

CURRICULUM VITAE FOR CHIARA DOMENEGHETTI

PERSONAL INFORMATION

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Google Scholar: <https://scholar.google.it/citations?user=DED9SjgAAAAJ&hl=en&oi=ao>

EDUCATION AND POSITIONS

1978	Graduated in Natural Sciences (110/110 cum laude)
1979 – 1980	Grant at the Institute of Mineralogy (University of Pavia)
1980 – 1983	Curator of the Museum of the Institute of Mineralogy (University of Pavia)
1983 – 1998	Researcher of the Italian National Council at the CNR-Centro di Studio per la Cristallografia Strutturale (University of Pavia)
1998 – 2001	Associate Professor at the Dept. of Earth Sciences (University of Pavia)
2001 - 2024	Full Professor of Mineralogy at the Dept. of Earth Sciences (University of Pavia)

FELLOWSHIPS AND GRANTS

MCD has been principal investigator and team leader for several national and international funded research project for the past 30 years with responsibilities over several hundreds of thousand euros

1986 – 1989	CNR research "Order disorder transformations in orthopyroxenes" within the cooperation Italy-USA. Italian Leader.
1987 – 2000	Coordinator of various research projects of the local "CNR Centro di studio per la Cristallografia and Cristallografia" (now CNR-IGG, Pavia).
1992 – 1995	European Science Foundation (ESF) project "Kinetics Processes in Minerals and Ceramics - in situ studies". Member
1997 – 2001	EU-TMR Network "Interdisciplinary European Network for the quantitative analysis of transformation processes in natural minerals" (Coordinator: E.K. Salje). Team Leader
1997 – 1999	Member of the Pavia group in the national projects funded by the Italian MURST
1999 – 2001	Member of the Pavia group in the national projects funded by the Italian MURST
2001 – 2003	Italian FIRB project (2001-03) "Mineral physics and technological applications of columbite-tantalite-tapiolite system". Principal Investigator.
2004 – 2006	Member of the Pavia group in the national projects funded by the Italian MURST
2006 – 2007	PRIN-MIUR: Studi sperimentali su materiali geologici alle alte pressioni e temperature: applicazioni alla comprensione del sistema Terra (PRIN 2006047943 - € 120,000 - PI: PF Zanazzi).

- 2010 – 2013 Italian Space Agency: MARS-XRD/ExoMars (ASI n.I/060/10/0 - PI: L. Marinangeli). Team leader
- 2011 – 2012 PRIN-MIUR: Dalle materie prime del Sistema Terra alle applicazioni tecnologiche: studi cristallografici e strutturali (PRIN-2010EARRRZ - € 469,693 - PI: M.F. Brigatti). Team Leader
- 2013 – 2018 ERC Starting grant: Inclusion in diamond messenger from the Deep Earth (INDIMEDEA, ERC-StG n.307322 - € 1.423,464 - PI: F. Nestola). Team member
- 2014 – 2016 PNRA-PEA: Meteoriti Antartiche (2013/AZ2.04 - € 88,000 - PI: L. Folco). Team leader.
- 2015 – 2018 Italian Space Agency: (TOMOX - PI: L. Marinangeli). Team leader.
- 2015 – 2018 SIR-MIUR: Mineral inclusion elasticity for a new deep subduction geobarometer (MILE DEEp, n.RBSI140351 - € 449,900). Team Member.
- 2016 – 2018 PNRA-PEA: Meteoriti Antartiche (PRNA16_00029 - € 87,900 - PI: L. Folco). Team leader.
- 2017 – 2022 ERC Starting grant: Determine the true depth of deep subduction from piezobarometry on host –inclusions systems (TRUE DEPTHS, ERC-StG n.714936 - € 1.697,500). Team Member.
- 2018 – 2021 FARE-MIUR: StackIng disorder in diaMonds as a marker for the history of Pre-solAr Carbon (IMPACT, FARE-MIUR n. R164WEJAHH- € 234.255). Team Member.
- 2018 – 2021 PNRA 2018 – COMMANDER: "Carbon minerals in Frontier Mountain ureilites of the Museo nazionale dell'Antartide, Siena, Italy" (PNRA18 00247 –P.I.: F. Nestola - € 63.500,00). Team leader.
- 2019 – 2021 ASI-INAF 2019 : Ol BODIES “ Olivine-bearing ungrouped achondrites and their parent bodies in the Solar System” (ASI-INAF n.2018-16-HH.0 – P.I. : C.Carli € 176.839,28) Team leader.

SUPERVISION ACTIVITIES:

MCD has been mentoring several influential scientists during their graduate and postgraduate studies contributing to shape their career in science for both academic studies and industry

- **Postdoctoral researchers**

- 1997 – 1998 Thomas Malcherek (EU-TMR project post-doc), Now professor at University of Hamburg
- 1999 – 2000 Fernando Camara Artigas (EU-TMR project post-doc), Now Professor at University of Milan
- 2015 – 2016 Matteo Alvaro (mineral physics): Now ERC grantees Professor at University of Pavia
- 2017 – 2019 Claudia Stangarone (Ab-initio calculations, crystallography), Now postdoctoral fellow at German Aerospace Center, DLR, Berlin
- 2017 – 2020 Marco Piazzi (solid state physics, magnetism)

- **Graduate students (PhD)**

- 1994 – 1997 *Tiziana Boffa Ballaran*: Study of order-disorder transformation in omphacites by X-ray single crystal diffraction and IR spectroscopy. Now head of research for x-ray diffraction at Bayerisches Geoinstitut, Bayreuth Germany
- 1994 – 1997 *Michele Zema*: Cooling rate calculation of meteorites (diogenites) from 4Vesta asteroid. Now researcher at University of Pavia
- 1998 – 2001 *Serena Tarantino*: Mixing properties in the enstatite-ferrosilite system: a study by IR spectroscopy and X-ray diffraction. Now researcher at University of Pavia
- 2003 – 2006 *Marco Pistorino*: Thermal expansion and compressibility of columbites and tantalites. Quality manager at Teofarma

- 2006 – 2009 *Matteo Alvaro*: Thermal expansion and compressibility of pigeonites. Now ERC grantee professor at University of Pavia
- 2009 – 2012 *Francesco Pandolfo*: Thermal expansion and compressibility of omphacitic pyroxenes. Now Documentarist and natural science guide
- 2013 – 2016 *Lorenzo Scandolo*: Thermal expansion of mantle minerals inclusions in diamonds. Now Gemologist at IGI, italia.
- 2015 – 2018 *Mattia L. Mazzucchelli*: Finite Element Modelling (FEM) of elastic anisotropy for host inclusion systems. Now research scientist at University of Mainz
- 2016 – 2019 *Mara Murri*: Raman investigation of inclusion under non-hydrostatic deviatoric stress. Now postdoctoral fellow at University of Milan Bicocca
- 2016 – 2019 *Gabriele Zaffiro*: Elastic properties of UHP metamorphism index mineral.
- 2017 – 2020 *Marta Morana*: Impact diamonds in meteorites. Now postdoctoral fellow at University Pavia
- 2018 – 2021 *Anna Barbaro*: Carbon phases in ureilites

• **Undergraduate students (M.Sc. and B.Sc.)**

- 1985: *Marco Ruocco*: Crystal chemical study of Al-rich orthopyroxenes. Master July 1985.
- 1985: *Claudio Negretto*: The order-disorder transformation in omphacites. Master July 1985.
- 1992: *Maria de Risky*: Fe distribution in orthopyroxene: a comparison between results by X-ray diffraction and Mossbauer spectroscopy. Master July 1992.
- 1997: *Davide Destro*: The intracrystalline exchange reaction in orthopyroxene: a trace for recovering thermal history of meteorites. Master July 1997
- 1999: *Annalisa Corsico Piccolino*: Relationship between closure temperature and trace elements partitioning in orthopyroxenes from howardites. Master July 1999
- 2004: *Matteo Orlandi*: Ortopirosseno della acondrite Moama: ordine-disordine e storia termica. Bachelor October 2004
- 2004: *Matteo Alvaro* (Now at University of Pavia, I): Riclassification of Trenzano chondritic meteorite. Bachelor July 2004
- 2006: *Matteo Alvaro* (Now at University of Pavia, I): Order – disorder processes in pyroxenes from ureilites meteorites. Master July 2006.
- 2006: *Tiziana Trabucchi*: Mona Lisa and Arctic project: geological experiences in simulation conditions for future planetary explorations. Master, July 2006.
- 2011: *Samuela Emily Bordoni*: Thermal expansion of a natural disordered $(\text{Mg}_{0.60}\text{Fe}_{1.40})\text{Si}_2\text{O}_6$ orthopyroxene. Bachelor July 2010
- 2013: *Davide Comboni* (Now PhD at University of Milan, I): New thermoelastic parameters, thermal expansion behaviour and dehydration of cancrinite. Bachelor July 2013
- Mattia Luca Mazzucchelli*: Diamond inclusions: new thermoelastic parameters for pyrope. Bachelor July 2013
- 2014: *Mara Murri*: Critical reassessment of the thermoelastic properties for diamond. Bachelor July 2014
- Greta Rustioni*: The role of fractures on the entrapment pressure for diamond-inclusion pair. Bachelor September 2014
- 2015: *Gabriele Zaffiro*: Development of a new resistance furnace for in situ high temperature single-crystal X-Ray diffraction. Bachelor January 2015
- Matteo Di Prima*: Almandine garnet at high-temperature: the role of controlled oxygen fugacity. Bachelor July 2015
- Mattia Luca Mazzucchelli*: Pressure of formation determination for host-inclusion systems. Master July 2015
- 2016: *Mara Murri*: Geothermometer calibration for augites (partially funded by The Barringer award for Impact related research). Master July 2016
- Greta Rustioni* (Now PhD at BGI, Bayreuth D): Brittle deformation in minerals. Master

- July 2016
Gabriele Zaffiro: Characterization of the stress distribution in synthetic host-inclusion pairs. Master July 2016
- 2018: *Pietro Bernocchi*: Raman spectroscopy of zircon inclusion in Dora Maira Garnets. Master February 2018
- 2019: *Leonardo Ravizza*: Geothermometric application on the graphite of Yamato 74123 ureilite.
Davide Sacchi: Characterization of Al Huwaysah 010 ungrouped achondrite.
- 2022: *Giuseppe Raciti*: Mineralogical Characterization of a New Lunar Feldspathic Breccia Meteorite

TEACHING ACTIVITIES

- 2001 – 2013 Introduction to Minerals for the degree in Geological Sciences, 3 CFU, University of Pavia, Italy
 Mineralogy and Laboratory, for the degree in Geological Sciences, 9 CFU, University of Pavia, Italy
- 2001 – 2007 Extraterrestrial Materials, M.Sc. degree programme in Geological Sciences, 3CFU, University of Pavia, Italy.
- 2013 - 2024 Mineralogy and Laboratory for the degree in Geological Sciences, 12 CFU, University of Pavia, Italy

INSTITUTIONAL RESPONSIBILITIES

- 1989 Director of CNR-Centro di Studio per la Cristallografia Strutturale (University of Pavia)
- 1998 – Faculty member, Dept. of Earth and Environmental Sciences, University of Pavia, Italy
- 2001 - 2023 Member of the Graduate Student Advisory board (PhD Committee), Dept. of Earth and Environmental Sciences, University of Pavia, Italy
- 2010 – 2013 Coordinator of the PhD Program in Earth Sciences of the University of Pavia
- 2013 – 2016 Coordinator of the PhD Program in Earth and Environmental Sciences of the University of Pavia

COMMISSIONS OF TRUST

- 1990 – Reviewer for American Mineralogist, Bulletin de Mineralogie, Physics and Chemistry of Minerals, Contributions to Mineralogy and Petrology, Meteoritics & Planetary Science.
- 2015 – Editorial board member for Frontiers (Earth and Planetary Material division)
- 2022 Member of the Merit Award committee for the French Society of Mineralogy and Crystallography (SFMC),

MEMBERSHIPS OF SCIENTIFIC SOCIETIES

- 1990 – Member, of the Italian Society of Mineralogy and Petrology (SIMP)
- 1990 – Member of the Mineralogical Society of America (MSA)
- 2003 – Member of the Meteoritical Society
- 1990 – 2005 Member of the Italian Association for Crystallography (AIC)

BIBLIOMETRIC RECORD

- 84 Research publications in ISI journals
- >100 scientific communications to national and international conferences
- Several invited talks and seminar to national and international institutions
- More than 2020 citations

TRACK RECORD AND SCIENTIFIC INTERESTS

The scientific field of interest of M.C. Domeneghetti developed in the crystal-chemistry of rock-forming minerals studying, by X-ray single-crystal diffraction, the structural variations which occur in pyroxenes and amphiboles as a function of chemical composition and degree of order. The aim was that of investigating how in these minerals the cation distribution affects geometrical parameters of the structure and of finding their correlations with the formation conditions. M.C.D. studied both thermodynamic and kinetic aspects of order-disorder reactions in pyroxenes under controlled conditions of T and pO₂ and phase transitions in pigeonite and cummingtonite induced by in situ annealings. In particular M.C.D.: a) investigated the convergent ordering process in omphacites, applying the Landau theory to the results of X-ray diffraction and using IR spectroscopy to analyse local heterogeneities; b) studied the non convergent ordering in orthopyroxene and pigeonite using the Mueller-Ganguly approach. This allowed her to obtain information about the cooling rate of host rocks and also to constrain the thermal history of meteorite and lunar samples. Moreover M.C.D focused on the study of thermal expansion and compressibility of minerals and on the effect, on these properties of the isomorphous substitutions and cation ordering. In the last year M.C.D. started to work on carbon phases in ureilites using a multi-methodological (nano- to micro- scale) approach to investigate the origin of such carbon phases.

PUBLICATIONS IN PEER-REVIEWD JOURNALS (past ten years)

MCD has authored over 80 extremely well cited publications on high and very high impact factor journals mainly focused on mineralogical crystallography addressing several crucial aspects spanning from conventional mineral physics problem to the more complex investigation of meteorites characterization, formation and evolution.

1. Domeneghetti M.C., Fioretti A.M., Cámara F., McCammon C., Alvaro M. (2013) Thermal history of nakhlites: a comparison between MIL-03346 and its terrestrial analogue theo's flow. *Geochimica et Cosmochimica Acta*, 121: 571-581 (IF: 4.250).
2. Ferrari S., Nestola F., Massironi M., Maturilli A., Helbert J., Alvaro M., Domeneghetti M.C., Zorzi F. (2014) In-situ high-temperature emissivity spectra and thermal expansion of C2/c pyroxenes. *American Mineralogist*, 99(4): 786-792 (DOI: 10.2138/am.2014.4698, IF:1.964)
3. Gatta G.D., Comboni D., Alvaro M., Lotti P., Cámara F., Domeneghetti M.C. (2014) Thermoelastic behavior and dehydration process of cancrinite. *Physics and Chemistry of Minerals*, 41(5): 373-386 (DOI: 10.1007/s00269-014-0656-2, IF: 1.538).
4. Alvaro M., Nestola F., Ross N.L., Domeneghetti M.C. and Reznitsky L. (2014) High pressure behavior of thiospinel CuCr₂S₄. *American Mineralogist* 99(5): 908-913 (DOI: 10.2138/am.2014.4689, IF: 1.964).
5. Pandolfo F., Cámara F., Domeneghetti M.C., Alvaro M., Nestola F., Karato S., Amulele G. (2015) Volume thermal expansion along the jadeite–diopside join. *Physics and Chemistry of Minerals*, 42(1): 1-14 (DOI: 10.1007/s00269-014-0694-9, IF: 1.585)
6. Alvaro M., Domeneghetti M.C., Marinangeli, L. (2015) A new calibration to determine the closure temperatures of Fe-Mg ordering in augite from nakhlites. *Meteoritics and Planetary Science*, 50(3): 499-507 (IF: 2.819).
7. Scandolo L., Mazzucchelli M.L., Alvaro M., Domeneghetti M.C., Nestola F. (2015) Thermal

- expansion behavior of orthopyroxenes: the role of the Fe-Mn substitution. *Mineralogical Magazine*, 79(1): 71-87. (IF: 2.212)
8. Milani S., Nestola F., Alvaro M., Mazzucchelli M.L., Domeneghetti M.C., Geiger C.A. (2015) Diamond-garnet geobarometry: The role of garnet compressibility and expansivity. *Lithos*, 227: 140-147. (IF: 3.723)
 9. M. Alvaro, R.J. Angel, C. Marciano, S. Milani, G. Zaffiro, L. Scandolo, M.L. Mazzucchelli, G. Rustioni, M.C. Domeneghetti, F. Nestola (2015) A new micro-furnace for “in situ” high-temperature single crystal X-ray diffraction measurements. *Journal of Applied Crystallography*, 48 (4): 1192-1200. (IF: 2.570)
 10. Nestola F., Alvaro M., Casati M.N., Wilhelm H., Kleppe A., Jephcoat A.J., Domeneghetti M.C., Harris J.W. (2016) Source assemblage types for cratonic diamonds from X-ray synchrotron diffraction. *Lithos*, 265: 334-338.
 11. M. Murri, L. Scandolo, A. Fioretti, M.C. Domeneghetti and M. Alvaro (2016). Fe-Mg equilibrium behaviour in augite: implications for the thermal history of terrestrial and extraterrestrial rocks. *American Mineralogist* 101 (12), 2747-2750.
 12. S. Milani, R.J. Angel, L. Scandolo, M.L. Mazzucchelli, T. Boffa-Ballaran, S. Klemme, M.C. Domeneghetti, R. Miletich, K. Scheidl, M. Derzsi, K. Tokár, M. Prencipe, M. Alvaro, F. Nestola (2017) Elastic behaviour of grossular garnets at high pressure and temperature. *American Mineralogist*, 102(4): 851-859.
 13. Murri M., Camara F., Adam J., Domeneghetti M.C., Alvaro M. (2018) Intracrystalline "geothermometry" assessed on clino- orthopyroxenes bearing synthetic rocks. *Geochimica et Cosmochimica Acta*, 227, pp. 133-142.
 14. M.L. Mazzucchelli, P. Burnley, R.J. Angel, S. Morganti, M.C. Domeneghetti, F. Nestola, and M. Alvaro (2018) Elastic geothermobarometry: Corrections for the geometry of the host-inclusion system. *Geology*, 46(3), 231-234.
 15. Vetere F., Murri M., Alvaro M., Domeneghetti M.C., Rossi S., Pisello A., Perugini D. Holtz F. (2019) Viscosity of pyroxenite melt and its evolution during cooling. *Journal of Geophysical Research: Planets*, 124, 5, 1451-1469.
 16. Murri M., Smith R.L., McColl K., Hart M., Alvaro M., Jones A.P., Nemeth P., Salzmann C.G., Corà F., Domeneghetti M.C., Nestola F., Sobolev N.V., Vishnevsky S.A., Logvinova A.M., McMillan P.F. (2019) Quantifying hexagonal stacking in diamond. *Scientific Reports*, 9, 1, Article 10334.
 17. Nestola F., Goodrich A.C., Morana M., Barbaro A., Jakubek R.S., Christ O., Brenker F., Domeneghetti M.C., Dalconi M.C., Alvaro M., Fioretti A.M., Litasov K.D., Fries M.D., Leoni M., Casati N.P., Jenniskens P., Shaddad M.H. (2020) Impact shock origin of diamonds in ureilite meteorites. *Proceedings of National Academy of Sciences*, USA, doi: 10.1073/pnas.1919067117
 18. A. Barbaro, M.C. Domeneghetti, A.C. Goodrich, M. Meneghetti, L. Litti, A.M. Fioretti, P. Jenniskens, M.H. Shaddad, F. Nestola. (2020) Micro-Raman spectroscopy of graphite in Almahata Sitta ureilites: implications on ureilites parent body. *Minerals*, 10, 1005, 1-14. doi:10.3390/min10111005 www
 19. A. Barbaro, M. C. Domeneghetti, L. Pittarello, L. Ferrière, M. Murri, O. Christ, M. Alvaro, F. Nestola, (2022) Characterization of carbon phases of Yamato 74123 ureilite to constrain the meteorite shock history. *American Mineralogist*, 107, 377-384 (doi.org/10.2138/am-2021-7856).
 20. A. Barbaro, M. C. Domeneghetti, K. D. Litasov, L. Ferrière, L. Pittarello, O. Christ, S. Lorenzon, M. Alvaro, F. Nestola, (2021) Origin of micrometer-sized impact diamonds in ureilites by catalytic growth involving Fe-Ni-silicide: The example of Kenna meteorite. *Geochimica et Cosmochimica Acta*, 309, 286-298 (<https://doi.org/10.1016/j.gca.2021.06.022>).

21. F.Nestola, S. Ferrari, M.G. Pamato, G. Redhammer, J.Helbert, M.Alvaro, M.C. Domeneghetti (2021). The best temperature range to acquire reliable thermal infrared spectra from orbit. *Scientific Reports*, 11(1), 13212, (10.1038/s41598-021-92130-1)
22. Christ S. O., Barbaro A., Brenker F.E, Nimis P., Novella D., Domeneghetti M.C., Nestola F. (2022) Shock degree and graphite geothermometry in ureilites NWA 6871 and NWA 3140. *Meteoritics and Planetary Sciences* 1-18 (doi.org/10.1111/maps.13907)
23. Carli C., Barbaro A., Murri M., Domeneghetti M.C., Langone A., Bruschini E., Stephant A., Alvaro M., Stefani S., Cuppone T., Casalini M., Migliorini A., Roush T.L., Pratesi G. (2023) Al Huwaysah 010: The most reduced brachinite, so far. *Meteoritics and Planetary Science*, 58(6), pp. 855–874 (doi10.1111/maps.13998)
24. Barbaro A., Domeneghetti M.C., Fioretti A.M., Alvaro M., Nestola F.(2023) Carbon polymorphs in Frontier Mountain ureilitic meteorites: A correlation with increasing the degree of shock? *Earth and Planetary Science Letters*, 2023, 614, 118201 (doi10.1016/j.epsl.2023.11820)