PhD in CONSERVAZIONE DEI BENI ARCHITETTONICI / PRESERVATION OF THE ARCHITECTURAL HERITAGE - 36th cycle

Research Field: PATINATED STEEL IN THE CONSERVATION WORKS OF BUILT HERITAGE

<table>
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<th>Monthly net income of PhD scholarship (max 36 months)</th>
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<td>€ 1180.0</td>
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In case of a change of the welfare rates during the three-year period, the amount could be modified.

**Context of the research activity**

Interdisciplinary PhD Grant

The PhD research will be carried out in collaboration with research groups of the PhD programme in "Materials Engineering". See http://www.dottorato.polimi.it/index.php?id=242&L=1 for further information.

The research is based on the increasing use of patinated and weathered steel in new projects for the conservation of historical architecture. The steel is used to create and build new functions and volumes, or consolidate historical elements. Material paradox, the weathered steel is surely selected for its aesthetical characteristics, as anew but aged building material, and also for its mechanical performance and durability characteristics. The research proposal is aimed at investigating both the theoretical aspects of the use of such material close to ancient structures, and the selection criteria from the technical point of view. Particular attention will be devoted to the correct use of the steel joined with historical ceramic porous materials, and to the aesthetical consequences and possible deterioration forms. It is well known that the weathered steel releases iron oxides after meteoric washout, and that these could promote surface deterioration phenomena and affect the disgragation of porous materials. Actually, this effect should be carefully considered in the design. Moreover, despite its high
resistance to corrosion, in specific conditions it can be subjected to deterioration and alteration, especially in aggressive marine environment, in which it found large employ. In the next future, the conservation of these steel additions could become a complex task, without a sufficient wealth of experience. The objectives of the research will be then, the definition of cleaning methodology and parameters, the set-up of best practices for the direct protection with innovative coatings. In this regard, the suitable treatments should be effective in preventing corrosion and preserving the aesthetical properties of the surfaces. Beyond that, some alternative proposals of different patinated steels will be evaluated from the point of view of the durability and compatibility in outdoor aggressive conditions.

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<th>Methods and techniques that will be developed and used to carry out the research</th>
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<td>The research is aimed at finding a correlation between the theoretical aspects of the conservation and the most advanced frontiers in materials engineering. Knowledge and competences about the analyses of materials, their properties and durability, will be integrated with the knowledge of the architectural palimpsest. The research actually, joins together the materials characterization and studies with the methodological and historical research. Suitable case studies will be considered to apply and verify the research findings gathered in the laboratory experimental work. The results will allow to evaluate the impact of the selection of steels in many projects together from the point of view of architectural restoration and for their specific material characteristics, such as deterioration and durability.</td>
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<th>Educational objectives</th>
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<td>Upon successful program completion, we expect that they will:</td>
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<td>• Be prepared for employment in research/faculty positions at high-level research institutions</td>
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<td>• Engage in and promote evidence-based practices through the application of rigorous methodology</td>
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<td>• Provide leadership in the field by developing an independent line of ethical and culturally responsive</td>
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Contribute to development of the next generation of scholars.

Graduates of the PhD programme have often found employment in public sector and conservation institutions, as well as in professional practices and in the business world, in specific specialized fields. PhD candidates from abroad find job in their native countries at University or in Cultural Heritage Institutions.

As regards Italy, the relationship with Italian Ministry of Cultural Heritage (Mibact), has been definitely fruitful, especially when we consider that many among the best PhDs in Preservation of Architectural Heritage have been hired as officers and executives to the above ministry: recently (February 2018) twelve PhD from this Programme won the competitive exam to become public officers in the Ministry of Cultural Heritage and most of them are now responsible in prestigious seats.

9 Full Professors
10 Associated Professors
0 Assistant Professors
30 PhD Students

Mc. Giambruno; L. Toniolo; S. Goidanich

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Additional support - Financial aid per PhD student per year (gross amount)

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<th>Housing - Foreign Students</th>
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<td>Housing - Out-of-town residents (more than 80Km out of Milano)</td>
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Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

The proposal is based on the resources and instrumental facilities of the Interdipartimental Lab MatArchLab, developed in collaboration among DCMC, DaStU, DABC, DFIS. The Lab is actually, aimed at characterizing the construction materials, with reference to the surfaces and ageing process in aggressive polluted atmosphere.

**Educational activities** (purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences):
financial aid per PhD student per year ("DOTE"):

1st year: max 0 euro
2nd year: max 1,534,33 euro
3rd year: max 1,534,33 euro

**Teaching assistantship** (availability of funding in recognition of supporting teaching activities by the PhD student)
There are various forms of financial aid supporting the teaching practice. The PhD candidate is encouraged to take part in these activities, within the limits allowed by the regulations.

**Computer availability:** In the PhD candidates room are available workstations for shared use, connected with the printer
All the PhD students can use their own laptop with the wireless connection. Workstations and other equipment are available in the various laboratories linked with the doctoral programme.