles 20.8 and 50.3.1(l)), the coordinator may not submit any reports after termination.

If the Commission does not receive the reports within the deadline (see above), only costs which are included in an approved periodic report will be taken into account.

The Commission will **calculate** the final grant amount (see Article 5.3) and the balance (see Article 21.4) on the basis of the reports submitted. Only costs incurred until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

This does not affect the Commission's right to reduce the grant (see Article 43) or to impose administrative sanctions (Article 45).

The beneficiaries may not claim damages due to termination by the Commission (see Article 46).

After termination, the beneficiaries' obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

(b) for **termination of the participation of one or more beneficiaries**:

The coordinator must — within 60 days from when termination takes effect — submit:

(i) a report on the distribution of payments to the beneficiary concerned;

(ii) a request for amendment (see Article 55), with a proposal for reallocation of the tasks and estimated budget of the beneficiary concerned (see Annexes 1 and 2) and, if necessary, the addition of one or more new beneficiaries (see Article 56). If termination is notified after the period set out in Article 3, no request for amendment must be submitted unless the beneficiary concerned is the coordinator. In this case the request for amendment must propose a new coordinator, and

(iii) if termination takes effect during the period set out in Article 3, a **termination report** from the beneficiary concerned, for the open reporting period until termination, containing an overview of the progress of the work, an overview of the use of resources, the individual financial statement and, if applicable, the certificate on the financial statement (see Article 20).

The information in the termination report must also be included in the periodic report for the next reporting period (see Article 20.3).

If the request for amendment is rejected by the Commission (because it calls into question the decision awarding the grant or breaches the principle of equal treatment of applicants), the Agreement may be terminated according to Article 50.3.1(c).

If the request for amendment is accepted by the Commission, the Agreement is **amended** to introduce the necessary changes (see Article 55).

The Commission will — on the basis of the periodic reports, the termination report and the report on the distribution of payments — **calculate** the amount which is due to the beneficiary and if the (pre-financing and interim) payments received by the beneficiary exceed this amount.

The **amount which is due** is calculated in the following steps:

Step 1 — Application of the reimbursement rate to the eligible costs

The grant amount for the beneficiary is calculated by applying the reimbursement rate(s) to the total eligible costs declared by the beneficiary and its linked third parties in the termination report and approved by the Commission.

Only costs incurred by the beneficiary concerned until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

Step 2 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations

In case of a reduction (see Article 43), the Commission will calculate the reduced grant amount for the beneficiary by deducting the amount of the reduction (calculated in proportion to the seriousness of the errors, irregularities or fraud or breach of obligations, in accordance with Article 43.2) from the grant amount for the beneficiary.

If the payments received **exceed the amounts due**:

- if termination takes effect during the period set out in Article 3 and the request for amendment is accepted, the beneficiary concerned must repay to the coordinator the amount unduly received. The Commission will formally notify the amount unduly received and request the beneficiary concerned to repay it to the coordinator within 30 days of receiving notification. If it does not repay the coordinator, the Commission will draw upon the Guarantee Fund to pay the coordinator and then notify a **debit note** on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);

- in all other cases, in particular if termination takes effect after the period set out in Article 3, the Commission will formally notify a **debit note** to the beneficiary concerned. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the Commission the amount due and the Commission will notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);

- if the beneficiary concerned is the former coordinator, it must repay the new coordinator according to the procedure above, unless:

  - termination takes effect after an interim payment and

  - the former coordinator has not distributed amounts received as pre-financing or interim payments (see Article 21.7).

  In this case, the Commission will formally notify a **debit note** to the former coordinator. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the Commission the amount due. The Commission will then pay the new coordinator and notify a debit note on behalf of the Guarantee Fund to the former coordinator (see Article 44).

If the payments received **do not exceed the amounts due**: amounts owed to the beneficiary concerned will be included in the next interim or final payment.

If the Commission does not receive the termination report within the deadline (see above), only costs included in an approved periodic report will be taken into account.

If the Commission does not receive the report on the distribution of payments within the deadline (see above), it will consider that:

- the coordinator did not distribute any payment to the beneficiary concerned and that

- the beneficiary concerned must not repay any amount to the coordinator.

After termination, the concerned beneficiary's obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

SECTION 4 FORCE MAJEURE

ARTICLE 51 — FORCE MAJEURE

'Force majeure' means any situation or event that:

- prevents either party from fulfilling their obligations under the Agreement,
- was unforeseeable, exceptional situation and beyond the parties' control,
- was not due to error or negligence on their part (or on the part of third parties involved in the action), and
- proves to be inevitable in spite of exercising all due diligence.

The following cannot be invoked as force majeure:

- any default of a service, defect in equipment or material or delays in making them available, unless they stem directly from a relevant case of force majeure,
- labour disputes or strikes, or
- financial difficulties.

Any situation constituting force majeure must be formally notified to the other party without delay, stating the nature, likely duration and foreseeable effects.

The parties must immediately take all the necessary steps to limit any damage due to force majeure and do their best to resume implementation of the action as soon as possible.

The party prevented by force majeure from fulfilling its obligations under the Agreement cannot be considered in breach of them.

CHAPTER 7 FINAL PROVISIONS

ARTICLE 52 — COMMUNICATION BETWEEN THE PARTIES

52.1 Form and means of communication

Communication under the Agreement (information, requests, submissions, 'formal notifications', etc.) must:

- be made in writing and
- bear the number of the Agreement.

All communication must be made through the Participant Portal **electronic** exchange system and using the forms and templates provided there.

If — after the payment of the balance — the Commission finds that a formal notification was not

accessed, a second formal notification will be made by registered post with proof of delivery ('formal notification on **paper**'). Deadlines will be calculated from the moment of the second notification.

Communications in the electronic exchange system must be made by persons authorised according to the Participant Portal Terms & Conditions. For naming the authorised persons, each beneficiary must have designated — before the signature of this Agreement — a 'legal entity appointed representative (LEAR)'. The role and tasks of the LEAR are stipulated in his/her appointment letter (see Participant Portal Terms & Conditions).

If the electronic exchange system is temporarily unavailable, instructions will be given on the Commission website.

52.2 Date of communication

Communications are considered to have been made when they are sent by the sending party (i.e. on the date and time they are sent through the electronic exchange system).

Formal notifications through the **electronic** exchange system are considered to have been made when they are received by the receiving party (i.e. on the date and time of acceptance by the receiving party, as indicated by the time stamp). A formal notification that has not been accepted within 10 days after sending is considered to have been accepted.

Formal notifications **on paper** sent by **registered post** with proof of delivery (only after the payment of the balance) are considered to have been made on either:

- the delivery date registered by the postal service or
- the deadline for collection at the post office.

If the electronic exchange system is temporarily unavailable, the sending party cannot be considered in breach of its obligation to send a communication within a specified deadline.

52.3 Addresses for communication

The **electronic** exchange system must be accessed via the following URL:

https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/myarea/projects

The Commission will formally notify the coordinator and beneficiaries in advance any changes to this URL.

Formal notifications on paper (only after the payment of the balance) addressed **to the Commission** must be sent to the official mailing address indicated on the Commission's website.

Formal notifications on paper (only after the payment of the balance) addressed **to the beneficiaries** must be sent to their legal address as specified in the Participant Portal Beneficiary Register.

ARTICLE 53 — INTERPRETATION OF THE AGREEMENT

53.1 Precedence of the Terms and Conditions over the Annexes

The provisions in the Terms and Conditions of the Agreement take precedence over its Annexes.

Annex 2 takes precedence over Annex 1.

53.2 Privileges and immunities

Not applicable

ARTICLE 54 — CALCULATION OF PERIODS, DATES AND DEADLINES

In accordance with Regulation No 1182/71[30], periods expressed in days, months or years are calculated from the moment the triggering event occurs.

The day during which that event occurs is not considered as falling within the period.

ARTICLE 55 — AMENDMENTS TO THE AGREEMENT

55.1 Conditions

The Agreement may be amended, unless the amendment entails changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

Amendments may be requested by any of the parties.

55.2 Procedure

The party requesting an amendment must submit a request for amendment signed in the electronic exchange system (see Article 52).

The coordinator submits and receives requests for amendment on behalf of the beneficiaries (see Annex 3).

If a change of coordinator is requested without its agreement, the submission must be done by another beneficiary (acting on behalf of the other beneficiaries).

The request for amendment must include:

- the reasons why;
- the appropriate supporting documents, and
- for a change of coordinator without its agreement: the opinion of the coordinator (or proof that this opinion has been requested in writing).

The Commission may request additional information.

If the party receiving the request agrees, it must sign the amendment in the electronic exchange system within 45 days of receiving notification (or any additional information the Commission has requested). If it does not agree, it must formally notify its disagreement within the same deadline. The deadline

[30] Regulation (EEC, Euratom) No 1182/71 of the Council of 3 June 1971 determining the rules applicable to periods, dates and time-limits (OJ L 124, 8.6.1971, p. 1).

may be extended, if necessary for the assessment of the request. If no notification is received within the deadline, the request is considered to have been rejected.

An amendment **enters into force** on the day of the signature of the receiving party.

An amendment **takes effect** on the date agreed by the parties or, in the absence of such an agreement, on the date on which the amendment enters into force.

ARTICLE 56 — ACCESSION TO THE AGREEMENT

56.1 Accession of the beneficiaries mentioned in the Preamble

The other beneficiaries must accede to the Agreement by signing the Accession Form (see Annex 3) in the electronic exchange system (see Article 52) within 30 days after its entry into force (see Article 58).

They will assume the rights and obligations under the Agreement with effect from the date of its entry into force (see Article 58).

If a beneficiary does not accede to the Agreement within the above deadline, the coordinator must — within 30 days — request an amendment to make any changes necessary to ensure proper implementation of the action. This does not affect the Commission's right to terminate the Agreement (see Article 50).

56.2 Addition of new beneficiaries

In justified cases, the beneficiaries may request the addition of a new beneficiary.

For this purpose, the coordinator must submit a request for amendment in accordance with Article 55. It must include an Accession Form (see Annex 3) signed by the new beneficiary in the electronic exchange system (see Article 52).

New beneficiaries must assume the rights and obligations under the Agreement with effect from the date of their accession specified in the Accession Form (see Annex 3).

ARTICLE 57 — APPLICABLE LAW AND SETTLEMENT OF DISPUTES

57.1 Applicable law

The Agreement is governed by the applicable EU law, supplemented if necessary by the law of Belgium.

57.2 Dispute settlement

If a dispute concerning the interpretation, application or validity of the Agreement cannot be settled amicably, the General Court — or, on appeal, the Court of Justice of the European Union — has sole jurisdiction. Such actions must be brought under Article 272 of the Treaty on the Functioning of the EU (TFEU).

As an exception, if such a dispute is between the Commission and Israel Antiquities Authority, UNIVERSITETET I OSLO, the competent Belgian courts have sole jurisdiction.

As an exception, for the following beneficiaries:

- UNIVERSIDADE FEDERAL DE MINAS GERAIS
- UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO
- THE J. PAUL GETTY TRUST
- SMITHSONIAN INSTITUTION

such disputes must — if they cannot be settled amicably — be referred to arbitration. Each party must formally notify to the other party its intention of resorting to arbitration and the identity of the arbitrator. The Permanent Court of Arbitration Optional Rules for Arbitration Involving International Organisations and States in force at the date of entry into force of the Agreement will apply. The appointing authority will be the Secretary-General of the Permanent Court of Arbitration following a written request submitted by either party. The arbitration proceedings must take place in Brussels and the language used in the arbitral proceedings will be English. The arbitral award will be binding on all parties and will not be subject to appeal.

If a dispute concerns administrative sanctions, offsetting or an enforceable decision under Article 299 TFEU (see Articles 44, 45 and 46), the beneficiaries must bring action before the General Court — or, on appeal, the Court of Justice of the European Union — under Article 263 TFEU.

ARTICLE 58 — ENTRY INTO FORCE OF THE AGREEMENT

The Agreement will enter into force on the day of signature by the Commission or the coordinator, depending on which is later.

SIGNATURES

For the coordinator

For the Commission

Apéndice 3: Acuerdo de Consorcio IPERION HS

CONSORTIUM AGREEMENT
IPERION HS – GA 871034

Table of Content

CONSORTIUM AGREEMENT

THIS CONSORTIUM AGREEMENT is based upon REGULATION (EU) No 1290/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2013 laying down the rules for the participation and dissemination in "Horizon 2020 – the Framework Programme for Research and Innovation (2014-2020)" (hereinafter referred to as "the Rules"), and the European Commission Multi-beneficiary General Model Grant Agreement and its Annexes.

BETWEEN:

1. **CONSIGLIO NAZIONALE DELLE RICERCHE (CNR**), established in PIAZZALE ALDO MORO 7, ROMA 00185, Italy, VAT number: IT02118311006, 'the Coordinator',

2. **KONINKLIJK INSTITUUT VOOR HET KUNSTPATRIMONIUM (KIK-IRPA)**, established in Jubelpark 1, Brussels 1000, Belgium,

3. ***UNIVERSIDADE FEDERAL DE MINAS GERAIS (UFMG)***, established in AV ANTONIO CARLOS 6627 PAMPULHA, BELO HORIZONTE MINAS GERAIS 31270 901, Brazil, as 'beneficiary not receiving EU funding',

4. **THE CYPRUS INSTITUTE (CyI)**, established in CONSTANTINOU KAVAFI 20, NICOSIA 2121, Cyprus, VAT number: CY10167225J,

5. **USTAV TEORETICKE A APLIKOVANE MECHANIKY AVCR (ITAM)**, established in PROSECKA 76, PRAHA 9 19000, Czechia, VAT number: CZ68378297,

6. **STIFTUNG PREUSSISCHER KULTURBESITZ (SPK)**, established in VON DER HEYDT STRASSE 16-18, BERLIN 10785, Germany,

7. **AGENCIA ESTATAL CONSEJO SUPERIOR DEINVESTIGACIONES CIENTIFICAS (CSIC, M.P.)**, established in CALLE SERRANO 117, MADRID 28006, Spain, VAT number: ESQ2818002D,

8. **CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS (CNRS)**, established in RUE MICHEL ANGE 3, PARIS 75794, France, VAT number: FR40180089013,

9. **IDRYMA TECHNOLOGIAS KAI EREVNAS (FORTH)**, established in N PLASTIRA STR 100, IRAKLEIO 70013, Greece, VAT number: EL090101655,

10. **Atommagkutató Intézet (Atomki)** established in BEM TER 18/C, DEBRECEN H4026, Hungary, VAT number: HU15300344,

11. **ISRAEL ANTIQUITIES AUTHORITY (IAA)**, established in Rockefeller Museum Bldg, JERUSALEM 91004, Israel,

12. **UNIVERSITA TA MALTA (UOM)**, established in University Campus, Tal-Qroqq, MSIDA 2080, Malta, VAT number: MT12894031,

13. ***UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO (UNAM)***, established in TORRE DE RECTORIA 9º. PISO, CIUDAD UNIVERSITARIA, D.F., MEXICO DISTRITO FEDERAL 04510, Mexico, as 'beneficiary not receiving EU funding',

14. **MINISTERIE VAN ONDERWIJS, CULTUUR EN WETENSCHAP (RCE)**, established in Rijnstraat 50, DEN HAAG 2500 BJ, Netherlands,

15. **UNIVERSITETET I OSLO (UiO)**, established in PROBLEMVEIEN 5-7, OSLO 0313, Norway, VAT number: NO971035854MVA,

16. **UNIWERSYTET MIKOLAJA KOPERNIKA W TORUNIU (NCU)**, established in UL. JURIJA GAGARINA 11, TORUN 87100, Poland, VAT number: PL8790177291,

17. **UNIVERSIDADE DE EVORA (UEvora)**, established in LARGO DOS COLEGIAIS 2, EVORA 7000 803, Portugal, VAT number: PT501201920,

18. **NATIONAL INSTITUTE OF RESEARCH AND DEVELOPMENT FOR OPTOELECTRONICS (INOE)**, established in ATOMISTILOR STREET 409, MAGURELE RO77125, Romania, VAT number: RO9113623,

19. **RIKSANTIKVARIEAMBETET (RAA)**, established in STORGATAN 41, STOCKHOLM 11484, Sweden, VAT number: SE202100109001,

20. **JAVNI ZAVOD REPUBLIKE SLOVENIJE ZA VARSTVO KULTURNE DEDISCINE (ZVKDS)**, established in POLIANSKA CESTA 40, LJUBLJANA 1000, Slovenia, VAT number: SI45991413,

21. **UNIVERSITY COLLEGE LONDON (UCL)**, established in GOWER STREET, LONDON WC1E 6BT, United Kingdom, VAT number: GB524371168,

22. ***THE J. PAUL GETTY TRUST (GCI)***, established in 1200 GETTY CENTER DRIVE, LOS ANGELES 90049, United States, as 'beneficiary not receiving EU funding',

23. ***SMITHSONIAN INSTITUTION (SI MCI)***, established in JEFFERSON DRIVE 1000, WASHINGTON DC 20560, United States, as 'beneficiary not receiving EU funding',

24. **KOBENHAVNS UNIVERSITET (UCPH)**, established in NORREGADE 10, KOBENHAVN 1165, Denmark, VAT number: DK29979812,

hereinafter, jointly or individually, referred to as "Parties" or "Party"

relating to the Action entitled

"Integrated Platform for the European Research Infrastructure ON Heritage Science"
in short

[IPERION HS]

hereinafter referred to as "Project"

WHEREAS:
The Parties, having considerable experience in the field concerned, have submitted a proposal for the Project to the Funding Authority as part of the Horizon 2020 – the Framework Programme for Research and Innovation (2014-2020).

The Parties wish to specify or supplement binding commitments among themselves in addition to the provisions of the specific Grant Agreement to be signed by the Parties and the EC (hereinafter "Grant Agreement").

NOW, THEREFORE, IT IS HEREBY AGREED AS FOLLOWS:

Section 1: Definitions

1.1 Definitions

Words beginning with a capital letter shall have the meaning defined either herein or in the Rules or in the Grant Agreement including its Annexes.

1.2 Additional Definitions

"Consortium Plan"

Consortium Plan means the description of the action and the related agreed budget as first defined in the Grant Agreement and which may be updated by the Governing Board.

"Funding Authority"

Funding Authority means the body awarding the grant for the Project.

"Defaulting Party"

Defaulting Party means a Party which the Governing Board has identified to be in breach of this Consortium Agreement and/or the Grant Agreement as specified in Section 4.2 of this Consortium Agreement.

"Legitimate interest(s)"
Legitimate interest includes but is not limited to academic or commercial interest or interest related to a Party's corporate image, which breach would result in such Party suffering great harm in the cases provided for in this Consortium Agreement.

"Needed"

Means,

- For the implementation of the Project:

  Access Rights are Needed if, without the grant of such Access Rights, carrying out the tasks assigned to the recipient Party would be impossible, significantly delayed, or require significant additional financial or human resources.

- For exploitation of own Results:

  Access Rights are Needed if, without the grant of such Access Rights, the Exploitation of own Results would be technically or legally impossible.

“Software”

Software means sequences of instructions to carry out a process in, or convertible into, a form executable by a computer and fixed in any tangible medium of expression.

Section 2: Purpose

The purpose of this Consortium Agreement is to specify with respect to the Project the relationship among the Parties, in particular concerning the organisation of the work between the Parties, the management of the Project and the rights and obligations of the Parties concerning inter alia liability, Access Rights and dispute resolution.

Section 3: Entry into force, duration and termination

3.1 Entry into force

An entity becomes a Party to this Consortium Agreement upon signature of this Consortium Agreement by a duly authorised representative. This Consortium Agreement shall have effect from the date of signature of the Consortium Agreement by all the Parties or the Start Date of the Grant Agreement whichever is the earlier.

A new entity becomes a Party to the Consortium Agreement upon signature of the accession document (Attachment 2) by the new Party and the Coordinator. Such accession shall have effect from the date identified in the accession document.

3.2 Duration and termination

This Consortium Agreement shall continue in full force and effect until complete fulfilment of all obligations undertaken by the Parties under the Grant Agreement and under this Consortium Agreement.
However, this Consortium Agreement or the participation of one or more Parties to it may be terminated in accordance with the terms of this Consortium Agreement.

If the Grant Agreement
- is not signed by the Funding Authority or a Party, or
- is terminated,

or if a Party's participation in the Grant Agreement is terminated,
this Consortium Agreement shall automatically terminate in respect of the affected Parties, subject to the provisions surviving the expiration or termination under Section 3.3 of this Consortium Agreement.
The Parties agree that if a Party requests to terminate its participation in this Consortium Agreement, this request will be considered as a request for termination in the Grant Agreement, according to article 50.2. The provisions of the Grant Agreement and of this Consortium Agreement regarding termination shall apply as hereafter complemented.

If a Party wishes to terminate its participation in the Grant Agreement and this Consortium Agreement, it shall send a request in writing to the Coordinator. Such request shall fully set out the reasons for which such withdrawal is deemed necessary. The Coordinator submits the

request to the competent Consortium body, who may require that certain conditions are fulfilled by the withdrawing Party, in the interest of the Project.

In case of one Party's withdrawal, the other Parties shall use reasonable endeavours to reach a timely agreement on how to reallocate the requesting Party's tasks under the Consortium Plan, and their related budget and EC contribution, so that the overall objectives of the Project can still be met after the Party's withdrawal. This agreement shall include the involvement of Third Parties. If applicable, one Third Party can request the competent Consortium Body to replace the withdrawing Party. Following the decisions above, the Coordinator shall promptly notify the Commission, for its approval and any needed Grant Agreement amendment procedure.

3.3 Survival of rights and obligations

The provisions relating to Access Rights (Section 9) and Confidential Information (Section 10), for the time period mentioned therein, as well as for liability (Section 5), Applicable law (Section 11.8) and Settlement of disputes (Section 11.9) shall survive the expiration or termination of this Consortium Agreement.
Termination shall not affect any rights or obligations of a Party leaving the Consortium incurred prior to the date of termination, unless otherwise agreed between the Governing Board and the leaving Party. This includes the obligation to provide all input, deliverables and documents for the period of its participation. However, Access Rights shall not apply in relation to a Party's Background where the Grant Agreement is not signed by that Party.

Section 4: Responsibilities of Parties

4.1 General principles

Each Party undertakes to take part in the efficient implementation of the Project, and to cooperate, perform and fulfil, promptly and on time, all of its obligations under the Grant Agreement and this Consortium Agreement as may be reasonably required from it and in a manner of good faith as prescribed by Belgian law.

Each Party undertakes to notify the Coordinator promptly, in accordance with the governance structure of the Project, any significant information, fact, problem or delay likely to affect the Project.

Each Party shall promptly provide all information reasonably required by a Consortium Body or by the Coordinator to carry out its tasks.

Each Party shall take reasonable measures to ensure the accuracy of any information or materials it supplies to the other Parties.

4.2 Breach

In the event that a responsible Consortium Body identifies a breach by a Party of its obligations under this Consortium Agreement or the Grant Agreement (e.g. improper implementation of

the Project), the Coordinator or, if the Coordinator is in breach of its obligations, the Party appointed by the Governing Board will give formal notice to such Party requiring that such breach will be remedied within 30 calendar days from the date of receipt of the written notice by the Party.

If such breach is substantial and is not remedied within that period or if appropriate steps have not been taken to remedy the breach or the breach is not capable of remedy, the Governing Board may decide to declare the Party to be a Defaulting Party and to decide on the consequences thereof which may include termination of its participation.

4.3 Involvement of third parties

A Party that enters into a subcontract or otherwise involves third parties (including but not limited to Affiliated Entities) in the Project remains responsible for carrying out its relevant part of the Project and for such third party's compliance with the provisions of this Consortium Agreement and of the Grant Agreement. It has to ensure that the involvement of third parties does not affect the rights and obligations of the other Parties under this Consortium Agreement and the Grant Agreement.

Section 5: Liability towards each other

5.1 No warranties

In respect of any information or materials (including Results and Background) supplied by one Party to another under the Project, no warranty or representation of any kind is made, given or implied as to the sufficiency or fitness for purpose nor as to the absence of any infringement of any proprietary rights of third parties.

Therefore,
- the recipient Party shall in all cases be entirely and solely liable for the use to which it puts such information and materials, and
- no Party granting Access Rights shall be liable in case of infringement of proprietary rights of a third party resulting from any other Party (or its Affiliated Entities) exercising its Access Rights.

5.2 Limitations of contractual liability

No Party shall be responsible to any other Party for any indirect or consequential loss or similar damage such as, but not limited to, loss of profit, loss of revenue or loss of contracts, provided such damage was not caused by a willful act.

A Party's aggregate liability towards the other Parties collectively shall be limited to once the Party's share of the total costs of the Project as identified in Annex 2 of the Grant Agreement provided such damage was not caused by a willful act.

The terms of this Consortium Agreement shall not be construed to amend or limit any Party's statutory or non-contractual liability.

5.3 Damage caused to third parties

Each Party shall be solely liable for any loss, damage or injury to third parties resulting from the performance of the said Party's obligations by it or on its behalf under this Consortium Agreement or from its use of Results or Background.

5.4 Force Majeure

No Party shall be considered to be in breach of this Consortium Agreement if it is prevented from fulfilling its obligations under the Consortium Agreement by Force Majeure.
Each Party will notify the competent Consortium Bodies of any Force Majeure without undue delay. If the consequences of Force Majeure for the Project are not overcome within 6 weeks after such notification, the transfer of tasks - if any - shall be decided by the competent Consortium Bodies.

Section 6: Governance structure

6.1 General structure

The organisational structure of the Consortium shall comprise the following Consortium Bodies:

Governing Board (GB) as the ultimate decision-making body of the consortium;
Steering Committee (SC) as the supervisory body for the execution of the Project which shall report to and be accountable to the Governing Board.
The Coordinator is the legal entity acting as the intermediary between the Parties and the Funding Authority. The Coordinator shall, in addition to its responsibilities as a Party, perform the tasks assigned to it as described in the Grant Agreement and this Consortium Agreement. The term "Project Coordinator" refers to the natural person expressed by the Coordinator to steer the Project.

The IPERION Coordination Office (CO) will support the Project Coordinator and the Steering Committee in the day-to-day management of the project.

Each Party will designate a natural person as Representative of the Party in each Consortium Body in which the Party is a Member. The Representative of a Party decides and votes on behalf of the Party they represent.
All notifications to a Party concerning a Consortium Body are considered validly transmitted if they are sent to the Party Representative in that Body.
The Representatives shall be designated by listing them in Attachment 5 to this Consortium Agreement or by a written delegation by the Party's Legal Representative.

6.2 General operational procedures for all Consortium Bodies

6.2.1 Representation in meetings

Any Party which is a member of a Consortium Body (hereinafter referred to as "Member"):

should be represented at any meeting of such Consortium Body;
may appoint a substitute by presenting a proxy statement to the chairperson of the Consortium Body, in order to attend the meeting and vote; such substitute shall be bound by the non-disclosure obligations such as described in Section 10 of this Consortium Agreement to attend and vote at any meeting;
and shall participate in a cooperative manner in the meetings.
Any person external to the Consortium attending by invitation the meeting of a Consortium Body dealing with confidential matters, who will participate without voting rights according to article 6.3.1.1.1, will be asked to sign a non-disclosure agreement.

6.2.2 Preparation and organisation of meetings

6.2.2.1 Convening meetings
The chairperson of a Consortium Body shall convene meetings of that Consortium Body.

	Ordinary meeting	Extraordinary meeting
Governing Board	At least once a year	At any time upon written request of the Steering Committee or 1/3 of the Members of the Governing Board
Steering Commitee	At least twice per year	At any time upon written request of any Member of the Steering Committee

6.2.2.2 Notice of a meeting:
The chairperson of a Consortium Body shall give notice in writing of a meeting to each Member of that Consortium Body as soon as possible and no later than the minimum number of days preceding the meeting as indicated below.

	Ordinary meeting	Extraordinary meeting
Governing Board	30 calendar days	14 calendar days
Steering Committee	14 calendar days	7 calendar days

A meeting of a Consortium Body is considered validly notified also with late notification, if all the Members are represented at the meeting and accept the late convocation.

6.2.2.3 Sending the agenda
The chairperson of a Consortium Body shall prepare and send each Member of that Consortium Body a written agenda no later than the minimum number of days preceding the meeting as indicated below.

Governing Board	14 calendar days, 7 calendar days for an extraordinary meeting
Steering Committee	7 calendar days

6.2.2.4 Adding agenda items

Any agenda item requiring a decision by the Members of a Consortium Body must be identified as such on the agenda.

Any Member of a Consortium Body may add an item to the original agenda by written notification to all of the other Members of that Consortium Body up to the minimum number of days preceding the meeting as indicated below.

Governing Board	8 calendar days, 4 calendar days for an extraordinary meeting
Steering Committee	2 calendar days

6.2.2.5 During a meeting the Members of a Consortium Body present or represented can unanimously agree to add a new item to the original agenda.

6.2.2.6 Any decision may also be taken without a meeting if the Coordinator circulates to all Members of the Consortium Body a written document which is then agreed by the defined majority (see Section 6.2.3.) of all Members of the Consortium Body. Such document shall include the deadline for responses.

6.2.2.7 Meetings of each Consortium Body may also be held by teleconference or other telecommunication means.

6.2.2.8 Decisions will only be binding once the relevant part of the Minutes has been accepted according to Section 6.2.5.

6.2.3 Voting rules and quorum

6.2.3.1 Each Consortium Body shall not deliberate and decide validly unless two-thirds (2/3) of its Members are present or represented (quorum).

If the quorum is not reached, the chairperson of the Consortium Body shall convene another ordinary meeting within 15 calendar days. If in this meeting the quorum is not reached once more, the chairperson shall convene an extraordinary meeting which shall be entitled to decide even if less than the quorum of Members are present or represented.

6.2.3.2 Each Member of a Consortium Body present or represented in the meeting shall have one vote.

6.2.3.3 Defaulting Parties may not vote, nor shall their presence account for the necessary quorum.

6.2.3.4 Decisions shall be taken by a majority of two-thirds (2/3) of the votes cast.

6.2.4 Veto rights

6.2.4.1 A Member which can show that its own work, time for performance, costs, liabilities, and intellectual property rights would be severely affected by a decision of a Consortium Body may exercise a veto with respect to the corresponding decision or relevant part of the decision.

6.2.4.2 When the decision is foreseen on the original agenda, a Member may veto such a decision during the meeting only.

6.2.4.3 When a decision has been taken on a new item added to the agenda before or during the meeting, a Member may veto such decision during the meeting and within 15 calendar days after the draft minutes of the meeting are sent.

6.2.4.4 In case of exercise of veto, the Members of the related Consortium Body shall make every effort to resolve the matter which occasioned the veto to the general satisfaction of all its Members.

6.2.4.5 A Party may not veto decisions relating to its identification as a Defaulting Party. The Defaulting Party may not veto decisions relating to its participation and termination in the consortium or the consequences of them.

6.2.4.6 A Party requesting to leave the consortium may not veto decisions relating thereto.

6.2.5 Minutes of meetings

6.2.5.1 The chairperson of a Consortium Body shall produce written minutes of each meeting which shall be the formal record of all decisions taken. They shall send the draft minutes to all Members within 15 calendar days of the meeting.

6.2.5.2 The minutes shall be considered as accepted if, within 15 calendar days from sending, no Member has sent an objection in writing to the chairperson with respect to the accuracy of the draft of the minutes.

6.2.5.3 The chairperson shall send the accepted minutes to all the Members of the Consortium Body and to the Coordinator, who shall safeguard them.
If requested the Coordinator shall provide authenticated duplicates to Parties.

6.3 Specific operational procedures for the Consortium Bodies

6.3.1 Governing Board

In addition to the rules described in Section 6.2, the following rules apply:

6.3.1.1 Members

6.3.1.1.1 The Governing Board shall consist of one representative of each Party (hereinafter Governing Board Member).

The Representative shall be designated by listing them in Attachment 5 to this Consortium Agreement or by a written delegation by the Party's Legal Representative. The Governing Board may invite observers without voting rights and subject to non disclosure agreements.
The Governing Board may decide to appoint permanent observers to the Governing Board without voting rights and subject to non disclosure agreements.

6.3.1.1.2 Each Governing Board Member shall be deemed to be duly authorised to deliberate, negotiate and decide on all matters listed in Section 6.3.1.2. of this Consortium Agreement.
In the event that during a Governing Board vote procedure one of the Representatives declares that they are not authorized to decide on the matter, their abstention shall not count towards meeting the quorum.
The meeting agenda identifying issues requiring a vote shall be circulated as specified in 6.2.2.3.
-
6.3.1.1.3 The Coordinator is member of the Governing Board and shall chair all meetings of the Governing Board.

6.3.1.1.4 The Parties agree to abide by all decisions of the Governing Board.
This does not prevent the Parties from submitting a dispute to resolution in accordance with the provisions of Settlement of disputes in Section 11.9.

6.3.1.1.5 The Parties are encouraged to appoint wherever possible their E-RIHS National Coordinators as their Representatives in the Governing Board.

6.3.1.2 Decisions
The Governing Board shall be free to act on its own initiative to formulate proposals and take decisions in accordance with the procedures set out herein. In addition, all proposals made by the Steering Committee shall also be considered and decided upon by the Governing Board.

The following decisions shall be taken by the Governing Board:

Content, finances and intellectual property rights
- Proposals for changes to Annexes 1 and 2 of the Grant Agreement to be agreed by the Funding Authority
- Changes to the Consortium Plan (including the Consortium budget)
- Modifications to Attachment 1 (Background Included)
- Additions to Attachment 3 (List of Linked Third Parties)
- Additions to Attachment 4 (Identified Affiliated Entities)

Evolution of the consortium
- Entry of a new Party to the consortium and approval of the conditions of the accession of such a new Party
- Withdrawal of a Party from the consortium and approval of the conditions of the withdrawal
- Identification of a breach by a Party of its obligations under this Consortium Agreement or the Grant Agreement
- Declaration of a Party to be a Defaulting Party
- Remedies to be performed by a Defaulting Party

- Termination of a Defaulting Party's participation in the consortium and measures relating thereto
- Proposal to the Funding Authority for a change of the Coordinator
- Proposal to the Funding Authority for suspension of all or part of the Project
- Proposal to the Funding Authority for termination of the Project and the Grant Agreement

6.3.2 Steering Committee

The Steering Committee is responsible for actual implementation, as well as directing quality assurance and the technical progress of the project.
In addition to the rules in Section 6.2, the following rules shall apply:

6.3.2.1 Members

The Steering Committee shall consist of the Coordinator and the Work package Leaders.

These individuals are hereinafter referred to as Steering Committee Members. All Steering Committee Members have voting rights.

The Steering Committee may invite additional external individuals to attend its meetings, without voting rights.

The Parties Representatives in the Steering Committee are the Work package Leaders which are listed in Attachment 5.

The Coordinator shall chair all meetings of the Steering Committee.

6.3.2.2 Minutes of meetings

Minutes of Steering Committee meetings, once accepted, shall be sent by the Coordinator to the Governing Board Members for information.

6.3.2.3 Tasks

6.3.2.3.1 The Steering Committee shall prepare the meetings, propose decisions and propose items for the agenda of the Governing Board according to Section 6.2.2.

6.3.2.3.2 It shall seek a consensus among the Parties.

6.3.2.3.3 The Steering Committee shall be responsible for the proper execution and implementation of the decisions of the Governing Board.

6.3.2.3.4 The Steering Committee shall:

- support the Coordinator in preparing the meetings of the Governing Board;
- support the Coordinator in preparing meetings with the Funding Authority and in preparing related data and deliverables.
- monitor and assess biannually the effective and efficient implementation of the Project;
- report whenever necessary (but at least biannually) to the Governing Board Members on the compliance of the Project with the Consortium Plan, and propose remedies in case of deviation from the Consortium Plan.

6.3.2.3.5 In the case of abolished tasks as a result of a decision of the Governing Board, the Steering Committee shall advise the Governing Board on ways to rearrange tasks and budgets of the Parties concerned. Such rearrangement shall take into consideration the legitimate commitments taken prior to the decisions, which cannot be cancelled.

6.4 Coordinator

6.4.1 The Coordinator shall be the intermediary between the Parties and the Funding Authority and shall perform all tasks assigned to it as described in the Grant Agreement and in this Consortium Agreement.

6.4.2 In particular, the Coordinator shall be responsible for:

- monitoring compliance by the Parties with their obligations with respect to this Consortium Agreement, the Grant Agreement and the Consortium Plan;
- keeping the address list of Members and other contact persons updated and available;
- collecting, reviewing to verify consistency and submitting reports, other deliverables (including financial statements and related certifications) and other required documents to the Funding Authority;
- transmitting documents and information connected with the Project to all Parties concerned;
- administering the financial contribution of the Funding Authority and fulfilling the financial tasks described in Section 7.3;
- providing, upon request, the Parties with official copies or originals of documents which are in the sole possession of the Coordinator when such copies or originals are necessary for the Parties to present claims;
- preparing press releases and joint publications by the Consortium or proposed by the Funding Authority in respect of the procedures of the Grant Agreement Article 29.

If one or more of the Parties is late in submission of any Project deliverable, the Coordinator may nevertheless submit the other parties' Project deliverables and all other documents required by the Grant Agreement to the Funding Authority in time.

6.4.3 If the Coordinator fails in its coordination tasks, the Governing Board may propose to the Funding Authority to change the Coordinator.

6.4.4 The Coordinator shall not be entitled to act or to make legally binding declarations on behalf of any other Party or of the consortium, unless explicitly stated otherwise in the Grant Agreement or this Consortium Agreement

6.4.5 The Coordinator shall not enlarge its role beyond the tasks specified in this Consortium Agreement and in the Grant Agreement.

6.5 IPERION Coordination Office

The IPERION Coordination Office (CO) shall be appointed by the Coordinator. Its composition and structure shall be notified to the Governing Board and to the Steering Committee.
It shall support the Project Coordinator and the Steering Committee in the day-to-day management of the project. A description of its members and of their function shall be available on the project website.
The Leader of WP8 is the head of the CO. Four specific positions in the CO will be appointed, to support specific tasks of the CO:

- Financial Officer to support the Project Coordinator and Steering Committee in all financial issues;
- Quality Officer to support the internal quality management system;
- Reporting Officer to support the Project Coordinator and Steering Committee in all issues related to internal project reporting and reporting to the Commission;
- Communication Officer to support the Project Coordinator and Steering Committee in providing efficient, high impact communication.

The CO will also chair the Editorial Committee.
More specific positions can be suggested by the Steering Committee during the project development, if deemed useful to the functionality of the CO.

6.6 Advisory Bodies

The Project's Advisory Bodies are:
• Access Board (AB)
• Three Peer Review Panels (PRP)
• Scientific Advisory Board (SAB)
• Advisory Board for Regional Development Strategies (RDSAB)

The Coordinator is authorised to execute with each member of the Advisory Boards a non-disclosure agreement, which terms shall be not less stringent than those stipulated in this Consortium Agreement, no later than 30 calendar days after their nomination or before any confidential information will be exchanged, whichever date is earlier. The Advisory Boards members shall be allowed to participate in Governing Board meetings upon invitation, without voting rights

6.6.1 Scientific Advisory Board

The Scientific Advisory Board (SAB) provides advice on general project strategies and offers independent views and evaluations of the effectiveness and impact of the Project. The SAB includes representatives of major stakeholders groups: researcher communities, industrial associations, professional associations, museums and Cultural Heritage institutions. The SAB can be consulted by the Project Coordinator or upon request of the Governing Board whenever deemed appropriate (e.g. in case of a major problem) and will be consulted at three stages in the project:

- after kick-off,
- after publication of the mid-term report,

- at the end of the project.

The SAB is entitled to give unsolicited advice at any stage in the Project. Although such advice from the SAB is not binding, the Project Coordinator should be able to show that any advice given has been duly considered.

The SAB is appointed by the Governing Board. The first Advisory Board meeting will be held within six months of the kick-off meeting. The SAB will elect its Chair at its first meeting. If necessary, SAB meetings may also be held through teleconferencing.

6.6.2 The Access Board (AB)

The Access Board (AB) is an internal advisory body composed of access experts helping the integration of user services. It includes six representatives for each access platform of IPERION HS – namely: the WP Leader, the Deputy WP Leader and four Task Leaders –, and the WP 8 Work Package leader. To secure connections among related activities carried out in other WPs, also task leaders responsible for Data management, Interoperability and IPR management shall also participate in the AB.

The AB shall serve as a forum to ensure continued interaction and exchange of experiences between TNA platforms on common issues, such as IPR, interoperability and data management. It will be assisted in its tasks by the Coordination Office.

The AB, in cooperation with CO, will:
collect and process all TNA submissions;
provide technical advice on TNA to users, supporting the activities of the Welcome Desk and User Helpdesk;
provide technical advice to the Peer Review Panels about the research projects submitted for TNA;
provide feedback to the SC and monitor the quality of TNA activity and identify possible contingencies in TNA provision;
advise the SC about quality and impact of communication and feedback to users, helping to identify optimized solutions wherever needed.

The AB will meet at the kick-off meeting and then at least every six months, in time to provide input to the Peer Review Panels. At the kick-off and mid-term meetings, the AB will elect one chair and two vice-chairs, each representing the three platforms of TNA. The addition of selected representatives of the user community to the AB (one or two for each TNA platform) will be considered during the development of the project, and decided on consultation with the SC.

6.6.3 Peer Review Panels (PRP)

Three Peer Review Panels, composed of acknowledged experts selected outside the consortium, will be in charge of the scientific evaluation and ranking of TNA submissions: one A-PRP for the ARCHLAB platform, one M-PRP for the MOLAB platform and one F-PRP for the FIXLAB platform. IPERION HS introduces an innovation in the reviewing process: the use of additional

experts in the PRPs. The fixed members of the three unique PRP will be able to call on additional experts to involve them in the evaluation of the proposals, related to their specific experience.

It will be composed of heritage science experts, past users of the Research Infrastructure (expert users) and of experts working for national facilities and access providers. The composition of the fixed part of PRPs will be proposed by the AB and approved by the SC. Each PRP will decide the procedures required to involve additional experts in the review process. PRPs shall meet following the deadlines of the periodic calls for TNA. The WP leader for the associated TNA will chair the PRP.

The PRPs will meet in person, or make efficient and effective use of web communication tools to discuss and provide consensual scores and recommendations. At the end of each meeting, a review report will be written ranking the approved projects and their classification in order of priority.

6.6.4 Advisory Board for Regional Development Strategies (RDSAB)
The Advisory Board for Regional Development Strategies (RDSAB) will support the networking activities for sustainability developed mainly in T6.2. The members of the board will be experts appointed by the Parties to help in the following activities:

- scouting of perspective national facilities (access providers) to be developed for their use in the research infrastructure;
- identification of potential national or European resources to enable the implementation of such reinforcements;
- alignment of national development strategies to support the coherent development of the RI at European level;
- supporting the implementation at national level of the resulting agenda for balanced development.

The RDSAB will elect its Chair at its first meeting and will decide the calendar of its meetings together with the WP6 Leader, who will Co-chair the RDSAB. If necessary, RDSAB meetings may also be held through teleconferencing.

Section 7: Financial provisions

7.1 General Principles

7.1.1 Distribution of Financial Contribution

The financial contribution of the Funding Authority to the Project shall be distributed by the Coordinator according to:
- the Consortium Plan
- the approval of reports by the Funding Authority, and
- the provisions of payment in Section 7.3.

A Party shall be funded only for its tasks carried out in accordance with the Consortium Plan.

7.1.2 Justifying Costs

In accordance with its own usual accounting and management principles and practices, each Party shall be solely responsible for justifying its costs with respect to the Project towards the Funding Authority. Neither the Coordinator nor any of the other Parties shall be in any way liable or responsible for such justification of costs towards the Funding Authority.

7.1.3 Funding Principles

A Party which spends less than its allocated share of the budget as set out in the Consortium Plan or – in case of reimbursement via unit costs - implements less units than foreseen in the Consortium Plan will be funded in accordance with its actual duly justified eligible costs only.

A Party that spends more than its allocated share of the budget as set out in the Consortium Plan will be funded only in respect of duly justified eligible costs up to an amount not exceeding that share.

7.1.4 Return of excess payments; receipts

7.1.4.1 In the case of a Party having received excess payments, the Party shall return the relevant amount to the Coordinator without undue delay.

7.1.4.2 In case a Party earns any receipt that is deductible from the total funding as set out in the Consortium Plan, the deduction is only directed toward the Party earning such income. The other Parties' financial share of the budget shall not be affected by one Party's receipt. In case the relevant receipt is more than the allocated share of the Party as set out in the Consortium Plan, the Party shall reimburse the funding reduction suffered by other Parties.

7.1.5 Financial Consequences of the termination of the participation of a Party
A Party leaving the consortium shall refund all payments it has received except the amount of contribution accepted by the Funding Authority or another contributor.

7.2 Budgeting

The budget set out in the Consortium Plan shall be valued in accordance with the usual accounting and management principles and practices of the respective Parties.

7.3 Payments

7.3.1 Payments to Parties are the exclusive tasks of the Coordinator.

In particular, the Coordinator shall:

- notify the Party concerned promptly of the date and composition of the amount transferred to its bank account, giving the relevant references
- perform diligently its tasks in the proper administration of any funds and in maintaining financial accounts

- With reference to Articles 21.2 and 21.3.2 of the Grant Agreement, no Party shall before the end of the Project receive more than its allocated share of the maximum grant amount from which the amounts retained by the Funding Authority for the Guarantee Fund and for the final payment have been deducted.

7.3.2

The payment schedule, which contains the transfer of pre-financing and interim payments to Parties, will be handled according to the following:

- Funding of costs included in the Consortium Plan will be paid to Parties after receipt from the

European Commission (EC) without undue delay and in conformity with the provisions of the Grant Agreement.
Banking and transaction costs incurred in connection with such transfer will be charged to each concerned Party.

Payment of the balance:

The payment of the balance will be made according to the balance between the costs approved by the EC and total amount of advance payment and interim payments transferred by the coordinator.

The Coordinator is entitled to withhold any payments due to a Party identified by the Governing Board to be in breach of its obligations under this Consortium Agreement or the Grant Agreement (provided that the Coordinator will release any such payments to the Party if and when the Party remedies the relevant breach(es)) or to a Beneficiary which has not yet signed this Consortium Agreement.
Subject always to Section 7.1.4 above the Coordinator may be entitled to recover payments already paid to a Defaulting Party. The Coordinator is entitled to withhold payments to a Party when this is suggested by or agreed with the Funding Authority.

Section 8: Results

8.1 Ownership of Results

Results are owned by the Party that generates them according to the Article 26 of the Grant Agreement. When the results are created within a transnational access, the results are regulated by Article 16 of the Grant Agreement, and their ownership shall be clear to the Users and the Parties before the access provision.

8.1.1 Joint ownership of Results

In case of joint ownership of Results in this Project, Parties' shares of ownership shall be proportional to the intellectual contribution invested in generating that specific Result. The joint owners shall agree on all protection measures, shares of property and on the division of related cost in a joint ownership agreement to be negotiated in advance.

8.1.2 Use of joint Results

Where no joint ownership agreement has yet been concluded or in absence of a joint ownership agreement, each of the joint owners shall be entitled to use the jointly owned Results as follows:

- each of the joint owners shall be entitled to use their jointly owned Results for non-commercial purposes, including research or educational activities on a royalty-free basis, and without requiring the prior consent of the other joint owner(s), and
- each of the joint owners shall be entitled to otherwise Exploit the jointly owned Results and to grant non-exclusive licenses to third parties (without any right to sub-license), if the other joint owners are given:
(a) at least 45 calendar days advance notice; and
(b) A fair and reasonable compensation.

Notwithstanding paragraph a) above, in case the non-exclusive licenses are granted to third parties for commercial purposes, the prior written consent of the joint owners must be obtained.

8.2 Transfer and licensing of Results

Each Party may license or transfer ownership of its own Results or, unless agreed otherwise in a joint ownership agreement, of its own share of jointly owned Results following the procedures of the Grant Agreement Article 30.

It may identify specific third parties it intends to transfer the ownership of its Results to in Attachment (3) to this Consortium Agreement. The other Parties hereby waive their right to prior notice and their right to object to a transfer to listed third parties according to the Grant Agreement Article 30.1.

The transferring Party shall, however, at the time of the transfer, inform the other Parties of such transfer and shall ensure that the rights of the other Parties will not be affected by such transfer.

8.2.1 The Parties recognize that in the framework of a merger or an acquisition of an important part of its assets, it may be impossible under applicable EU and national laws on mergers and acquisitions for a Party to give the full 45 calendar days prior notice for the transfer as foreseen in the Grant Agreement.

8.2.2 The obligations above apply only for as long as other Parties still have - or still may request - Access Rights to the Results.

8.3 Dissemination

8.3.1 Dissemination of jointly created Results

8.3.1.1 During the Project and for a period of 1 year after the end of the Project, the dissemination of jointly created Results by one or several Parties including but not restricted to publications and presentations, shall be governed by the procedure of Article 29.1 of the Grant Agreement subject to the following provisions.

Prior notice of any planned publication shall be given to the other co-owning Party or Parties at least 30 calendar days before the publication. Any objection to the planned publication shall be made in accordance with the Grant Agreement in writing to the Coordinator and to the Party or Parties proposing the dissemination within 15 calendar days after receipt of the notice. If no objection is made within the time limit stated above, the publication is permitted.

Parties are free to disseminate the Results they own exclusively, upon previous information to all Parties.

8.3.1.2 An objection is justified if
(a) the protection of the objecting Party's Results or Background would be adversely affected
(b) the objecting Party's Legitimate interests in relation to the Results or Background would be significantly harmed.

The objection has to include a precise request for necessary modifications.

8.3.1.3 If an objection has been raised the involved Parties shall discuss how to overcome the justified grounds for the objection on a timely basis (for example by amendment to the planned publication and/or by protecting information before publication) and the objecting Party shall not unreasonably continue the opposition if appropriate measures are taken following the discussion.

The objecting Party can request a publication delay of not more than 90 calendar days from the time it raises such an objection. After 90 calendar days the publication is permitted, provided that any information indicated by the objecting Party according to 8.3.1.2 has been removed from the Publication.

8.3.2 Dissemination of another Party's unpublished Results or Background

A Party shall not include in any dissemination activity another Party's Results or Background without obtaining the owning Party's prior written approval, unless they are already published. In the case of a Party publishing already published Results or Background, this Party shall include references to the previous dissemination and the author's name, and inform the author.

8.3.3 Cooperation obligations

The Parties undertake to cooperate to allow the timely submission, examination, publication and defence of any dissertation or thesis for a degree which includes their Results or Background subject to the confidentiality and publication provisions agreed in this Consortium Agreement.

8.3.4 Use of names, logos or trademarks of the Parties

Nothing in this Consortium Agreement shall be construed so as to confer rights to use in advertising, publicity or otherwise the name of the Parties or any of their logos or trademarks without their prior written approval.

8.3.5 Logo and trademark of the Project

Each Party shall be entitled to use any logo or trademark of the Project royalty-free and on a non-exclusive basis for the execution of the Project only, even if such logo or trademark has been filed by a single Party only.
The Parties shall agree on further rules on use of the logo and/or trademark of the Project and its possible needed protection measures in a specific agreement.

Section 9: Access Rights

9.1 Background included

9.1.1 In Attachment 1, the Parties have identified and agreed on the Background for the Project and have also, where relevant, informed each other that Access to specific Background is subject to legal restrictions or limits.

Anything not identified in Attachment 1 shall not be the object of Access Right obligations regarding Background.

9.1.2 Any Party can propose to the Governing Board to modify its Background in Attachment 1 according to the article 6.2.2.6.

9.2 General Principles

9.2.1 Each Party shall implement its tasks in accordance with the Consortium Plan and ensure that its acts within the Project do not knowingly infringe third party property rights.

9.2.2 Any Access Rights granted expressly exclude any rights to sublicense unless otherwise. expressly stated.

9.2.3 Access Rights shall be free of any administrative transfer costs.

9.2.4 Access Rights are granted on a non-exclusive basis.

9.2.5 Results and Background shall be used only for the purposes for which Access Rights to it have been granted.

9.2.6 All requests for Access Rights shall be made in writing.
The granting of Access Rights may be made conditional on the acceptance of specific conditions aimed at ensuring that these rights will be used only for the intended purposes, only for so long as it is necessary for those purposes and that appropriate confidentiality obligations are in place.

9.2.7 The requesting Party must show that the Access Rights are Needed.

9.3 Access Rights for implementation

Access Rights to Results and Background Needed for the performance of the own work of a Party under the Project shall be granted on a royalty-free basis, unless otherwise agreed for Background in Attachment 1.

9.4 Access Rights for Exploitation

9.4.1 Access Rights to Results if Needed for Exploitation of a Party's own Results shall be granted on Fair and Reasonable conditions.
Access rights to Results for internal non-commercial research activities and for non-commercial educational purposes shall be granted on a royalty-free basis

9.4.2 Access Rights to Background if Needed for Exploitation of a Party's own Results, including for research on behalf of a third party, shall be granted on Fair and Reasonable conditions.

9.4.3 A request for Access Rights may be made up to 12 months after the end of the Project or, in the case of Section 9.7.2.1.2, after the termination of the requesting Party's participation in the Project.

9.5 Access Rights for Affiliated Entities established in an EU Member State or Associated Country

9.5.1 Affiliated Entities established in an EU Member State or Associated Country, or in Countries covered by section 11.7 of the Consortium Agreement have Access Rights under the conditions of the Grant Agreement Articles 25.4 and 31.4 if they are identified in Attachment 4 (Identified Affiliated Entities) to this Consortium Agreement.

Such Access Rights must be requested by the Affiliated Entity from the Party that holds the Background or Results. Alternatively, the Party granting the Access Rights may individually agree with the Party requesting the Access Rights to have the Access Rights include the right to sublicense to the latter's Affiliated Entities. Access Rights to Affiliated Entities (listed in Attachment 4) shall be granted on Fair and Reasonable conditions and upon written bilateral agreement.

Affiliated Entities which obtain Access Rights shall fulfil all confidentiality and other obligations accepted by the Parties under the Grant Agreement or this Consortium Agreement as if such Affiliated Entities were Parties.

Access Rights may be refused to Affiliated Entities if such granting is contrary to the legitimate interests of the Party which owns the Background or the Results.

Access Rights granted to any Affiliated Entity are subject to the continuation of the Access Rights of the Party to which it is affiliated, and shall automatically terminate upon termination of the Access Rights granted to such Party.

Upon cessation of the status as an Affiliated Entity, any Access Rights granted to such former Affiliated Entity shall lapse.
Further arrangements with Affiliated Entities may be negotiated in separate agreements. The involvement of Affiliated Entities that are not established in a Country must be covered by specific agreements.

9.6 Additional Access Rights

For the avoidance of doubt any grant of Access Rights not covered by the Grant Agreement or this Consortium Agreement shall be at the absolute discretion of the owning Party and subject to such terms and conditions as may be agreed between the owning and receiving Parties.

9.7 Access Rights for Parties entering or leaving the consortium

9.7.1 New Parties entering the consortium

As regards Results developed before the accession of the new Party, the new Party will be granted Access Rights on the conditions applying for Access Rights to Background.

9.7.2 Parties leaving the consortium

9.7.2.1 Access Rights granted to a leaving Party

9.7.2.1.1 Defaulting Party

Access Rights granted to a Defaulting Party and such Party's right to request Access Rights shall cease immediately upon receipt by the Defaulting Party of the formal notice of the decision of the Governing Board to terminate its participation in the consortium.

9.7.2.1.2 Non-defaulting Party

A non-defaulting Party leaving voluntarily and with the other Parties' consent shall have Access Rights to the Results developed until the date of the termination of its participation.
It may request Access Rights within the period of time specified in Section 9.4.3.

9.7.2.2 Access Rights to be granted by any leaving Party

Any Party leaving the Project shall continue to grant Access Rights pursuant to the Grant Agreement and this Consortium Agreement as if it had remained a Party for the whole duration of the Project.

9.8 Specific Provisions for Access Rights to Software

9.8.1 Definitions relating to Software

“Application Programming Interface”
means the application programming interface materials and related documentation containing all data and information to allow skilled Software developers to create Software interfaces that interface or interact with other specified Software.

"Controlled Licence Terms" means terms in any licence that require that the use, copying, modification and/or distribution of Software or another work ("Work") and/or of any work that is a modified version of or is a derivative work of such Work (in each case, "Derivative Work") be subject, in whole or in part, to one or more of the following:
(where the Work or Derivative Work is Software) that the Source Code or other formats preferred for modification be made available as of right to any third party on request, whether royalty-free or not;
that permission to create modified versions or derivative works of the Work or Derivative Work be granted to any third party;
that a royalty-free licence relating to the Work or Derivative Work be granted to any third party.

For the avoidance of doubt, any Software licence that merely permits (but does not require any of) the things mentioned in (a) to (c) is not a Controlled Licence (and so is an Uncontrolled Licence).

"Object Code" means software in machine-readable, compiled and/or executable form including, but not limited to, byte code form and in form of machine-readable libraries used for linking procedures and functions to other software.

"Software Documentation" means software information, being technical information used, or useful in, or relating to the design, development, use or maintenance of any version of a software programme.

"Source Code" means software in human readable form normally used to make modifications to it including, but not limited to, comments and procedural code such as job control language and scripts to control compilation and installation.

9.8.2. General principles

For the avoidance of doubt, the general provisions for Access Rights provided for in this Section 9 are applicable also to Software as far as not modified by this Section 9.8.

Parties' Access Rights to Software do not include any right to receive Source Code or Object Code ported to a certain hardware platform or any right to receive Source Code, Object Code or respective Software Documentation in any particular form or detail, but only as available from the Party granting the Access Rights.
The intended introduction of Intellectual Property (including, but not limited to Software) under Controlled Licence Terms in the Project requires the approval of the General Assembly to implement such introduction into the Consortium Plan.

9.8.3. Access to Software

Access Rights to Software which is Results shall comprise:
- Access to the Object Code; and,
- where normal use of such an Object Code requires an Application Programming Interface (hereafter API), Access to the Object Code and such an API; and,

- if a Party can show that the execution of its tasks under the Project or the Exploitation of its own Results is technically or legally impossible without Access to the Source Code, Access to the Source Code to the extent necessary.

Background shall only be provided in Object Code unless otherwise agreed between the Parties concerned.

9.8.4. Software licence and sublicensing rights

9.8.4.1 Object Code

9.8.4.1.1 Results - Rights of a Party

Where a Party has Access Rights to Object Code and/or API which is Results for Exploitation, such Access shall, in addition to the Access for Exploitation foreseen in Section 9.4, as far as Needed for the Exploitation of the Party's own Results, comprise the right:

- to make an unlimited number of copies of Object Code and API; and
- to distribute, make available, market, sell and offer for sale such Object Code and API alone or as part of or in connection with products or services of the Party having the Access Rights;

provided however that any product, process or service has been developed by the Party having the Access Rights in accordance with its rights to exploit Object Code and API for its own Results.

If it is intended to use the services of a third party for the purposes of this Section 9.8.4.1.1, the Parties concerned shall agree on the terms thereof with due observance of the interests of the Party granting the Access Rights as set out in Section 9.2 of this Consortium Agreement.

9.8.4.1.2 Results - Rights to grant sublicenses to end-users

In addition, Access Rights to Object Code shall, as far as Needed for the Exploitation of the Party's own Results, comprise the right to grant in the normal course of the relevant trade to end-user customers buying/using the product/services, a sublicense to the extent as necessary for the normal use of the relevant product or service to use the Object Code alone or as part of or in connection with or integrated into products and services of the Party having the Access Rights and, as far as technically essential:

- to maintain such product/service;
- to create for its own end-use interacting interoperable software in accordance with the Directive 2009/24/EC of the European Parliament and of the Council of 23 April 2009 on the legal protection of computer programs

9.8.4.1.3 Background

For the avoidance of doubt, where a Party has Access Rights to Object Code and/or API which is Background for Exploitation, Access Rights exclude the right to sublicense. Such sublicensing rights may, however, be negotiated between the Parties.

9.8.4.2 Source Code

9.8.4.2.1 Results - Rights of a Party
Where, in accordance with Section 9.8.3, a Party has Access Rights to Source Code which is Results for Exploitation, Access Rights to such Source Code, as far as Needed for the Exploitation of the Party's own Results, shall comprise a worldwide right to use, to make copies, to modify, to develop, to adapt Source Code for research, to create/market a product/process and to create/provide a service.
If it is intended to use the services of a third party for the purposes of this Section 9.8.4.2.1, the Parties shall agree on the terms thereof, with due observance of the interests of the Party granting the Access Rights as set out in Section 9.2 of this Consortium Agreement.

9.8.4.2.2 Results – Rights to grant sublicenses to end-users
In addition, Access Rights, as far as Needed for the Exploitation of the Party's own Results, shall comprise the right to sublicense such Source Code, but solely for purpose of adaptation, error correction, maintenance and/or support of the Software.
Further sublicensing of Source Code is explicitly excluded.

9.8.4.2.3 Background
For the avoidance of doubt, where a Party has Access Rights to Source Code which is Background for Exploitation, Access Rights exclude the right to sublicense. Such sublicensing rights may, however, be negotiated between the Parties.

9.8.5 Specific formalities
Each sublicense granted according to the provisions of Section 9.8.4 shall be made by a traceable agreement specifying and protecting the proprietary rights of the Party or Parties concerned.

Section 10: Non-disclosure of information

10.1 All information in whatever form or mode of communication, which is disclosed by a Party (the "Disclosing Party") to any other Party (the "Recipient") in connection with the Project during its implementation and which has been explicitly marked as "confidential" at the time of disclosure, or when disclosed orally has been identified as confidential at the time of disclosure and has been confirmed and designated in writing within 15 calendar days from oral disclosure at the latest as confidential information by the Disclosing Party, is "Confidential Information".

10.2 The Recipients hereby undertake in addition and without prejudice to any commitment of non-disclosure under the Grant Agreement, for a period of 4 years after the end of the Project:

- not to use Confidential Information otherwise than for the purpose for which it was disclosed;
- not to disclose Confidential Information to any third party without the prior written consent of the Disclosing Party;
- to ensure that distribution of Confidential Information internally to their organization shall take place on a strict need-to-know basis; and
- to return to the Disclosing Party on demand all Confidential Information which has been supplied to or acquired by the Recipients including all copies thereof and to delete all information stored in a machine readable form. The Recipients may keep a copy to the

extent it is required to keep, archive or store such Confidential Information because of compliance with applicable laws and regulations or for the proof of on-going obligations.

10.3 The Recipients shall be responsible for the fulfilment of the above obligations on the part of their employees or third parties involved in the Project and shall ensure that they remain so obliged, as far as reasonably possible, during and after the end of the Project and/or after the termination of the contractual relationship with the employee or third party.

10.4 The above shall not apply for disclosure or use of Confidential Information, if and in so far as the Recipient can show that:

- the Confidential Information becomes publicly available by means other than a breach of the Recipient's confidentiality obligations;
- the Disclosing Party subsequently informs the Recipient that the Confidential Information is no longer confidential;
- the Confidential Information is communicated to the Recipient without any obligation of confidence by a third party who is to the best knowledge of the Recipient in lawful possession thereof and under no obligation of confidence to the Disclosing Party;
- the disclosure or communication of the Confidential Information is foreseen by provisions of the Grant Agreement;
- the Confidential Information, at any time, was developed by the Recipient completely independently of any such disclosure by the Disclosing Party; or
- the Confidential Information was already known to the Recipient prior to disclosure or
- the Recipient is required to disclose the Confidential Information in order to comply with applicable laws or regulations or with a court or administrative order, subject to the provision of Section 10.7 hereunder.

10.5 The Recipient shall apply the same degree of care with regard to the Confidential Information disclosed within the scope of the Project as with its own confidential and/or proprietary information, but in no case less than reasonable care.

10.6 Each Party shall promptly advise the other Party in writing of any unauthorised disclosure, misappropriation or misuse of Confidential Information after it becomes aware of such unauthorised disclosure, misappropriation or misuse.

10.7 If any Party becomes aware that it will be required, or is likely to be required, to disclose Confidential Information in order to comply with applicable laws or regulations or with a court or administrative order, it shall, to the extent it is lawfully able to do so, prior to any such disclosure
- notify the Disclosing Party of said request, and
- comply with the Disclosing Party's reasonable instructions to protect the confidentiality of the information.

Section 11: Miscellaneous

11.1 Linked Third Parties

All Parties confirm that all Third Parties linked to them are listed in the Grant Agreement (art 14) and in the Attachment 3 to this Consortium Agreement.

- All Parties acknowledge that Access Rights to Background and Results of the Third Parties may be Needed by other Parties for Implementation of the Project or for exploitation of own Results.
- Each Party shall put in place appropriate measures in order to ensure that all Access Rights to the Background and Results Needed to each Party – and its Third Parties – be made available by its own Third Parties at the same conditions as if they were requested and granted among Parties (Sections 8, 9 and 10 of this Consortium Agreement).
- Each Party shall adequately inform its Third Parties of their rights and obligations under the Grant Agreement and this Consortium Agreement.

11.2 Attachments, inconsistencies and severability

This Consortium Agreement consists of this core text and
Attachment 1 (Background included)
Attachment 2 (Accession document)
Attachment 3 (List of Linked Third Parties)
Attachment 4 (Identified Affiliated Entities)
Attachment 5 (Designated Representatives)
Attachment 6 (Bank account information)
In case the terms of this Consortium Agreement are in conflict with the terms of the Grant Agreement, the terms of the latter shall prevail. In case of conflicts between the attachments and the core text of this Consortium Agreement, the latter shall prevail.

Should any provision of this Consortium Agreement become invalid, illegal or unenforceable, it shall not affect the validity of the remaining provisions of this Consortium Agreement. In such a case, the Parties concerned shall be entitled to request that a valid and practicable provision be negotiated which fulfils the purpose of the original provision.

11.3 No representation, partnership or agency

Except as otherwise provided in Section 6.4.4, no Party shall be entitled to act or to make legally binding declarations on behalf of any other Party or of the consortium. Nothing in this Consortium Agreement shall be deemed to constitute a joint venture, agency, partnership, interest grouping or any other kind of formal business grouping or entity between the Parties.

11.4 Notices and other communication

Any notice to be given under this Consortium Agreement shall be in writing to the addresses and recipients as listed in the most current address list kept by the Coordinator.

Formal notices:

If it is required in this Consortium Agreement (Sections 4.2, 9.7.2.1.1, and 11.5) that a formal notice, consent or approval shall be given, such notice shall be signed by an authorised representative of a Party and shall either be served personally or sent by mail with recorded delivery and with receipt acknowledgement.

Other communication:
Other communication between the Parties may also be effected by other means such as e-mail with acknowledgement of receipt, which fulfils the conditions of written form.

Any change of persons or contact details shall be notified immediately by the respective Party to the Coordinator. The address list shall be accessible to all concerned.

11.5 Assignment and amendments

Except as set out in Section 8.2, no rights or obligations of the Parties arising from this Consortium Agreement may be assigned or transferred, in whole or in part, to any third party without the other Parties' prior formal approval.

Amendments and modifications to the text of this Consortium Agreement not explicitly listed in Section 6.3.1.2 require a separate written agreement to be signed between all Parties.

11.6 Mandatory national law

Nothing in this Consortium Agreement shall be deemed to require a Party to breach any mandatory statutory law under which the Party is operating.

11.7 Conformity with the EU-UK Withdrawal Agreement

In conformity with the Agreement on the withdrawal of the United Kingdom of Great Britain and Northern Ireland from the European Union and the European Atomic Energy Community (hereinafter referred to as "the EU-UK Withdrawal Agreement"), the UK and persons or entities established in the UK continue to be eligible to receive Union funds under actions carried out in direct, indirect or shared management, which implement the Project until the closure of the Project and its activities.

For the purpose of this Consortium Agreement, the UK entities (Linked Third Parties and Beneficiaries) listed in the Grant Agreement share the same rights and obligations as European Union Members and Associated Countries as defined by the European Commission's DG for Research and Innovation further to article 7 of the Regulation (EU).

11.8 Language

This Consortium Agreement is drawn up in English, which language shall govern all documents, notices, meetings, arbitral proceedings and processes relative thereto.
Any translation shall be for convenience only and shall have no legal effects.

11.9 Applicable law

This Consortium Agreement shall be construed in accordance with and governed by the laws of Belgium excluding its conflict of law provisions.

11.10 Settlement of disputes

The Parties shall endeavor to settle amicably any dispute, controversy or claim arising under, out of or relating to this Agreement and any subsequent amendments of this Agreement, including, without limitation, its formation, validity, binding effect, interpretation, performance, breach or termination, as well as non-contractual claims.
In the event of a dispute, controversy or claim related to this Agreement the Governing Board shall advise the conflicting Parties in order to help them to come to an amicable settlement.

If, and to the extent that, any such dispute, controversy or claim has not been settled amicably within 90 days of it being raised by one of the disputing Parties, the courts of Brussels shall have exclusive jurisdiction.

Nothing in this Consortium Agreement shall limit the Parties' right to seek injunctive relief in any applicable competent court.

Section 12: Signatures

AS WITNESS:
The Parties have caused this Consortium Agreement to be duly signed by the undersigned authorised representatives in separate signature pages the day and year first above written.

1. Consiglio Nazionale Delle Ricerche (CNR)

Signature

Name:
Title:

Date

2. Koninklijk Instituut voor het Kunstpatrimonium (KIK-IRPA)

Signature

Name:
Title:

Date

3. Universidade Federal De Minas Gerais (UFMG)

Signature

Name:
Title:

Date

4. The Cyprus Institute (CYI)

Signature

Name:
Title:

Date

5. Ustav Teoreticke a Aplikovane Mechaniky AVCR (ITAM)

Signature

Name:
Title:

Date

6. Stiftung Preussischer Kulturbesitz (SPK)

Signature

Name: Prof. Dr. Hermann Parzinger
Title: Präsident

Date

7. Agencia Estatal Consejo Superior De Investigaciones Cientificas (CSIC, M.P.)

Signature

Name:
Title:

Date

8. Centre National De La Recherche Scientifique (CNRS)

Signature

Name:
Title:

Date

9. Idryma Technologias Kai Erevnas (FORTH)

Signature

Name: Nektarios Tavernarakis (Prof.)
Title: Chairman of the Board of Directors of FORTH

Date

10. Atommagkutató Intézet (Atomki)

Signature

Name: Dr. Zsolt Dombrádi
Title: director

Date

11. Israel Antiquities Authority (IAA)

Signature

Name:
Title:

Date

12. Universita Ta Malta (UM)

Signature

Name: Prof. Alfred J. Vella
Title: Rector

Date

13. Universidad Nacional Autonoma De Mexico (UNAM)

Signature

Name: Dr. William Henry Lee Alardín
Title: Coordinator of the Scientific Research of UNAM

Date

14. Ministerie Van Onderwijs, Cultuur En Wetenschap (RCE)
Signature

Name:
Title:

Date

15. Universitetet i Oslo (UiO)

Signature

Name:
Title:

Date

16. Uniwersytet Mikolaja Kopernika W Toruniu (NCU)
Signature

Name: Prof. dr hab. Andrzej Tretyn
Title: Rector

Date

17. Universidade De Evora (UEvora)

Signature

Name: António Candeias
Title: Vice-Rector

Date

18. National Institute Of Research And Development For Optoelectronics (INOE)

Signature

Name: Roxana Savastru
Title: General Director

Date

19. Riksantikvarieambetet (RAA)

Signature

Name:
Title:

Date

20. Javni Zavod Republike Slovenije Za Varstvo Kulturne Dediscine (ZVKDS)

Signature

Name: Janez Kromar
Title: Acting Director General

Date

21. University College London (UCL)

Signature

Name: Giles Machell
Title: Head of EU Contract Management Team

Date

22. The J. Paul Getty Trust (GCI)

Signature

Name:
Title:

Date

23. Smithsonian Institution (SI MCI)

Signature

Name: Jill Robidoux
Title: Contract and Grant Specialist

Date:

24. Kobenhavns Universitet (UCPH)

Signature

Name:
Title:

Date

[Attachment 1: Background included]

According to the Grant Agreement (Article 24) Background is defined as "data, know-how or information (…) that is needed to implement the action or exploit the results". Because of this need, Access Rights have to be granted in principle, but parties must identify and agree amongst them on the Background for the Project. This is the purpose of this attachment.

1. ***Consiglio Nazionale delle Ricerche – National Research Council (CNR)***

As to ***CNR***, it is agreed between the parties that, to the best of their knowledge:

The following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions, shall be as mentioned hereunder:

Describe Background	Specific limitations and/or conditions for implementation (Article 25.2 Grant Agreement)	Specific limitations and/or conditions for exploitation (Article 25.3 Grant Agreement)
All background of the coordination and research groups involved	Royalty-free. Limited to Background Needed for Implementation. Legal restrictions or limits to be evaluated on a case-by-case basis.	Fair and reasonable conditions. Legal restrictions or limits to be evaluated on a case-by-case basis.

This represents the status at the time of signature of this Consortium Agreement.

2. Koninklijk Instituut voor het Kunstpatrimonium – Royal Institute for Cultural Heritage (KIK-IRPA)

As to ***KIK-IRPA***, it is agreed between the parties that, to the best of their knowledge:

The following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions, shall be as mentioned hereunder:

Describe Background	Specific limitations and/or conditions for implementation (Article 25.2 Grant Agreement)	Specific limitations and/or conditions for exploitation (Article 25.3 Grant Agreement)
All background of the research groups involved	Royalty-free. Limited to Background needed for Implementation. Legal restrictions or limits to be evaluated on a case-by-case basis.	Fair and reasonable conditions. Legal restrictions or limits to be evaluated on a case-by-case basis.

This represents the status at the time of signature of this Consortium Agreement.

3. Universidade Federal de Minas Gerais (ANTECIPA)

As to ***ANTECIPA***, it is agreed between the parties that, to the best of their knowledge:

No data, know-how or information of ANTECIPA shall be needed by another Party for implementation of the Project (Article 25.2 Grant Agreement) or Exploitation of that other Party's Results (Article 25.3 Grant Agreement).

This represents the status at the time of signature of this Consortium Agreement.

4**. The Cyprus Institute (CyI)**

As to ***CYI***, it is agreed between the parties that, to the best of their knowledge:

No data, know-how or information of CYI shall be needed by another Party for implementation of the Project (Article 25.2 Grant Agreement) or Exploitation of that other Party's Results (Article 25.3 Grant Agreement).

This represents the status at the time of signature of this Consortium Agreement.

5. Ústav teoretické a aplikované mechaniky – The Institute of Theoretical and Applied Mechanics (ITAM)

As to ***ITAM***, it is agreed between the parties that, to the best of their knowledge:

No data, know-how or information of ITAM shall be needed by another Party for implementation of the Project (Article 25.2 Grant Agreement) or Exploitation of that other Party's Results (Article 25.3 Grant Agreement).

This represents the status at the time of signature of this Consortium Agreement.

6. Stiftung Preußischer Kulturbesitz-Staatliche Museen zu Berlin-Rathgen Forschungslabor – Rathgen Research laboratory - Prussian Cultural Heritage Foundation (SPK)

As to ***SPK,*** it is agreed between the parties that, to the best of their knowledge:

Option 1: The following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions, shall be as mentioned hereunder:

Describe Background	Specific limitations and/or conditions for implementation (Article 25.2 Grant Agreement)	Specific limitations and/or conditions for exploitation (Article 25.3 Grant Agreement)

All background of the coordination and research groups involved	Royalty-free. Limited to Background Needed for Implementation. Legal restrictions or limits to be evaluated on a case-by-case basis.	Fair and reasonable conditions. Legal restrictions or limits to be evaluated on a case-by-case basis.

This represents the status at the time of signature of this Consortium Agreement.

7. Agencia Estatal Consejo Superior de Investigaciones Científicas - Superior Council for Scientific Research (CSIC, M.P.)

As to ***CSIC***, it is agreed between the parties that, to the best of their knowledge:

The following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions, shall be as mentioned hereunder:

Describe Background	Specific limitations and/or conditions for implementation (Article 25.2 Grant Agreement)	Specific limitations and/or conditions for exploitation (Article 25.3 Grant Agreement)
Know-how on the application of electrochemical techniques for the study of corrosion and protection of metals, including devices for in-situ application of these techniques, and evaluation of corrosivity of atmospheres	Royalty-free. Limited to Background Needed for Implementation. Legal restrictions or limits to be evaluated on a case-by-case basis.	Fair and reasonable conditions. Legal restrictions or limits to be evaluated on a case-by-case basis.
Know-how on linear and nonlinear laser spectroscopies, nonlinear laser microscopies and effects of laser irradiation of materials	Royalty-free. Limited to Background Needed for Implementation. Legal restrictions or limits to be evaluated on a case-by-case basis.	Fair and reasonable conditions. Legal restrictions or limits to be evaluated on a case-by-case basis.

This represents the status at the time of signature of this Consortium Agreement.

8. Centre National de la Recherche Scientifique – National Scientific research Centre **(CNRS)**

As to ***CNRS***, it is agreed between the parties that, to the best of their knowledge:

Option 1: The following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions, shall be as mentioned hereunder:

Describe Background	Specific limitations and/or conditions for implementation (Article 25.2 Grant Agreement)	Specific limitations and/or conditions for exploitation (Article 25.3 Grant Agreement)
All background of the coordination and research groups involved	Royalty-free. Limited to Background Needed for Implementation. Legal restrictions or limits to be evaluated on a case-by-case basis.	Fair and reasonable conditions. Legal restrictions or limits to be evaluated on a case-by-case basis.

This represents the status at the time of signature of this Consortium Agreement.

9. The Foundation for Research and Technology Hellas (FORTH)

As to ***FORTH***, it is agreed between the parties that, to the best of their knowledge:

The following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions, shall be as mentioned hereunder:

Describe Background	Specific limitations and/or conditions for implementation (Article 25.2 Grant Agreement)	Specific limitations and/or conditions for exploitation (Article 25.3 Grant Agreement)
a) Expertise/know-how on the development and application of non-linear microscopy techniques for the study of cultural heritage materials. b) Expertise/know-how on the development and application of laser spectroscopic techniques (LIBS, micro-LIBS, LIF, Raman) for the analysis of cultural heritage materials. c) Expertise/know-how on the development and application of holography-based techniques for the study of cultural heritage objects. d) Expertise/know-how on the development and application of photoacoustic	Royalty-free. Limited to Background Needed for Implementation. Any limitation and/or condition arising from restrictions, stipulations, provisions and the like, institutional or otherwise, on Background, requiring an express, in writing, case-by-case waiver/license/ agreement.	Fair and reasonable conditions. Any limitation and/or condition arising from restrictions, stipulations, provisions and the like, institutional or otherwise, on Background, requiring an express, in writing, case-by-case waiver/license/ agreement.

techniques for the study of cultural heritage objects and for monitoring laser cleaning of cultural heritage objects. e) Expertise/know-how on the development and application of laser-based methods for the cleaning of cultural heritage objects. f) Expertise/know-how on the development and application of ground based (geophysical) techniques for mapping archaeological landscapes/ sites and monitoring of monuments. g) Expertise/know-how on the application of satellite remote sensing and aerial photogrammetry in mapping archaeological landscapes. h) Expertise/know-how on the spatial analysis and modelling of archaeological landscapes in GIS.		

This represents the status at the time of signature of this Consortium Agreement.

10. Atommagkutató Intézet (Atomki)

As to ***Atomki***, it is agreed between the parties that, to the best of their knowledge:

Option 1: The following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions, shall be as mentioned hereunder:

Describe Background	Specific limitations and/or conditions for implementation (Article 25.2 Grant Agreement)	Specific limitations and/or conditions for exploitation (Article 25.3 Grant Agreement)
All background of research groups from Atomki and its linked third parties involved	Royalty-free. Limited to Background Needed for Implementation. Legal restrictions or limits to be evaluated on a case-by-case basis.	Fair and reasonable conditions. Legal restrictions or limits to be evaluated on a case-by-case basis.

This represents the status at the time of signature of this Consortium Agreement.

11. Israel Antiquities Authority (IAA)

As to ***IAA*** , it is agreed between the parties that, to the best of their knowledge:

No data, know-how or information of IAA shall be needed by another Party for implementation of the Project (Article 25.2 Grant Agreement) or Exploitation of that other Party's Results (Article 25.3 Grant Agreement).

This represents the status at the time of signature of this Consortium Agreement.

12. L-Università ta' Malta – University of Malta (UM)

As to ***UM***, it is agreed between the parties that, to the best of their knowledge:

No data, know-how or information of UM shall be needed by another Party for implementation of the Project (Article 25.2 Grant Agreement) or Exploitation of that other Party's Results (Article 25.3 Grant Agreement).

This represents the status at the time of signature of this Consortium Agreement.

13. Universidad Nacional Autónoma de México - National Autonomous University of Mexico (UNAM)

As to ***UNAM***, it is agreed between the parties that, to the best of their knowledge:

The following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions, shall be as mentioned hereunder:

Describe Background	Specific limitations and/or conditions for implementation (Article 25.2 Grant Agreement)	Specific limitations and/or conditions for exploitation (Article 25.3 Grant Agreement)
Expertise on the development and application of the available techniques in our group of research for cultural heritage studies and some data bases for the DIGILAB project	Royalty-free. Limited to Background Needed for Implementation. Legal restrictions or limits to be evaluated on a case-by-case basis.	Fair and reasonable conditions. Legal restrictions or limits to be evaluated on a case-by-case basis.

This represents the status at the time of signature of this Consortium Agreement.

14. Rijksdienst voor het Cultureel Erfgoed, Ministerie van Onderwijs, Cultuur en

Wetenschap – Cultural Heritage Agency, Ministry of Education, Culture and Science (RCE)

As to ***RCE***, it is agreed between the parties that, to the best of their knowledge:

The following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions, shall be as mentioned hereunder:

Describe Background	Specific limitations and/or conditions for implementation (Article 25.2 Grant Agreement)	Specific limitations and/or conditions for exploitation (Article 25.3 Grant Agreement)
All background of the coordination and research groups involved	Royalty-free. Limited to Background needed for Implementation. Legal restrictions or limits to be evaluated on a case-by-case basis.	Fair and reasonable conditions. Legal restrictions or limits to be evaluated on a case-by-case basis.

This represents the status at the time of signature of this Consortium Agreement.

15. The University of Oslo – (UiO)

As to ***UiO***, it is agreed between the parties that, to the best of their knowledge:

No data, know-how or information of UiO shall be needed by another Party for implementation of the Project (Article 25.2 Grant Agreement) or Exploitation of that other Party's Results (Article 25.3 Grant Agreement).

This represents the status at the time of signature of this Consortium Agreement.

16. Uniwersytet Mikołaja Kopernika Toruń – Nicolaus Copernicus University (NCU)

As to ***NCU***, it is agreed between the parties that, to the best of their knowledge:

No data, know-how or information of NCU shall be needed by another Party for implementation of the Project (Article 25.2 Grant Agreement) or Exploitation of that other Party's Results (Article 25.3 Grant Agreement).

This represents the status at the time of signature of this Consortium Agreement.

17. University of Evora (UEVORA) - Laboratorio Herança Cultural, Estudos e Salvaguarda (HERCULES)

As to Universidade de Évora - HERCULES , it is agreed between the parties that, to the best of their knowledge:

No data, know-how or information of Universidade de Évora - HERCULES shall be needed by another Party for implementation of the Project (Article 25.2 Grant Agreement) or Exploitation of that other Party's Results (Article 25.3 Grant Agreement).

This represents the status at the time of signature of this Consortium Agreement.

18. Institutul National de Cercetare Dezvoltare in Optoelectronica - National Institute for Research and Development in Optoelectronic (INOE)

As to ***INOE***, it is agreed between the parties that, to the best of their knowledge:

No data, know-how or information of INOE shall be needed by another Party for implementation of the Project (Article 25.2 Grant Agreement) or Exploitation of that other Party's Results (Article 25.3 Grant Agreement).

This represents the status at the time of signature of this Consortium Agreement.

19. Riksantikvarieämbetet - Swedish National Heritage Board (RAA)

As to ***RAA***, it is agreed between the parties that, to the best of their knowledge:

The following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions, shall be as mentioned hereunder:

Describe Background	Specific limitations and/or conditions for implementation (Article 25.2 Grant Agreement)	Specific limitations and/or conditions for exploitation (Article 25.3 Grant Agreement)
All background of the research groups involved	Royalty-free. Limited to Background Needed for Implementation. Legal restrictions or limits to be evaluated on a case-by-case basis.	Fair and reasonable conditions. Legal restrictions or limits to be evaluated on a case-by-case basis.

This represents the status at the time of signature of this Consortium Agreement.

20. Zavod za varstvo kulturne dediščine Slovenije (ZVKDS)

As to ***ZVKDS***, it is agreed between the parties that, to the best of their knowledge

The following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions, shall be as mentioned hereunder:

Describe Background	Specific limitations and/or conditions for implementation (Article 25.2 Grant Agreement)	Specific limitations and/or conditions for exploitation (Article 25.3 Grant Agreement)
All background of the research groups involved	Royalty-free. Limited to Background Needed for Implementation. Legal restrictions or limits to be evaluated on a case-by-case basis.	Fair and reasonable conditions. Legal restrictions or limits to be evaluated on a case-by-case basis.

This represents the status at the time of signature of this Consortium Agreement.

21. University College London (UCL)

As to ***UCL***, it is agreed between the parties that, to the best of their knowledge:

No data, know-how or information of UCL shall be needed by another Party for implementation of the Project (Article 25.2 Grant Agreement) or Exploitation of that other Party's Results (Article 25.3 Grant Agreement).

This represents the status at the time of signature of this Consortium Agreement.

22. The J. Paul Getty Trust – The Getty Conservation Institute (GCI)

As to ***GCI***, it is agreed between the parties that, to the best of their knowledge:

No data, know-how or information of GCI shall be needed by another Party for implementation of the Project (Article 25.2 Grant Agreement) or Exploitation of that other Party's Results (Article 25.3 Grant Agreement).

This represents the status at the time of signature of this Consortium Agreement.

23. The Smithsonian Institution – Museum Conservation Institute – (SI MCI)

As to ***SI MCI***, it is agreed between the parties that, to the best of their knowledge:

The following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions, shall be as mentioned hereunder:

Describe Background	Specific limitations and/or conditions for implementation (Article 25.2 Grant Agreement)	Specific limitations and/or conditions for exploitation (Article 25.3 Grant Agreement)

All background of the coordination and research groups involved.	Royalty-free Limited to Background Needed for Implementation. Legal restrictions or limits to be evaluated on a case-by-case basis.	Fair and reasonable conditions. Legal restrictions or limits to be evaluated on a case-by-case basis.

This represents the status at the time of signature of this Consortium Agreement.

24. University of Copenhagen (UCPH)

As to ***UCPH,*** it is agreed between the parties that, to the best of their knowledge:

No data, know-how or information of UCPH shall be needed by another Party for implementation of the Project (Article 25.2 Grant Agreement) or Exploitation of that other Party's Results (Article 25.3 Grant Agreement)

This represents the status at the time of signature of this Consortium Agreement.

[Attachment 2: Accession document]

ACCESSION

of a new Party to IPERION HS Consortium Agreement, version […, YYYY-MM-DD]

[OFFICIAL NAME OF THE NEW PARTY AS IDENTIFIED IN THE **Grant Agreement**]

hereby consents to become a Party to the Consortium Agreement identified above and accepts all the rights and obligations of a Party starting [date].

[OFFICIAL NAME OF THE NEW PARTY AS IDENTIFIED IN THE **Grant Agreement**] will be represented in the Governing Board by [NAME OF THE REPRESENTATIVE IN THE GOVERNING BOARD].

IF APPLICABLE: [OFFICIAL NAME OF THE NEW PARTY AS IDENTIFIED IN THE **Grant Agreement**] will be represented in the Steering Committee by [NAME OF THE REPRESENTATIVE IN THE STEERING COMMITTEE].

[OFFICIAL NAME OF THE COORDINATOR AS IDENTIFIED IN THE **Grant Agreement**]

hereby certifies that the consortium has accepted in the meeting held on [date] the accession of [the name of the new Party] to the consortium starting [date].

This Accession document has been done in 2 originals to be duly signed by the undersigned authorised representatives.

[Date and Place]

[INSERT NAME OF THE NEW PARTY]
Signature(s)
Name(s)
Title(s)

[Date and Place]

[INSERT NAME OF THE COORDINATOR]
Signature(s)
Name(s)
Title(s)

[Attachment 3: List of Linked Third Parties, as described in article 14.1 of the Grant Agreement]

Linked Third Parties to CNR: - OPD - INFN - UNIBO - UNIPG	Linked Third Parties to RAA: - MAL - SciLifeLab - CL
Linked Third Party to KIK-IRPA: - KMKG-MRAH	Linked Third Party to ZVKDS: - UL
Linked Third Parties to ITAM: - IAP - IAB	Linked Third Parties to CSIC: - CENIEH - IPCE
Linked Third Parties to SPK: - CEZA - RWTH - DI - DAI - Fraunhofer - EKUT - TUM	Linked Third Parties to CNRS: - MC - MNHN - SOLEIL - UBX - ULL
Linked Third Parties to RCE: - RUG - TUD - KNAW DANS - RMA - VU	Linked Third Parties to UCL: - HEL-FC - NG - UoY - NTU - BM
Linked Third Parties to NCU: - AGH - JHI - UW	Linked Third Parties to Atomki: - EK - WIGNER -
Linked Third Party to UEvora: - LNEC	Linked Third Party to FORTH: - Of-ADC
Linked Third Party to INOE: - INP	Linked Third Party to UNAM: - CICORR-UAC

-

[Attachment 4: Affiliated Entities]

UCL Business Ltd, The Network Building, 97 Tottenham Court Road, London, W1T 4TP

[Attachment 5: Designated Representatives]

Party number	Party	Representative in the Governing Board	Representative in the Steering Committee
1	CNR	Luca Pezzati	Luca Pezzati
			Costanza Miliani
			Jana Striova
2	KIK-IRPA	Wim Fremout	Hilde De Clercq
3	UFMG	Luiz A C Souza	----------
4	CYI	Sorin Hermon	----------
5	ITAM	Stanislav Pospíšil	----------
6	SPK	Stefan Simon	----------
7	CSIC	Emilio Cano	Marta Castillejo
8	CNRS	Isabelle Pallot-Frossard	Michel Menu
			Victor Etgens
9	FORTH	Demetrios Anglos	----------
10	Atomki	Zita Szikszai	----------
11	IAA	Kamil Sari	----------
12	UM	JoAnn Cassar	----------
13	UNAM	Jose Luis Ruvalcaba	----------
14	RCE	Tatja Scholte	----------
15	UiO	Ingrid Louise Flatvall	----------
16	NCU	Piotr Targowski	----------
17	UEvora	António Candeias	----------
18	INOE	Roxana Radvan	----------
19	RAA	Marei Hacke	----------
20	ZVKDS	Polonca Ropret	----------
21	UCL	May Cassar	Adam Gibson
22	GCI	Tom Learner	----------
23	SI MCI	Robert J. Koestler	----------
24	UCPH	Matthew Collins	----------

[Attachment 6: Consortium plan and bank account information]

PRE-FINANCING: the amount of the pre-financing payment to the consortium will be EUR 4,930,168.90.

An amount of EUR 308,135.56, corresponding to 5% of the maximum grant amount (see Article 5.1), is retained by the Commission from the pre-financing payment and transferred into the ‘Guarantee Fund’.

Actual amount of the pre-financing to be paid to the bank account specified in the agreement: 4,622,033.34 €

2 – KIK-IRPA	
Account Holder:	Institut royal du Patrimoine artistique
Bank:	bpost banque S.A.
Bank Address:	Boulevard Anspach 1/24
00000 City, Country	1000 Brussels, Belgium
Bank Code No:	
IBAN:	BE73 6792 0047 5960
SWIFT:	PCHQ BEBB
Reference	Prefin IPERION HS project
VAT	BE 0356.463.617
4- CYI	
Account Holder:	THE CYPRUS INSTITUTE
Bank:	ALPHA BANK
Bank Address:	CHILONOS & GLADSTONOS ST. CORNER, STYLIANOU LENA SQUARE
00000 City, Country	1101 NICOSIA, CYPRUS
Bank Code No:	202
IBAN:	CY86 0090 0202 0002 0210 1006 5013
SWIFT:	ABKLCY2N
Reference	Prefin IPERION HS project
VAT	10167225J
5 – ITAM	
Account Holder:	Ústav teoretické a aplikované mechaniky AV ČR, v. v. i.
Bank:	Raiffeisenbank, a. s.
Bank Address:	Karlovo náměstí 10
00000 City, Country	120 00 Praha 2, Česká republika
Bank Code No:	5500
IBAN:	CZ9055000000001234994348
SWIFT:	RZBCCZPP
Reference	Prefin IPERION HS project
VAT	CZ68378297
6 - SPK	
Account Holder:	Bundeskasse Trier, Dienstsitz Trier
Bank:	Deutsche Bundesbank, Filiale Hamburg
Bank Address:	Adolfstr. 14-28
00000 City, Country	24105 Kiel - Germany
Bank Code No:	20000000
IBAN:	DE18 2000 0000 0020 0010 66
SWIFT:	MARKDEF1200
Reference	Prefin IPERION HS project
VAT	DE136630206
7- CSIC	

Account Holder:	AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS
Bank:	BANCO DE ESPAÑA
Bank Address:	C/ALCALÁ, 48
00000 City, Country	28014 MADRID, SPAIN
Bank Code No:	9000 0001 20 0220000047
IBAN:	ES07 9000 0001 2002 2000 0047
SWIFT:	ESPBESMM
Reference	Prefin IPERION HS project
VAT	ESQ2818002D
8 – CNRS	
Account Holder:	Agent comptable secondaire CNRS – Region Ile de France Paris B
Bank:	Trésor Public – DRFIP Ile de France et de Paris
Bank Address:	94, rue Réaumur 75104 Paris Cedex 02
00000 City, Country	Paris, FRANCE
Bank Code No:	10071
IBAN:	FR76 1007 1750 0000 0010 0519 321
SWIFT:	BDFEFRPPXXX
Reference	Prefin IPERION HS project
VAT	FR40180089013
9 - FORTH	
Account Holder:	FOUNDATION FOR RESEARCH AND TECHNOLOGY – HELLAS
Bank:	PIRAEUS BANK S.A.
Bank Address:	100 N. Plastira Str., Vassilika Vouton
00000 City, Country	71110 Heraklion, Crete, GREECE
Bank Code No:	
IBAN:	GR90 0172 7550 0057 5507 6921 562
SWIFT:	PIRBGRAA
Reference	Prefin IPERION HS project
VAT	EL090101655
10 - Atomki	
Account Holder:	Atommagkutató Intézet
Bank:	Magyar Államkincstár Budapesti és Pest Megyei Igazgatóság
Bank Address:	Váci út 71
00000 City, Country	1139 Budapest, Hungary
Bank Code No:	
IBAN:	HU68 1000 4885 1000 8016 0013 5731
SWIFT:	HUSTHUHB
Reference	Prefin IPERION HS project
VAT	HU 15300344
11 – IAA	
Account Holder:	Israel Antiquities Authority
Bank:	Bank Leumi le Israel B.M.
Bank Address:	1 Agudat Sport HApoel Jerusalem
00000 City, Country	Jerusalem, Israel

Bank Code No:	10
IBAN:	IL33 0109 0100 0003 8570 070
SWIFT:	LUMIILITXXX
Reference	Prefin IPERION HS project
VAT	---
12 - UOM	
Account Holder:	UNIVERSITA TA' MALTA
Bank:	Bank of Valletta Malta plc
Bank Address:	Ground Floor Premises, Fawwara Building, Triq l-Imsida,
00000 City, Country	Gzira GZR 1405, MALTA
Bank Code No:	22013
IBAN:	MT88VALL22013000000040018325025
SWIFT:	VALLMTMT
Reference	Prefin IPERION HS project
VAT	MT12894031
14 - RCE	
Account Holder:	Ministerie van OCW
Bank:	ING Bank
Bank Address:	PO Box 1800
00000 City, Country	1000 BV Amsterdam, Netherlands
Bank Code No:	INGBNL2A
IBAN:	NL46 INGB 0705 0039 22
SWIFT:	INGBNL2A
Reference	Prefin IPERION HS project
VAT	N/A
15 - UiO	
Account holder:	UNIVERSITETET I OSLO
Bank:	IDNB BANK ASA
Bank Address:	DRONNING EUFEMIAS GATE 30
00000 City, Country	N-0021 OSLO, Norway
Bank Code No:	
IBAN:	IN077 769405 11077
SWIFT:	DNBANOKKXXX
Reference	Prefin IPERION HS project
VAT	NO971035854MVA
16 - NCU	
Account Holder:	Uniwersytet Mikołaja Kopernika w Toruniu
Bank:	Bank Millenium S.A.
Bank Address:	ul.Stanisława Żaryna 2A
00000 City, Country	02-593 Warszawa, Poland
Bank Code No:	28 1160 2202 0000 0004 6218 5318
IBAN:	PL28 1160 2202 0000 0004 6218 5318
SWIFT:	BIGBPLPWXXX
Reference	Prefin IPERION HS project
VAT	PL879 017 72 91
17 - HERCULES	

Account Holder:	UNIVERSIDADE DE EVORA
Bank:	Millennium BCP
Bank Address:	Rua Conde da Serra da Tourega
00000 City, Country	7000, Évora
Bank Code No:	
IBAN:	PT50 0033 00000020800699505
SWIFT:	BCOMPTPL
Reference	Prefin IPERION HS project
VAT	PT501201920
18 - INOE	
Account Holder:	NATIONAL INSTITUTE OF RESEARCH AND DEVELOPMENT FOR OPTOELECTRONICS
Bank:	BCR UNIREA
Bank Address:	B-dul Unirii nr..43-45, sector 3
00000 City, Country	Bucharest, Romania
Bank Code No:	
IBAN:	RO34RNCB0082044183870040
SWIFT:	RNCBROBU
Reference	Prefin IPERION HS project
VAT	RO9113623
19 - RAA	
Account Holder:	RIKSANTIKVARIEAMBETET
Bank:	Danske Bank Sweden
Bank Address:	Norrmalmstorg 1 - Box 7523
00000 City, Country	S-103 92 Stockholm, Sweden
Bank Code No:	
IBAN:	SE4312000000012810112614
SWIFT:	DABASESX
Reference	Dnr RAA-2019-343 IPERION HS
VAT	SE202100109001
20 - IPCHS - ZVKDS	
Account Holder:	Institute For The Protection Of Cultural Heritage Of Slovenia
Bank:	Bank of Slovenia
Bank Address:	Slovenska cesta 35
00000 City, Country	1000 Ljubljana, Slovenia
Bank Code No:	
IBAN:	SI56 0110 0603 0381 005 (BANKA SLOVENIJE LJUBLJANA)
SWIFT:	BSLJSI2X
Reference	Prefin IPERION HS project
VAT	45991413
21 - UCL	
Account Holder:	University College London
Bank:	Barclays Bank
Bank Address:	6-17 Tottenham Court Road
00000 City, Country	London, W1T 1AZ United Kingdom
Bank Code No:	20-10-79

IBAN:	GB 93 BARC 2010 7985 487311
SWIFT:	SWIFT BARC GB 22
Reference	Prefin IPERION HS project
VAT	GB 524 3711 68
24 – UCPH	
Account Holder:	Kobenhavns Universitet
Bank:	Den Danske Bank
Bank Address:	Holmens Kanal 2
00000 City, Country	København K. 1090, Denmark
Bank Code No:	
IBAN:	DK73 0216 4069 0443 36
SWIFT_	DABADKKK
Reference	Prefin IPERION HS project
VAT	DK29979812