PhD Programme in

Preservation of the Architectural Heritage

36th Cycle (2020)

2 Open Topic
Scholarships

2 Thematic & Interdisciplinary
Scholarships

POLITECNICO
MILANO 1863

DIPARTIMENTO DI ARCHITETTURA
E STUDI URBANI

OPEN CALL
Deadline:
29th May 2020

DAStU - Politecnico di Milano
PhD programme in Preservation of the Architectural Heritage

Call for applications 2020 now open!

The PhD programme in **Preservation of the Architectural Heritage** grants **four PhD** positions to start in November 2020.

All positions are fully funded with scholarships and other benefits.

- **Two positions** allow candidates to freely choose their own research topic.
- **Two positions** are based on predefined research topics as follows:

1. Astronomy and Feng Shui in Ancient Chinese City Planning: A Satellite Imagery Approach. This position is co-financed in collaboration with Mathematics Department (Dipartimento di Matematica). Academic supervisors:
Prof. Mariacristina Giambruno (mariacristina.giambruno@polimi.it) and Prof. Giulio Magli (giulio.magli@polimi.it)

2. Patinated Steel in the Conservation Works of Built Heritage.
This is an interdisciplinary grant. The research is carried out in cooperation with the PhD programme in Materials Engineering. Academic supervisors:
Prof. Mariacristina Giambruno (mariacristina.giambruno@polimi.it) and Prof. Lucia Toniolo (lucia.toniolo@polimi.it)

How to Apply

The official call for applications, along with procedures and requirements, is available on: http://www.dottorato.polimi.it/en/looking-for-a-phd/call-for-positions-and-scholarships/index.html

► **Deadline: May, 29th , 2020 (2 p.m. Italian time)**

► **For administrative inquiries contact:**
Marina Bonaventura (marina.bonaventura@polimi.it)

► **Information about the PhD programme in Preservation of the Architectural Heritage is available on:** http://www.dottorato.polimi.it/en/phd-programmes/active-phd-programmes/preservation-of-the-architectural-heritage/index.html

Two Open Scholarships

Motivation and objectives of the research

The PhD programme focuses its attention to some currently crucial themes for the preservation, conservation, management and enhancement of Architectural Heritage. Actually, the conservation of Architectural Heritage is a strategic field, one of the main important resources for worldwide economy and the base for a sustainable future in different areas of the world.

The team of professors, promoting and participating in debates on these topics on a national and international scale, will deal with a broad range of issues requiring strong and real multi-disciplinary approaches. Moreover, to the many competences present in the PhD Board will add others, from outside (different institutions), for specific topics.

The proposals covering following topics are strongly encouraged:

Fragile Heritage
Historic centres, fragility and potentiality; Inner Areas: census, conservation and re-use of architectural heritage; Strategic approaches for preservation; Social involvement and communities engagement in the protection and management of their heritage; Architectural Heritage at risk in seismic or in conflict areas; Architectural Heritage and Cultural Landscapes in countries in transition.

Studies on Built Heritage
Construction techniques and materials: from the 15th to the 20th century; Architecture and methods of construction: languages, technologies, products and sources; Preservation, conservation and re-use of pre-20th century architecture; The question of re-use as possible cause of conflict with the issues of conservation; Protection, conservation and re-use of twentieth-century architecture; Twentieth-century building techniques and methods of restoration; Inventories of cultural heritage, their history and methodologies; Historical systems of heating, lighting, water supply and drainage / waste evacuation in individual buildings and on an urban scale; Wooden and masonry structures (carpentry, floors and ceilings, stone or brick vaults); Traditional construction techniques: conservation problems and approach; Materials and finishing of historic buildings: characteristics, production techniques and use as identified in technical literature and by material analysis; Technical literature on construction: texts and their transmission, treatises, early technical and scientific journals, architectural manuals and journals; Building archaeology: practical issues in archaeological research; Buildings materials archaeology: history of their use, continuity and discontinuity in the use of traditional building materials; archaeology of modernism.

Diagnostics of Materials and Structural Issues
Innovative materials and methods for the conservation of architectural surfaces; Protocols for monitoring the state of preservation of building materials; Innovative methods for the dynamic monitoring of resisting structures (under the effect of environmental noise or specific stimuli); Critical evaluation of empirical construction technologies developed in the pre-scientific age to meet special needs (in particular, resistance to earthquakes); Definition of evaluation process and knowledge of the increases "residual capacity" in existing buildings, ensuring the achievement of the preservation objectives.

Cultural Heritage and Economic Evaluation
The economic perspective on Cultural Heritage; The notion of Total Economic Value; Stated preferences and revealed preferences methods; How to support decisions about preservation, enhancement and re-use of Cultural Heritage.

The PhD programme grants two scholarships financed by the Italian Ministry of University and Research. Applicants may freely submit a research proposal related to innovative topics of personal interest.

For further information:
PAH Programme Coordinator
Prof. Mariacristina Giambruno, DAStU, Politecnico di Milano
E-mail: mariacristina.giambruno@polimi.it

The PhD Supervisor will be selected from the Faculty Board Members after the enrollment.

Astronomy and Feng Shui in Ancient Chinese City Planning: A Satellite Imaginary Approach

Motivation and objectives of the research

A new frontier for research in Cultural Heritage is Digital Heritage, or better, the application of digital methods in cultural heritage research and preservation. Indeed in the first years of the century UNESCO defined Digital Heritage referring only to its materiality: "cultural, educational, scientific and administrative resources (...) created digitally, or converted into digital form from existing analogue resources".

Digital Heritage is however today much more than this, since the potentialities of digital instruments for research on cultural heritage are constantly growing. This is true, for instance, for non-invasive analysis of cultural relics as well as for the satellite analysis of entire ancient landscapes with the aim of investigating aspects of cognitive archaeology, but also for the sustainability and preservation of cultural heritage in developing environments.

In particular, satellite imagery is a powerful tool possible to use in studying aspects of the ancient landscape related to topography, planning, and astronomical orientation of monuments and cities. Notwithstanding the fact that a direct fieldwork is always necessary for the sampling of data, the use of satellite tools allows the collection of complete data sets in settings with restricted access. This opens up the possibility of identifying general trends and choices made by the ancient builders, as well as cognitive aspects which should be preserved in complex contemporary planning settings as that of the Chinese cities. Their fast growth, directly linked to the country's economic development, occurs very often without taking into account the historical permanence.

The research objective of this proposal is to construct a database of the topographical features of ancient Chinese towns and to perform on this database a series of tests aimed at a better understanding of Chinese town planning and the role played by astronomy and Feng Shui in it, also with sustainability purposes.

The techniques used will be: satellite imagery analysis, extraction of data from satellite historical archives, computer analysis of the sky in ancient times, application of palaomagnetic and statistical methods. The database will be a useful starting point to understand the role of ancient planning for the preservation of cultural heritage in developing Chinese cities. It should be noted that the number of towns founded/re-founded in China during the imperial age (220 BC to 1912 AD) is enormous (more than one thousand) and it will be probably necessary to limit the research to one or two very significant periods, which could be the Ming and the Tang dynasties.

A (non-exclusive) list of the elements of the database, constructed for each town, includes orientation, shape of the horizon at the main axes, general landscape setting, ancient maps (if existing), and written information about the foundation (e.g. date, emperor etc.), if existing. Each town will also be endowed with a palaomagnetic data set. Following, simple statistical methods will be used to identify trends in the ancient towns planning i.e, orientation and topography. In spite of the existence of several studies on Chinese towns, satellite imagery has never been applied before to collect adequate samples of data. As a consequence, a series of questions are still much debated and we expect to address them. In particular:

- the role of Feng Shui in siting, planning and orientation of Chinese towns. (Notice: Feng Shui, of course has no scientific basis. We are interested here in it because of its fundamental importance from the historical point of view, since it was regularly applied in Chinese architecture);
- the role (if any) of magnetic orientation, since the magnetic compass was known in China since the Han dynasty;
- the role of astronomy in the planning of the towns and in the establishment of their main axes.

Further to these aspects, more general issues are related to sustainability of Cultural Heritage in China, a point of great interest for People's Republic of China authorities nowadays. For instance, a recently studied case is that of the tombs of the Han emperors, distributed in the outskirts of Xi'an. We have shown in that case that a main cognitive aspect hopefully to be safeguarded within the frenetic development of the area is that of the inter-visibility of the monuments.

For further information:

Supervisors and Scientific Responsible for this research:
Prof. Mariacristina Giambruno, DAStU, Politecnico di Milano
E-mail:macriacristina.giambruno@polimi.it
Prof. Giulio Magli, Dip. Matematica, Politecnico di Milano
E-mail: giulio.magli@polimi.it

This is a joint PhD grant between the following PhD programmes: **Preservation of the Architectural Heritage** and **Mathematical Models and Methods in Engineering**.

Patinated Steel in the Conservation Works of Built Heritage

Motivation and objectives of the research

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 a new 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 that 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.

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. Actually, the research joins together the materials features 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 features, such as deterioration and durability

For further information:

Supervisors and Scientific Responsible for this research:
Prof. Mariacristina Giambruno, DAStU, Politecnico di Milano
E-mail:macriacristina.giambruno@polimi.it
Prof. Lucia Toniolo, CMIC, Politecnico di Milano
E-mail: lucia.toniolo@polimi.it

This is an **interdisciplinary PhD Grant**. The PhD research will be carried out in collaboration with research groups from the PhD programme in "Materials Engineering".

DAStU - Politecnico di Milano
PhD programme in
Preservation of the Architectural Heritage

How to Apply

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