



Martina Bernabale

About me:

Motivated researcher in Cultural Heritage fields. My research focuses on understanding the corrosion processes and manufacturing techniques of archaeological metals through microscopic, spectroscopic and 3D imaging analyses.

Curriculum vitae "Ai fini della pubblicazione in ottemperanza all'art. 15 del D. Lgs. 33/2013"

● EDUCATION AND TRAINING

2024 – CURRENT – Rome, Italy

Ph.D. student IN MODELLI MATEMATICI PER L'INGEGNERIA, ELETTROMAGNETISMO E NANOSCIENZE

University of Rome LA SAPIENZA

2024 – Rome, Italy

Subject Expert for the courses 'Metallic Minerals and Gemstones: Use and Origin' and 'Laboratory of Stone Materials'

University of Rome LA SAPIENZA

2022 – Rome, Italy

Ph.D. IN EARTH SCIENCES, ENVIRONMENT AND CULTURAL HERITAGE CURRICULUM (GEO/09) -

Excellent cum laude – University of Rome LA SAPIENZA

2017 – Rome, Italy

MASTER DEGREE IN SCIENCE AND TECHNOLOGY FOR THE CONSERVATION OF CULTURAL HERITAGE (LM-11) - 110 cum laude – University of Rome LA SAPIENZA

2016 – Rome, Italy

BACHELOR'S DEGREE IN TECHNOLOGIES FOR THE CONSERVATION AND RESTORATION OF CULTURAL HERITAGE (L-43) - 110 cum laude – University of Rome LA SAPIENZA

2012 – Rome, Italy

HIGH SCHOOL LEAVING QUALIFICATION IN CLASSICAL STUDIES – Tito Lucrezio Caro High School

● WORK EXPERIENCE

2024 – CURRENT – Rome, Italy

POST-DOCTORAL RESEARCH FELLOW – University of Rome LA SAPIENZA

Title: Caratterizzazione di denti e ossa archeologiche mediante tecniche spettroscopiche, in particolare SEM-EDS e spettroscopia Raman

2023 – 2024 – Rome, Italy

POST-DOCTORAL RESEARCH FELLOW – University of Rome LA SAPIENZA

Title: Caratterizzazione di manufatti metallici provenienti dal sito archeologico fenicio-punico di Mozia (Trapani) mediante un approccio multianalitico: Multiscale X-Ray Microscopy, Micro-Raman Spectroscopy, SEM-EDS, FESEM and EMPA.

2022 – 2023 – Rome, Italy

SENIOR RESEARCH FELLOW – University of Rome LA SAPIENZA

Title: Caratterizzazione minero-petrografica e chimica di campioni sperimentali nell'ambito del progetto DTC ON-Tech mediante microscopia ottica, XRD, SEM-EDS e EMPA

● **LANGUAGE SKILLS**

Mother tongue(s): **ITALIAN**

Other language(s): **ENGLISH**

● **PUBLICATIONS**

- **M. Bernabale**, A.C. Felici, P. Atanasio, L. Buccini, D. Passeri, M. Rossi, P. Binaco, D. Dini, Characterization of ultramarine blue in Roman wall paintings: case study from Volsinii (Bolsena, Italy), *Anal Bioanal Chem* (2025). <https://doi.org/10.1007/s00216-025-05745-y>.
- **M. Bernabale**, M. Spanu, E. Borgia, L. Buccini, F.I. Barbaccia, M. Elefante, S. Milana, T. de Caro, D. Passeri, M. Rossi, C. De Vito, Combined use of Raman spectroscopy, cluster analysis, and SEM-EDS for the characterization of Roman bronze artifacts from Spoleto's cistern (Civitella D'Agliano, VT), *Spectrochim Acta A Mol Biomol Spectrosc* 333 (2025). <https://doi.org/10.1016/j.saa.2025.125885>.
- **M. Bernabale**, F. Cognigni, S. Contessi, A. Proietti, C. Mancini, F. Spagnoli, M. Rossi, C. De Vito. Correlative analysis of advanced microscopy techniques for metallography and corrosion microstructures of bronze phoenician coins. *Materials Characterization*, 217, <https://doi.org/10.1016/j.matchar.2024.114441>.
- **M. Bernabale**, F. Cognigni, S. Contessi, S. Silvestri, G. La Penna, F. Spagnoli, De Vito C., M. Rossi. Correlative microscopy and Micro-Raman spectroscopy for enhancing the evaluation of corrosion damage in archaeological objects. *Journal of Cultural Heritage*. 2024. 67, 500–511. <https://doi.org/10.1016/j.culher.2024.04.016>
- L. Medeghini, L. Calzolari, S. Capriotti, **M. Bernabale**, C. De Vito, M. Giustini, ... S. Mignardi. How the materials knowledge of Roman mortars could be helpful for the production of future materials: The case of the Aqua Traiana aqueduct (Rome, Italy). *Cement and Concrete Research*. 2024, 179. <https://doi.org/10.1016/j.cemconres.2024.107478>.
- C. De Vito, **M. Bernabale**, C. Aurisicchio, F. Catalli, L. Medeghini, S. Mignardi, A.M.Conte, T. de Caro. Ancient Roman Coins from the Republican Age to the Imperial Age: A Multi-Analytical Approach. *Heritage*. 2024, 7(1), 412–426. <https://doi.org/10.3390/heritage7010020>
- **M. Bernabale**, F. Cognigni, C. Mancini, A. Proietti, F. Mura, D. Montanari, L. Nigro, M. Rossi, C. De Vito. 3D fractures analysis and conservation assessment of wrought iron javelin through advanced non-invasive techniques. *Scientific reports*, 2023, 13(1). <https://doi.org/10.1038/s41598-023->

- **M. Bernabale**, F. Cognigni, F. Mura, L. Nigro, D. Montanari, M. Rossi, C. De Vito. 3D imaging of micro-segregation and corrosion behavior of alloying elements in archaeological artefacts from Motya (Sicily, Italy). *Corrosion Science*, 2023, 211. <https://doi.org/10.1016/j.corsci.2022.110900>.
- **M. Bernabale**, F. Cognigni, L. Nigro, M. Rossi, T. de Caro, C. De Vito. A comprehensive strategy for exploring corrosion in iron-based artefacts through advanced Multiscale X-ray Microscopy. *Scientific reports*, 2022 12(1), 1–9. <https://doi.org/10.1038/s41598-022-10151-w>.
- **M. Bernabale**, D. Montanari, L. Nigro, F. Spagnoli, C. Vaccaro, N. Eftekhari, M. Nicoli, C. De Vito. Micro-Raman spectroscopy and complementary techniques applied for the study of copper and iron wastes from Motya (Italy), *J Raman Spectroscopy*, 2023, 54(1), 54–67. <https://doi.org/10.1002/jrs.6453>
- **M. Bernabale**, F. Cognigni, L. Nigro, M. Rossi, C. De Vito. Conventional and advanced techniques for archaeological diagnostic of iron artefacts, 2022 IMeko TC-4 International Conference on Metrology for Archaeology and Cultural Heritage, *MetroArchaeo 2022*, 510–515. <https://doi.org/10.21014/tc4-ARC-2022.096>
- **M. Bernabale**, L. Nigro, C. Vaccaro, M. Nicoli, D. Montanari, P. Bigini, C. De Vito. Micro-Raman spectroscopy and complementary techniques for the study of iron weapons from Motya and Lilybaeum (Sicily, Italy): Corrosion patterns in lagoon-like and calcarenitic hypogea environments, *J Raman Spectroscopy*, 2022, 53(2), 272–287. <https://doi.org/10.1002/jrs.6285>
- **M. Bernabale**, L. Nigro, D. Montanari, C. De Vito. Exploring the chemical composition and corrosion patterns of arrowheads used in the Siege of Motya (397 BC) through a multi-analytical approach. *Journal of Cultural Heritage*, 2021, 52, 146–152. <https://doi.org/10.1016/j.culher.2021.10.001>
- **M. Bernabale**, L. Nigro, D. Montanari, A.M. Niveau-de-Villedary, C. De Vito, Microstructure and chemical composition of a Sardinian bronze axe of the Iron Age from Motya (Sicily, Italy), *Materials Characterization*, 2019, 158. <https://doi.org/10.1016/j.matchar.2019.109957>.
- L. Nigro, D. Montanari, F. Mura– **M. Bernabale**, C. De Vito, A Sardinian early 1st millennium BC bronze axe from Motya, *Vicino Oriente*, 2020, 24, 57–74. doi:10.53131/VO2724-587X2020_3.
- USER STORY. “Exploring Corrosion in Iron Nail Artifacts with Multi-Scale X-ray Microscopy” by ZEISS Microscopy, September 12, 2022. <https://www.zeiss.com/microscopy/en/resources/insights-hub/laboratory-routine/exploring-corrosion-in-iron-nail-artifacts-with-multiscale-x-ray-microscopy.html>
- **M. Bernabale**, An integrated multi-analytical approach for the study of iron and bronze weapons from Motya (Sicily, Italy), PhD Thesis, 2022, 1–182.

● ABSTRACT

- **Bernabale M.**, Nigro L., De Vito C. Microstructure and chemical composition of Iron Age archaeological objects from the Phoenician-Punic site of Motya (Sicily, Italy). SIMP-SGI-SOGEI 2019, Parma (Italia). 19/09/2019. (Oral Presentation).
- **Bernabale M.**, Nigro L., Montanari D., Sabatini S., De Vito C. Microstructures of corrosion in archaeological iron artifacts from Motya (Sicily, Italy). ScienceABC, Rome (Italia). 20/02/2020 (Poster)
- **Bernabale M.**, Montanari D., Spagnoli F., De Vito C., Archaeometric investigation of bronze arrowheads from the Siege of Motya (Sicily). XI Congresso Nazionale AIAR, Napoli (Italia). 29/07/2021 (Oral Presentation).
- **Bernabale M.**, Cognigni F., Nigro L., Rossi M., De Vito C., Conventional and advanced techniques for archaeological diagnostic of iron artefacts. 2022 Imeko International Conference on Metrology for Archaeology and Cultural Heritage. 21/10/2022 (Oral Presentation).



- **Bernabale M.**, Capriotti S., Calzolari L., Medeghini L., De Vito C., Giustini M., Ida I., Dell'Agli G., Spiridigliozzi L., Antonacci A., Gasperuzzo G., Di Tullio V., Zappelli M., Conti L., Gioventù E., Marcelli M., Bonaccini A., Mignardi S. ON-Tech: from Roman mortars to green innovative solutions. 3° Convegno annuale centro di eccellenza DTC LAZIO, Aula Magna, Rettorato, Sapienza, 23 November 2022 (Poster).
- Medeghini L., Calzolari L., **Bernabale M.**, Capriotti S., De Vito C., and Mignardi S. How the past can help the future. 7th ARCH_RNT_Symposium 6–8 October 2022 – Kalamata, Greece (Oral Presentation).
- Medeghini, L., De Vito, C., Calzolari, L., **Bernabale, M.**, Capriotti, S., Giustini, M., ... & Mignardi, S. ON-Tech project-A bridge in restoration mortars. In TMM-CH 2023 3rd International Conference on Transdisciplinary Multispectral Modelling and Cooperation for the Preservation of Cultural Heritage. Recapturing the World in Conflict through Culture promoting mutual understanding and Peace, 20–23 March 2023 – Athens, Greece.
- Capriotti, S., **Bernabale, M.**, Calzolari, L., Chiarucci, C., Di Fazio, M., Mignardi, S., ... & Medeghini, L. GeoMLab Laboratory for the archaeometric characterization of geomaterials. 3° Convegno annuale centro di eccellenza DTC LAZIO, Aula Magna, Rettorato, Sapienza, 23 November 2022 (Poster).
- **Bernabale M.**, Cognigni F., Medeghini L., Rossi M., De Vito C. Evaluation of stress corrosion and micro-segregation in copper-based artefacts through X-ray Microscopy. XII Congresso Nazionale AIAR Messina, 19–21 April 2023 (Oral Presentation).
- **Bernabale M.**, Cognigni F., Rossi M., De Vito C. Multiscale characterization of corrosion in archaeological artefacts from Motya (Sicily, Italy) through X-ray microscopy, Congresso SIMP-SGI-SOGEL-AIV, 2023, Potenza, Italy. 21/09/2023 (Oral Presentation).
- **Bernabale M.**, Medeghini L., De Vito C., Calzolari L., Capriotti S., Mignardi S. Exploring ancient mortars for the creation of innovative restoration materials: On-Tech Project, Congresso SIMP-SGI-SOGEL-AIV, 2023, Potenza, Italy. 21/09/2023 (Poster).
- **Bernabale M.**, Cognigni F., Rossi M., De Vito C. ShareMetals: Forging connections between the past and future through shared knowledge. ShareScience, Sapienza University of Rome, 15–16 February, (Poster).
- **Bernabale M.**, Cognigni F., Contessi S., Proietti A., Mancini C., Spagnoli F., De Vito C., Rossi M. Combined use of 3D X-ray microscopy and correlative microscopy for chemical-physical investigation of bronze Phoenician coins, 110° Congresso Nazionale SIF, 2024. (Oral Presentation)
- **Bernabale M.**, Cognigni F., Contessi S., Silvestri S., La Penna G., Spagnoli F., De Vito C., Rossi M. Investigating corrosion systems in archaeological artifacts from Motya (Sicily, Italy): A Micro-Raman Spectroscopy and Correlative Imaging approach, Congresso congiunto SGI-SIMP, 3–5 September 2024. (Oral presentation)

● TECHNOLOGICAL SKILLS

- Scanning Electron Microscopy (SEM-EDS);
- X-ray Diffraction (XRD);
- Electron Microprobe Analysis (EMPA);
- Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS);
- Micro-Raman;
- Fourier transform infrared spectroscopy (FTIR);
- X-ray Microscopy (XRM).

● **INFORMATIC SKILLS**

- Power Point, Word, Excel;
- Adobe Photoshop e Illustrator
- Surfer, Chromas, X Powder12, OriginLab, OMNIC Spectra Spectroscopy, QGIS, Dragonfly, Agisoft Metashape, MountainsLab, ZEISS ZEN Connect

● **BLOG AND SOCIAL NETWORKS CONTRIBUTION**

- Author in the scientific blog "Research For Cultural Heritage", dedicated to the dissemination of Science applied to Cultural Heritage
- Support in the management of social networks of the bachelor and master courses in Sciences Applied to Cultural Heritage

● **CONFERENCE AND EVENT ORGANIZATION**

- Member of the organizing committee of the ON-Tech Conference, Sapienza University of Rome, 16 May 2023.
- Participated of NanoInnovation 2024 as part of the Local Staff, Faculty of Civil and Industrial Engineering– Sapienza University of Rome, 9–13 September 2024

● **VISITING FELLOW**

- Polo Scientifico e Tecnologico Fondazione Bruno Kessler Centro Sensors & Devices (Trento, Italy) – April 2025
- Department of Physics and Earth Sciences–University of Ferrara (Prof. Carmela Vaccaro) – November 2020; May 2021
- Istituto per lo Studio dei Materiali Nanostrutturati – National Research Council (ISMN–CNR) (Prof. Tilde de Caro) – July 2021

● **RELEVANT SCHOOLS AND WORKSHOPS**

November 2018	Centro Conservazione e Restauro La Venaria Reale, Italy	"Infrared and Raman Spectroscopy School on Cultural Heritage" (VII edition)
November 2024	Faculty of Civil and Industrial Engineering– La Sapienza Università di Roma	8th ZEISS X-Ray Microscopy European Network User Workshop 2024

● WORKING AND TEACHING EXPERIENCE

INVITED LECTURER – University of Rome LA SAPIENZA

14 June 2023	Invited lecturer within the Zeiss School of Microscopy for Cultural Heritage
12–19 December 2022	“Metals in Cultural Heritage”, guest lecturer within the course on “Geomaterial for cultural heritage”
9 September 2021	Invited lecturer for the students of advanced training course DTC Lazio
7 November 2020	Invited lecturer within the course on “Geomaterial for cultural heritage”

THESIS SUPERVISOR – University of Rome LA SAPIENZA

2023	Co-Supervisor and degree commission member of Master’s Degree Thesis in “ARCHEOLOGIA e in FILOLOGIA, LETTERATURE E STORIA DEL MONDO ANTICO” with the title « I chiodi di Mozia tra VI e IV secolo a.C. : analisi tipologico-funzionale e archeometriche ».
2022	Co-Supervisor of Master’s Degree Thesis in “SCIENZE E TECNOLOGIE PER LA CONSERVAZIONE E IL RESTAURO DEI BENI CULTURALI” with the title « Studio archeometrico e caratterizzazione mediante un approccio multi-analitico di monete romane »

TUTORING – University of Rome LA SAPIENZA

November–December 2019	Tutoring for the course of “Geomaterial for cultural heritage”, 40 hours
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SOBSTITUTE TEACHER – Sant’Orsola Highschool - Rome

February 2022

Substitute Teacher (Highschool Science Professor)

March 2022

Substitute Teacher (Highschool Science Professor)

● GRANTS

2024	Unveiling Etruscan goldsmithing techniques by laboratory- and synchrotron- based integrated X-ray imaging	Progetto di Avvio alla Ricerca	2000 €
2024	Excavation and Research in the Necropolis and the villa/vicus of Castel Sozzio (VT): historical and archaeological evolution of a rural settlement in the Middle Tiber Valley from the Roman period to Early Middle Ages	Scavi Archeologici, Sapienza, University of Rome	10.300 €
2023	Jericho from Pre-Pottery Neolithic to the Bronze and Iron Ages (12,500–332 BCE). Investigating a key-site of the ancient Near East – a multidisciplinary approach	Scavi Archeologici, Sapienza, University of Rome	63.477 €
2020	La produzione metallurgica di Tell el-Far’ah Nord nell’Età del Ferro IIA–B	International Mobility Grant for PhD students, Sapienza, University of Rome	1050 €
2020	Motya at the center of the Mediterranean Sea: contacts, interactions and exchanges between cultures in the 2nd and 1st millennium BC – A multidisciplinary perspective	Scavi Archeologici, Sapienza, University of Rome	79000€
2020	Trash to treasure: come un rifiuto può risanare l'ambiente	Progetti Medi, Sapienza, University of Rome	13000 €
2019	Tecnologie produttive dell'acquedotto Traiano: una infrastruttura del passato parte integrante del presente	Progetti Medi, Sapienza, University of Rome	14000 €



● SUMMARY OF RESEARCH ACTIVITIES

During my research experience I have applied several analytical techniques (SEM-EDS, FTIR, Micro-Raman, EMPA, XRD, LA-ICP-MS) for the chemical and geo-chemical study of archaeomaterials (*e.g.*, obsidians, metals artefacts, slags, pigments, mortars) and experimental samples for restoration in the field of Cultural Heritage (ON-Tech project).

My graduate work at the Chemistry Department of Sapienza University focused on multi-technique study on materials used for the fresco by Baglione (Basilica of Saints Cosma and Damiano, Rome, Italy). Pigments, binder media and raw materials were studied using optical (OM) and electronic microscopy equipped with energy dispersive spectroscopy qualitative microanalysis (SEM-EDS). The goal of this study was to characterize this painting and provide information about historical and stylistic background.

During the master's thesis project, I performed a geochemical study on obsidian blades from Iraqi Kurdistan by Electron Microprobe analysis (EMPA) and Inductively Coupled Plasma Mass Spectrometry associated with Laser Ablation (LA-ICP-MS) at CNR-IGG of Pavia to show geochemical differences in their trace and REE compositions, which identify their source areas and establish their provenance for archeometric purposes.

My PhD research project at Sapienza, University of Rome aimed to reconstruct archaeometallurgical processes and cycle-life of iron and bronze artefacts from Motya (Sicily, Italy), evaluating the nature and the availability of raw materials that were used in the production of different types of objects.

More recently, as a result of a collaboration with the Research Center on Nanotechnology Applied to Engineering (CNIS), I applied non-invasive technique, *i.e.*, Multiscale X-ray Microscopy (XRM) for multi-scale and multi-modal 2D and 3D investigations of metal samples in order to reconstruct 3D volumes and microtopography of the objects and implement corrosion models.

Finally, I participated to the characterization of innovative hydraulic mortars for restoration from a petrographic, chemical and physical point of view within the ON-Tech project (Distretto Tecnologico Beni e Attività Culturali - DTC Lazio and Lazio Innova)

Curriculum vitae di Martina Bernabale – Autorizzo il trattamento dei miei dati personali, ai sensi del GDPR (Regolamento UE 2016/679) e del D.lgs. 196 del 30 giugno 2003

Rome, 30/04/2025