



PhD in INGEGNERIA STRUTTURALE, SISMICA, GEOTECNICA / STRUCTURAL SEISMIC AND GEOTECHNICAL ENGINEERING - 39th cycle

**PNRR 118 PA Research Field: EXPERIMENTAL AND NUMERICAL METHODS FOR THE
ASSESSMENT OF THE STATE OF PRESERVATION OF BUILDINGS IN THE
ARCHAEOLOGICAL PARK OF POMPEII**

Monthly net income of PhDscholarship (max 36 months)

€ 1195.5

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

**Motivation and objectives of the research
in this field**

The Archaeological Park of Pompeii (<http://pompeisites.org/>) is an ongoing construction site characterized by: i) uniqueness (from 2014 to 2020, it has been visited by over 20 million visitors); ii) vastness (it spans across 66 hectares, of which approximately 50 have been excavated); iii) fragility. The fragility is linked to the fact that the currently visible structures and those that will be unearthed in future excavations require: i) being secured (due to past damage and the ongoing natural and human actions), ii) intervention to protect the artistic assets (frescoes and mosaics) contained within them, and iii) enabling the accessibility of the spaces. This implies that intervention projects must necessarily be based on a thorough understanding of the current state of affairs in order to be effective while also respecting the archaeological asset. The Archaeological Park of Pompeii currently possesses a substantial amount of data collected from previous interventions, but these data have not been systematized. Furthermore, it lacks specific experimental and numerical diagnostics to be requested prior to the design phases for the assessment of the existing structure. This results in suboptimal management of the knowledge aspect prior to a project intervention, consequently impacting costs and quality.

The applied research objectives are: i) to systematize the



	material collected in previous investigation campaigns through appropriate organization and digitization work; ii) to develop technical specifications of experimental and numerical diagnostic to be used during the preliminary knowledge phase prior to project drafting, in order to maximize the obtainable information, standardize the quality of the collected data, and control investigation costs. All of this would lead to: i) promoting the digital transition, contributing to the selection and adoption processes of technologies in order to ensure greater effectiveness, efficiency and cost-effectiveness of the Archaeological Park action. ii) developing the diagnostic capacity as regards the phases of identification, evaluation, decision and solution implementation for possible problems concerning the ongoing construction sites. iii) improving the procedures for managing external contracts both in terms of diagnostics and intervention projects, contributing to the redesign and optimization of the processes for selecting and adopting enabling technologies and solutions, aiming to ensure greater effectiveness, efficiency, and cost-effectiveness in public actions. The proposed research program will be carried out in a multidisciplinary perspective, oriented towards applied research activity in public administrations and aimed at integrated development to enhance administrative capacity by developing diagnostic capacity as regards the phenomenology of possible problems in the problem definition phases and solution identification, decision making, implementation and evaluation.
Methods and techniques that will be developed and used to carry out the research	The proposed objectives will be achieved through: 1) The organization of an easily accessible database containing data derived from previous investigations, both pre and post intervention. 2) The development of innovative diagnostic methodologies specific to the structures of Pompeii (such as the development of a high-resolution multi-stack ground-penetrating radar system and techniques for sonic tomographic surveys using shear waves), aimed at



	gaining a thorough understanding of the structural elements (joints, masonry texture, presence of voids, infills, etc.), the subsurface within 5 meters (presence of cavities, cisterns, archaeological evidence, etc.), and the mechanical properties of the masonry. 3) The development of procedures for assessing the current state of the building. In particular, an abacus of Pompeii masonry (types and some mechanical characteristics) will be proposed, and ad hoc modeling strategies will be defined based on the level of knowledge attained.
Educational objectives	The Ph.D. student is expected to develop multidisciplinary skills, ranging from the use of tools for the management and analysis of big data, to the development of innovative diagnostic methodologies and up to an in-depth knowledge of computational methods for the structural analysis of ancient masonry buildings.
Job opportunities	Public authorities, private companies and managing bodies, involved in assessment, inspection, diagnostics, monitoring, and/or maintenance of cultural heritage.
Composition of the research group	1 Full Professors 2 Associated Professors 0 Assistant Professors 1 PhD Students
Name of the research directors	L. Petrini, M. Lualdi, A. Zambrano, V. Calvanese

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www.polimi.it

<http://pompeisites.org/>

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

Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad

Amount monthly	597.75 €
By number of months	6

National Operational Program for Research and Innovation

Company where the candidate will attend the stage (name and brief description)	Parco Archeologico di Pompei - http://pompeisites.org/
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	University of Minho
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): The Ph.D. course supports the educational activities of its Ph.D. students with an additional funding equal to 10% of the scholarship, starting from the first year.

Teaching assistantship (availability of funding in recognition of support to teaching activities by the PhD student): Ph.D. students are encouraged to apply, upon prior authorization, to the calls to support teaching activities at the undergraduate and Master levels at Politecnico, being paid for that. The teaching assistantship will be limited up to about 80 hours, maximum half of them devoted to teaching and classroom activities and the rest to support classworks and exams.

Computer availability and desk availability: Each Ph.D. student has his/her own computer for individual use. Each Ph.D. student has his/her own desk, cabinet and locker.