

LAURA GAGGERO

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CURRICULUM VITAE

Born in Genoa on 19 October 1961
1986 Graduated with honors in Geological Sciences, University of Genoa
1990 PhD in Earth Sciences
1991 Permanent research position in *Petrology and Petrography*, University of Genoa
1-11-2000 Associate Professor confirmed full time in *Petrology and Petrography*
1-2-2018 to present: Associate Professor confirmed full time in *Mining and mineralogical-petrographic applications for the environment and cultural heritage* at the Department of Earth, Environment and Life Sciences (DISTAV), University of Genoa.
1-11-2018 to present: Coordinator Master Degree in Methods for the Conservation and Restoration of Cultural Heritage LM11.

RESEARCH ACTIVITY

The research lines of Laura Gaggero are:

- 1) Igneous and metamorphic petrology of lower Paleozoic continental lithosphere in Ligurian Alps and Sardinia.
- 2) Permo-Carboniferous magmatism in Brianconnais, Sardinia, Southalpine and Balkan terrane.
- 3) Permo-Triassic volcanism in Sardinia and Southalpine.
- 4) Igneous petrology, ocean floor and orogenic metamorphism of oceanic lithosphere in Jurassic and Ordovician ophiolites and modern oceanic crust.
- 5) Petrography applied to material sciences.

MAIN RESEARCH TOPICS

IGNEOUS AND METAMORPHIC PETROLOGY OF LOWER PALEOZOIC CONTINENTAL LITHOSPHERE IN LIGURIAN ALPS AND SARDINIA

Field survey, petrologic, radiometric and geochemical characterization of petrogenetic processes in the Lower Paleozoic basement of Ligurian Alps, and the pre-Variscan Sardinia.

The microstructural analysis, the petrology of basic and pelitic systems, geochemical (Sr-Nd) and radiometric (U/Pb) analyses are integrated towards a geodynamic model of the pre-Variscan and Variscan evolution that coupled structural units from different crustal levels.

The paleopertinence of the studied basement is being revised in the light of their different pre-alpine evolution and on radiometric and stratigraphic basis. Some research topics are related with the PETROGRAPHIC CONTRIBUTIONS TO GEOLOGIC MAPPING (see below).

PERMO-CARBONIFEROUS MAGMATISM IN SOUTHERN EUROPE

Stratigraphic, petrographic, mineralogical, alteration, geochemical, radiometric (Ar/Ar and U/Pb) investigations of Permo-Carboniferous volcano-sedimentary sequences of Southern Europe (Ligurian Alps, Sardinia, Southalpine, Balkan). Some research topics derive from the PETROGRAPHIC CONTRIBUTIONS TO GEOLOGIC MAPPING (see below).

PERMO-TRIASSIC VOLCANISM IN SOUTHERN EUROPE Stratigraphic, petrographic, mineralogical, geochemical investigations and radiometric dating (Ar/Ar) of Permo-Triassic calcalkaline and alkaline volcano-sedimentary sequences in Sardinia, Southalpine, Balkan, support that they were precursors of the Alpine Tethys and Meliata rifts. Some research topics are related with the PETROGRAPHIC CONTRIBUTIONS TO GEOLOGIC MAPPING (see below).

IGNEOUS PETROLOGY, OCEAN FLOOR AND OROGENIC METAMORPHISM OF OCEANIC LITHOSPHERE IN JURASSIC AND ORDOVICIAN OPHIOLITES AND MODERN OCEANIC CRUST

The research covers several topics, grouped as: i: Petrogenesis and oceanic evolution in modern and fossil environments, ii: Orogenic evolution of oceanic lithosphere and associated sedimentary covers in subduction, orogenic prism, obduction environments. They are carried out by means of survey and characterization of ophiolitic complexes in the Neo-Tethys and Alpine Tethys (Alps, Apennine, Albania) in the Uralian orogen and in present-day oceanic lithosphere representative of different genetic environments. Some research topics are related with the PETROGRAPHIC CONTRIBUTIONS TO GEOLOGIC MAPPING (see below).

PETROGRAPHIC CONTRIBUTIONS TO GEOLOGIC MAPPING

Since 1995, L. Gaggero collaborates to CARG projects (Sheet 213-Genova, Sheet 411-Bocche di Bonifacio; Sheet 428 Arzachena, Sheet 99 - Iseo; Sheet 541 Jerzu; Sheet 549 Muravera; Sheet 228 Cairo Montenotte, and CartoTI, geological map of Mendrisio Sheet in Switzerland) on igneous and/or metamorphic petrology topics.

ARCHEOMETRY. Characterization and provenance of polished stone tools of Neolithic to Eneolithic Age. Lithic and material culture related with Copper Age quarrying activity (hammers, tools and metallurgic raw material).

BIOMINERALIZATIONS IN MARINE ENVIRONMENT

PETROGRAPHY APPLIED TO MATERIAL SCIENCES

Co-convenor of sessions at national and international congresses; referee of national and international journals; referee of national and international research projects.

PARTICIPATION TO NATIONAL AND INTERNATIONAL RESEARCH PROJECTS:

- Ocean Drilling Program Leg 153 (1993) member of Shipboard Scientific Party Leg 153. Leg 153 drilled the core complex at Kane Transform, 23 ° N.
- CNR bilateral project Italy Albania (1993-1995) 1990, 1992, 1993, 1995 surveys on the ophiolites of Albania, within the CNR bilateral project Italy Albania (duration 1993-1995). Thesis Supervisor of Etleva Jaho, 1998.
- CNR-BAN bilateral project Italy Bulgaria (1993-1995) 2001, 2003 surveys in the Balkan orogen (bilateral program CNR - BAN - Bulgarian Academy of Sciences, National Coordinator G. Cassinis).
- Europrobe (Uralides) project 1995-1996. 1993, 1995 survey campaigns on the ophiolites of the southern Urals (project EUROPROBE - URALIDES, European Science Foundation, National Coordinator Piera Spadea). Collaboration with G.N. Savelieva, N. Pertzev (Moscow, University and Academy). Collaboration within the Europrobe Uralides consortium (Spain, Germany, Sweden).
- Vigoni CRUI (Italy) - DAAD (Germany). Calls for proposals 1999 and 2000, 2 exchanges with GFZ Potsdam Prof. Dr. Christoph Breitzkreuz (now at the University of Freiberg).
- Research activity since 1987 in projects funded by MPI, MURST on PERIMEDITERRANEAN CRYSTALLINE BASEMENTS, CNR Alpi Group,
- PhD Thesis Supervisor in Co-tutele Italy France XIV PhD Program (University of Genoa L. Cortesogno, L. Gaggero - Université de Savoie-Chambery, J.M. Bertrand). Candidate: Milli Molina.
- PRIN COFIN 2001,
- PRIN COFIN 2004 (PI and unit coordinator)
- PRIN COFIN 2008 (Unit Coordinator)
- PRA 2011 Petrology of pre-Triassic magmatic events in the Europe-Adria lithosphere
- PRA 2012 Tracers of the petrogenetic processes at the convergent plate margins
- PRA 2014 The geodynamic cycle of the "Ligurian" oceanic lithosphere: research of tectonic and petrological impressions

- Collaboration with Jeff Alt (University of Michigan, US). Tectonic activity and interaction with hydrothermal fluids during the ocean spreading phase. Understanding serpentinization processes of ultramafites, with emphasis on fault control on the flow of fluids.

PRINCIPAL INVESTIGATOR, PROJECT MANAGER 2011- PRESENT

2005 to present: Responsible of the Laboratory *Analisi delle proprietà microstrutturali, chimiche e fisiche dei materiali inorganici; determinazioni qualitative e quantitative della composizione mineralogica di materiali naturali e delle proprietà tecniche di materiali litici*, appointed at the MIUR , according ISO 9001/2000

2009 to present: Responsible for the Research Agreement between the University of Genoa - Beijing Academy of Sciences for SHRIMP SROS analysis on SHRIMP II at the University of Milan Bicocca. The Research Agreement is issued from the PRIN 2008 "From Gondwana to Mesoeuropa: Petrological evidence in the geodynamic reconstruction of Southern Variscides (Sardinia, Eastern and Ligurian Alps)"

2011 to present Appointment by the Health Ministry to the Laboratorio di *Analisi delle proprietà microstrutturali, chimiche e fisiche dei materiali inorganici; determinazioni qualitative e quantitative della composizione mineralogica di materiali naturali e delle proprietà tecniche di materiali litici* to execute qualitative and quantitative analyses by MOCF, SEM EDX and DRX on asbestos-bearing materials after participation to the national interlaboratory calibration.

2011-2013 Member of the Interdepartmental Center for Research and Technology of Materials MAST (Material Science and Technology).

October 2013-June 2016 Project Manager of the LIFE+ project Life 12 ENV/IT/000295 FIBERS, Fibers Innovative Burning and Re-use by SHS

2012-2014 Principal investigator of Genoa University Research project for technology transfer (PRATT): Inertization of asbestos fibers by innovative application of SHS combustion synthesis

2014-2016 Supervisor of the European Doctorate XXVIII Cycle Doctorate School of Sciences and Technologies for the Environment and the Territory. University of Genoa (L. Gaggero) - Universidad de Zaragoza (J. Gisbert Aguilar). Candidate: Simona Scrivano.

Unit Coordinator PRA 2013 Petrogenesis, geodynamic evolution and environmental implications in oceanic lithosphere

2014- 2018 CARTO Ti Geological Atlas of Switzerland, Sheet 1373 Mendrisio. The direction of the sheet is managed by SUPSI, Politecnico di Lugano (CH). The collaboration is aimed at the mapping and interpretation of Permian volcanic rocks

2015 to present. Member of the Management Committee of the "Interdepartmental Center for Research and Technological Innovation for the reduction, recovery and reuse of waste" - RIT4Waste.

2016 to present. Member of the EUROPEAN INNOVATION PARTNERSHIP (EIP) on Raw Materials "Building a harmonized European database on natural stones for the use of construction and restoration stakeholders". Coordinatore: Prof. Dolores Pereira (Salamanca).

2008 to present .Scientific and technical manager of the Laboratory of Scanning Electron Microscopy at DISTAV – UNIGE

PARTICIPATION IN EDITORIAL BOARDS OF JOURNALS

1992 to present. Referee of international journals of Earth Sciences
(*Journal of Metamorphic Geology, European Journal of Mineralogy, Lithos, Italian Journal*

of Earth Sciences, Environmental Earth Sciences, Journal of the Geological Society of London, Neues Jahrbuch für Geologie und Paläontologie, Journal of Marine Systems, Gondwana Research, Journal of Petrology, International Journal of Earth Sciences, Tectonophysics, Ofioliti, Periodico di Mineralogia, Canadian Mineralogist, Iberian Journal of Earth Sciences, Rendiconti online Società Geologica Italiana, Journal of Cultural Heritage, Geoscience Frontiers).

- Guest editor Gaggero L. and Piccardo G.B.

Doi: 10.2451/2007PM0008. Per. Mineral., 76, 49-66, Special Issue "From Petrogenesis to Orogenesis", Gaggero L. & Piccardo G.B. eds., ISSN 0369 – 8963. Periodico di Mineralogia. dal 01-01-2006 al 01-01-2006

- Guest editor C Boschi, L Gaggero, M Marroni (2013).

OPHIOLITES AND ENVIRONMENTAL HAZARDS. OFIOLITI, vol. 38, ISSN: 0391-2612, doi: 10.4454/ofioliti.v38i1.413. dal 01-01-2013 al 01-01-2013

PARTICIPATION IN THE BOARD OF TEACHERS OF PHD SCHOOL IN EARTH SCIENCES

1995 to present.

Supervisor / co-supervisor of 7 theses carried out in the Doctorate of Earth Sciences or in the STAT PhD School of UNIGE (1 European PhD; 1 thesis in co-tutelage Italy France).

Supervisor / co-supervisor of 3 theses carried out in the PhDs of Earth Sciences of the Universities of Pavia and Florence.

In particular: Matteo Maino is RTDB at Pavia University; Simona Scrivano (Eu PhD) is post – doc at Genoa University; Giacomo Pepe is post-doc at Genoa University.

Co-supervisor 1 thesis in the Doctorate of Geological Sciences of the Université de Marrakech (Morocco).

2006-2014 Member of the Teaching Committee XXII - XXIX PhD Program in Earth Sciences

2014 to present. Member of the Teaching Committee XXX - XXXII PhD Program in Sciences and Technologies for the Environment and the Territory (STAT)

PRODUCTION

The scientific activity of Laura Gaggero is addressed to igneous, metamorphic petrology and to the applications of petrography. She has been and is responsible for research projects funded by national and international bodies (eg, MIUR, European Community) and has established collaborative relationships with researchers all over the world. Laura Gaggero published 142 publications including 81 ISI Scopus articles, 14 articles in peer reviewed monographs and proceedings of international conferences, 2 prefaces, 2 national patents, 1 international patent, 77 abstracts of oral and poster presentations at national conferences, 116 abstracts of oral and poster presentations at international conferences, 1 exhibition, 25 geological maps and 20 geological and conference field trip guides.

The bibliometric data are Scopus Index-H: 22 (1328 citations), Google Scholar Index-H: 26 (2093 citations).

NATIONAL AND INTERNATIONAL PATENTS

1. Maurizio Ferretti, Laura Gaggero, Giulia Torrielli 2014 Apparato e metodo per il trattamento di materiali porosi. Brevetto Italiano GE2014A000065
2. Maurizio Ferretti, Laura Gaggero, Giulia Torrielli 2015 Apparatus and method for treating porous materials. Brevetto internazionale PCT/IB2015/055129
3. Gaggero L., Ferretti M., Belfortini C., Isola E., 2010 METODO E APPARATO PER L'INERTIZZAZIONE DI FIBRE DI AMIANTO. Brevetto italiano n. GE2010A000032

PUBLICATIONS FROM 2010

4. Oggiano G, Gaggero L., Funedda A, Buzzi L, Tiepolo M - 2010 - Multiple early Palaeozoic volcanic events at the northern Gondwana margin: U-Pb age evidence from the Southern Variscan branch (Sardinia, Italy). **Gondwana Research**, ISSN: 1342-937X, Volume 17, Issue 1, January 2010, Pages 44-58 doi:10.1016/j.gr.2009.06.001,
5. Castelli Daniele, Gaggero Laura, Mazzoleni Paolo & Rocchi Sergio 2011 The classification of igneous, sedimentary and metamorphic rocks and the UNI/CEN terminology of natural stones. In: **Rocce e minerali industriali**, (Andrea Giuliani editor) (giugno 2011) ISBN 978-88-5483745-4, DOI 10.4399/97888548374545, pag. 65-73, Aracne editrice
6. H.P. Schönlaub, A. Ferretti, L. Gaggero, E. Hammarlund, D.A.T. Harper , K. Histon , H. Priewalder, C. Spötl, P. Storch 2011 The late Ordovician glacial event in the Carnic Alps (Austria) in: J.C. Gutiérrez-Marco, I. Rábano and D. García-Bellido (eds.), Ordovician of the World. **Cuadernos del Museo Geominero, 14. Instituto Geológico y Minero de España, Madrid**. ISBN 978-84-7840-857-3 © Instituto Geológico y Minero de España 2011.
7. Gaggero Laura, Oggiano Giacomo, Funedda Antonio, Buzzi Laura 2012 Rifting and arc-related early Paleozoic volcanism along the North Gondwana margin: geochemical and geological evidence from Sardinia (Italy). **The Journal of Geology**, Volume: 120 Issue: 3 Pages: 273-292 DOI: 10.1086/664776 Published: MAY 2012
8. Maino Matteo, Dallagiovanna Giorgio, Gaggero Laura, Seno Silvio & Tiepolo Massimo 2012. U–Pb zircon geochronological and petrographic constraints on late to post-collisional Variscan magmatism and metamorphism in the Ligurian Alps, Italy **Geological Journal** 10-2-2012, doi: 10.1002/gj.2421
9. Maino M., Dallagiovanna G., Dobson K.J., Gaggero L, Persano C., Seno S., Stuart F.M. 2012. Testing models of orogen exhumation using zircon (U-Th)/He thermochronology: insight from the Ligurian Alps, Northern Italy. **Tectonophysics**, Volumes 560–561, 17 August 2012, Pages 84–93, doi: 10.1016/j.tecto.2012.06.045
10. Schwarzenbach, E., Fruh-Green, G.L., Bernasconi, S.M., Alt, J.C., Shanks, W.C., Gaggero, L., Crispini, L., 2012. Sulfur geochemistry of peridotite-hosted hydrothermal systems: Comparing the Ligurian ophiolites with oceanic serpentinites, **Geochim. Cosmochim. Acta**, Volume 91, 15 August 2012, Pages 283–305, 10.1016/j.gca.2012.05.021.
11. Alt J.C, Shanks III W.C., Crispini L., Gaggero L., 2012. Uptake of Carbon and Sulfur During Seafloor Serpentinization and the Effects of Subduction Metamorphism in Ligurian Peridotites. Accepted Chemical Geology Final version published online: 15-AUG-2012 Full bibliographic details: **Chemical Geology** (2012), Volumes 322–323, 5 September 2012, Pages 268–277, DOI information: 10.1016/j.chemgeo.2012.07.009
12. Scrivano S., Gaggero L., Taddei A., 2012. Alteration patterns of marble under different environmental exposures: a systematic approach from the Staglieno Monumental Cemetery and Museum Collections in Genoa (Italy). In **Proceedings of the 12th International Conference on Stone Deterioration and Conservation**, Columbia University, New York 22-26 Novembre 2012. <http://iscs.icomos.org/pdf-files/NewYorkConf/scrietal.pdf>
13. Vicini S., Princi E., Gaggero L. 2013 Characterization, weathering and protection of the Agro sandstone. **Studies in conservation**. 58/1, 50-57 DOI: 10.1179/2047058412Y.0000000066.
14. Alt Jeffrey C., Schwarzenbach Esther M., Früh-Green Gretchen L., Shanks Wayne C. III, Bernasconi Stefano M., Garrido Carlos J., Crispini Laura, Gaggero Laura, Padrón-Navarta José A., Marchesi Claudio 2013 The Role of Serpentinites in Cycling of Carbon and Sulfur: Seafloor Serpentinization and Subduction Metamorphism. **Lithos**, Online publication complete: 23-JAN-2013, DOI: 10.1016/j.lithos.2012.12.006

15. Gaggero L., Crispini L., Isola E., Marescotti P. 2013 Asbestos in natural and anthropic ophiolitic environments: a case study of geohazards related to the northern Apennine ophiolites (Eastern Liguria, Italy). **Ofioliti**, 2013, 38 (1), 29-40 - doi: 10.4454/ofioliti.v38i1.414
16. Boschi, Chiara; Gaggero, Laura; Marroni, Michele 2013 Ophiolites and environmental hazards preface. **Ofioliti**, 2013, 38 (1)
17. Pepe, G., Cevasco A., Gaggero L., Berardi, R. 2016. Analysis of the variability of intact rock strength and stiffness properties in relation to number of test samples. **Bulletin of Engineering Geology and the Environment**. doi: 10.1007/s10064-016-0912-4
18. Costamagna Luca Giacomo, Elter Franco Marco, Gaggero Laura, Mantovani Federico 2016. Contact metamorphism in Middle Ordovician arc rocks (SW Sardinia, Italy): new paleogeographic constraints, **Lithos**, doi: 10.1016/j.lithos.2016.09.014.
19. Torrielli Giulia, Gaggero Laura, Caratto Valentina, Ferretti Maurizio 2016 Innovative method and apparatus for deep cleaning of soluble salts from mortars and lithic materials. **Energy Procedia**, doi:10.1016/j.egypro.2016.10.066, Volume 97, November 2016, Pages 523–530
20. Gaggero Laura, Ferretti Maurizio, Caratto Valentina, 2016 Self-Sustained Combustion Synthesis and Asbestos-Bearing Waste: Scaling Up From Laboratory Towards Pre-Industrial Size Plant. **Energy Procedia** 97 515 – 522, doi:10.1016/j.egypro.2016.10.064
21. Gaggero, L., Gretter, N., Langone A., Ronchi A. 2016 U-Pb geochronology and geochemistry of Late Palaeozoic volcanism in Sardinia (Southern Variscides). **Geoscience Frontiers**. doi 10.1016/j.gsf.2016.11.015
22. Laura Gaggero, Elisa Sanguineti, Adrian Yus Gonzalez, Gaia Maria Militello, Alberto Scuderi, Giovanni Parisi 2017 Airborne asbestos fibres monitoring in tunnel excavation. **J Env Management**, 196, 583-593, doi: 10.1016/j.jenvman.2017.03.055
23. Scrivano S., Gaggero L., Yus Gonzalez A., Gisbert Aguilar J. 2017 Micro invasive techniques to assess surface weathering: review and implementation of the peeling-test. **Journal Cultural Heritage**, doi: 10.1016/j.culher.2017.04.004
24. Gaggero L., Scrivano S., Landi D. 2017. The Staglieno Monumental Cemetery (Genoa, Italy): microenvironment characterization through weathering indicators. **Environmental Earth Sciences**, 76, 9, 1-16, doi: 10.1007/s12665-017-6654-1.
25. Simona Scrivano, Laura Gaggero, Josep Gisbert Aguilar, Tim de Kock, Hannelore Derluyn, Veerle Cnudde, 2017 Texture and mineralogical influence on durability: the Macigno Sandstone. **Quarterly Journal of Engineering Geology** special issue. Doi: 10.1144/qjgeh2016-107
26. Scrivano S., Gaggero L., 2017 Non-invasive analytical technique to address water uptake on stone surfaces: the implemented contact sponge method (i-CSM), **Journal Cultural Heritage**, 10.1016/j.culher.2017.05.013.
27. Decarlis Alessandro, Maino Matteo, Beltrando Marco, Manatschal Gianreto, Ferrando Simona, Fellin Maria Giuditta, Gaggero Laura, Seno Silvio & Stuart Finlay M. 2017. Tectono-thermal evolution of a distal rifted margin: constraints from the Calizzano Massif (Prepiedmont-Briançonnais domain, Ligurian Alps), **Tectonics**, 36(12), pp. 3209-3228, doi:10.1002/2017TC004634
28. Gaggero Laura, Ferretti Maurizio. 2018 The Self-sustained High temperature Synthesis (SHS) technology as novel approach in the management of asbestos waste. **J Env Management** 216, pp. 246-256, <http://dx.doi.org/10.1016/j.jenvman.2017.09.019>
29. Giorgio Bavestrello, Marzia Bo, Federico Betti, Martina Canessa, Laura Gaggero, Fabio Rindi, Riccardo Cattaneo-Vietti 2018. Differences in composition of shallow water benthic

communities associated with two ophiolitic rock substrata. **Estuarine, Coastal and Shelf Science**. 200, pp. 71-80, doi.org/10.1016/j.ecss.2017.10.009, 200, 71-80.

30. Sanguineti Elisa, Yus González Adrián, Militello Gaia Maria, Gaggero Laura, Alberto Scuderi, Giovanni Parisi 2018 Monitoraggio di fibre di amianto nello scavo di gallerie. In: **AMIANTO** un fantasma del passato o una storia infinita? Eds. C. Minoia, P. Comba, Newpress edizioni, ISBN 978-88-9356-038-2
31. Scrivano S., Gaggero L., Gisbert Aguilar J. 2018 Micro-porosity and minero-petrographic features influences on decay: experimental from four dimension stones. 2018 **Construction & Building Materials**, 173, 342-349, doi: 10.1016/j.conbuildmat.2018.04.041
32. Jeff Alt, Laura Crispini, Laura Gaggero, David Levine, Giorgia Lavagnino, Pat Shanks, and Cayce Gulbransen, 2017 Normal Faulting and Fluid Upflow in the Subsurface of a Seafloor Ultramafic-Hosted Hydrothermal System, Northern Apennines, Italy. 2018 **Geology** 46(6), pp. 523-526, doi: /10.1130/G40287.1
33. Maino M., Gaggero L., Langone A., Seno S., Fanning M. 2018 Cambro-Silurian magmatisms at the northern Gondwana margin (Penninic basement of the Ligurian Alps). **Geoscience Frontiers**, doi: 10.1016/j.gsf.2018.01.003