



NTNU
Norwegian University of
Science and Technology



PhD /Early Stage Researcher (ESR 7)^o position for **Microscopic 3D imaging and conservation**

PhD Enrollment: NORVEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY (NTNU)

Host Institution: Research and Restoration center for the French Museums C2RMF, Centre de recherche et de Restauration des Musées de France, (<https://c2rmf.fr/>)

The **Centre for Research and Restoration of the Museums of France (C2RMF, *Centre de recherche et de restauration des musées de France*)** in the collaboration with the **Norwegian University of Science and Technology in Gjøvik** invites applications for 3-year full time early stage Researcher (ESR 7) position in 3D metrology and 3D printing in the context of the EU-funded Marie Skłodowska-Curie Initial training network (ITN) project entitled Cultural Heritage Analysis for New Generations (CHANGE).

The position will be based in France, at the Research and Restoration center for the French Museums (C2RMF) in Paris, France. The PhD Enrollment is based at the NTNU. Collaborations with **Institut National du Patrimoine (INP)** and **Warsaw University of Technology** are planned.

The **Centre for Research and Restoration of the Museums of France (C2RMF, *Centre de recherche et de restauration des musées de France*)** is the national research centre in France responsible for the research, conservation and restoration of the items held in the collections of the French museums. C2RMF also carries out extensive scientific studies and data recording for these collections, and is active both nationally and internationally in the field of cultural heritage conservation and analysis. The C2RMF is involved in the development of technologies and scientific procedures employed in the preservation of art works and artefacts, both on its own and in partnership with other museums and research institutions across the globe.

The recruited researchers will work in a professional environment in the domain of conservation, restoration and research on cultural heritage, the C2RMF. During their 36 month contract the researchers will be based in the imagery team, 3D metrology section and in close collaboration with the other departments of the center as well as other partners from the CHANGE project all around Europe (especially Norway ITN).

Position description: The candidate is expected to work towards applications of microscale 3D imaging for research, conservation and art restoration purposes. The ESR program will lead the candidate to work on the measurement, modelling and print of surface details with the support of 3D imaging tools.

The objectives are 1) Using of microscale 3D imaging acquisition and solution for 3D printing for conservation purposes. 2) Measurement and modelling of surface details 3) Early stage detection of micro alterations 4) Investigation of 3D printing methods at microscale levels. Expected Results: Tools, methods and materials for using 3D printing in objects conservation.

For 3D measures acquisitions, a high resolution microscale profilometer and several scanners are available. With 3D acquisition data, surface metrology will be used to characterize tool marks or detect early stage micro alterations. The candidate will have to develop protocols for automatic recognition of forms and surface statistics in order to characterize surfaces. Tool marks descriptor will allow object classification; surfaces changes detection will allow monitoring for restoration or climate variations controls. The data will be gathered in a database, which will be chosen and designed for the project purpose.

For example, the candidate could work on analysis of engraved objects and mineral color fragments (from the Paleolithic period) coming from one site but which are located in different museum collections in France. 3D scanning will be used to bring the pieces virtually together again by working on a database. Moreover, the work could consist on elaborating analysis techniques to decipher the engraving and figure out engraving techniques. 3D printing aspects could be used for copy production to bring together split objects from different museum collection. The candidate will also evaluate the quality of 3D printings compared to the 3D models and originals using the methods developed in the project.

The candidate will collaborate with the CHANGE partners and other ESRs to validate and understand the results.

Main Supervisor:

- Nicolas Mélard (C2RMF)

Co-Supervisor(s):

- Jon Hardeberg (NTNU) PhD director
- Clotilde Boust (C2RMF)
- Angèle Dequier (INP)

Qualifications required for the announced position

The candidate must have:

- Master's degree within the field of 3D imaging, computer science, mathematics or a related discipline, obtained with very good final grade (with an average grade of B or better).

Applicants with no letter grades from previous studies must have an equally good academic foundation. Applicants who are unable to meet these criteria may be considered only if they can document that they are particularly suitable candidates for education leading to a PhD degree.

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- The following is desired:
 - Experience with 3D imaging and metrology
 - Experience with statistical analysis and visualization
 - Proficiency in Meshlab, Matlab, or similar programming environments.

Formal regulations

Eligibility criteria:

Eligibility for admission will be determined by considering the combination of the candidate's academic qualifications and relevant professional experience according to the qualifications mentioned above.

Candidates who have completed their Master degree in an institution where English is not the language of instruction must present one of the following Secure English Language Test (SELT) results as follows:

- TOEFL Internet-Based (iBT) – minimum 95 with a writing score of at least 24
- Academic IELTS – minimum 6.5 with a minimum of 6.0 in each element
- Advanced Cambridge Certificate at grade C or better.
- The test results must not be older than 24 months on the date of the application deadline.

Selection criteria:

- Quality of the candidate assessed through the candidate's academic merit and relevant professional experience.

Personal attributes:

- High motivation for research work and ability to work independently
- Interest for cultural heritage and arts
- Ability to work both individually and in a (virtual) team environment and a high level of personal responsibility, initiative and leadership skills
- Excellent oral and written communication skills and an ability to communicate effectively across different stakeholder groups.
- Flexibility and ability to take direction and accommodate feedback from diverse stakeholders.
- Ability to meet deadlines and produce work of a consistently high standard.

- Eager to disseminate research results through publications and presentations at international conferences.

In the evaluation of which candidate is best qualified, emphasis will be placed on education, experience and personal suitability, in terms of the qualification requirements specified in the advertisement.

Please note there are strict eligibility requirements that apply to all Marie Skłodowska-Curie Researchers:

- The candidate must not have resided or carried out his/her main activity (work, studies, etc.) in France for more than 12 months in the 3 years immediately prior to his/her recruitment under the project (short stays such as holidays are not counted).
- At the time of recruitment, the candidate must not have been awarded a doctorate degree and must be in the first 4 years of her/his research career.
- The candidate must work exclusively for the project during the employment contract.

Researchers can be of any nationality. They are required to undertake transnational mobility (i.e. Move from one country to another) when taking up their appointment.

The university is committed to a policy of equal opportunity in employment practices, and we would particularly like to encourage female candidates to apply.

For further information on Marie Skłodowska-Curie schemes and eligibility please visit <http://ec.europa.eu/research/mariecurieactions> and [Guide for Applicants](#)

Applicants must be qualified for admission as PhD students at NTNU. See http://www.ntnu.no/studieavd/dok/PhD_regulations.pdf for information about PhD studies at NTNU.

Salary conditions

PhD candidates are remunerated by CNRS with EU rules : 3783 € / month.

In addition, there will be a monthly mobility allowance of EUR 600 and a monthly family allowance of EUR 500. Eligibility for receiving family allowance depends on the family status when the contract starts. National taxation rules for French salaries apply.

We offer

- Prestigious EU fellowship.
- Be part of a team of leading scientists in different fields of academia doing interdisciplinary research (Visual computing, Imaging techniques, Conservation science)
- Opportunity to develop multidisciplinary research skills.
- Excellent training programme covering research within the field of the topic covered in the PhD position.
- Establish a professional network Internships and visits to different institutes within industry and academia.

To apply

Send an email with explicit subject (e.g Application for ITN-CHANGE-ESR7) containing all required documents (cf. application components above) compiled in one PDF file to the email addresses : jon.hardeberg@ntnu.no, nicolas.melard@culture.gouv.fr & clotilde.boust@culture.gouv.fr.

Application components:

- Curriculum vitae. Include if there any relevant publications and the names and contact information of 2 references.
- Copies of academic certificates and transcripts.
- Motivation letter
- A brief research proposal addressing the topic of the research project (2-3 pages)
- English proficiency results if applicable.

For additional information about the research project, contact:

Main Supervisor: Nicolas Mélard (C2RMF), nicolas.melard@culture.gouv.fr

Co-Supervisor(s):

- Clotilde Boust (C2RMF), clotilde.boust@culture.gouv.fr
- Jon Hardeberg (NTNU), jon.hardeberg@ntnu.no

Starting date: September 2019

Application deadline: 15 February 2019