

Curriculum vitae

PERSONAL INFORMATION

Family name: Spagnuolo

First name: Mario

Researcher unique identifiers: ORCID: <http://orcid.org/0000-0003-2614-3328>

Scopus ID: 57191339036

Date of birth: April, 8th 1988

Nationality: Italian

• EDUCATION

2016-2019 PhD in Mechanics of Materials, funding from the European Union's Horizon 2020 under the Marie Skłodowska-Curie grant No 665850, achieved on 10/09/2019 at the Ecole Doctorale Sciences, Technologie, Santé, Galilée (ED 146) of “Université PARIS 13 Sorbonne Paris Cité”, Paris, France.

Thesis: “*Continuous models for multi-phase architected/meta materials: homogenization and damage evolution in three-dimensional lattices embedded in a softer matrix*”.

Supervisor Prof. PATRICK FRANCIOSI (Université PARIS 13 Sorbonne Paris Cité)

2012-2015 Master’s Degree in Physics University of Naples “Federico II”, Napoli, Italy

2007-2011 Bachelor’s Degree in Physics University of Naples “Federico II”, Napoli, Italy

• FURTHER EDUCATION

2019 “3D printing and using CAD modeling” (30 hours) Warsaw University of Technology, Poland, hosted by Prof. T. Lekszycki

2017 Summer school “Modélisations de la déformation des cristaux. Processus auto-similaires” in Sinaia (Romania), University of Bucharest and the Institut de Mathématique “Simion Stoilow” de l’Académie Roumaine

2017 Journée thématique FERMI “Genèse des microstructures” FERMI Federation of the CNRS, Jussieu, University of Paris UPMC;

2017 COMSOL Day in Paris held at the Espace St Martin in Paris.

• CURRENT POSITION

March 1st 2024 – current

Researcher RTDb

DICAAR, Università degli Studi di Cagliari, Cagliari, Italy

• PREVIOUS POSITIONS

Oct. 1st 2023 – Feb. 29th 2024

2020 – Sept. 30th 2023

Researcher RTDa

DICAAR, Università degli Studi di Cagliari, Cagliari, Italy

2019 – 2020

Substitute Professor for the course SSD ICAR/08 Corso di Laurea Ingegneria Civile LM Insegnamento Modulo: Scienza delle Costruzioni 2

DICAAR, Università degli Studi di Cagliari, Cagliari, Italy

• FELLOWSHIPS AND AWARDS

2018 – 2022

Member of the research group at Research Institute for Mechanics, National Research Lobachevsky State University of Nizhni Novgorod supported by a grant from Government of the Russian Federation (contract No. 14.Y26.31.0031)

2016 – 2019 H2020 COFUND INSPIRE doctoral project benefiting from a European Marie Sklodowska Curie grant.

- **SUPERVISION OF GRADUATE STUDENTS; PHD POSTDOC STUDENTS**

2024 – 2025 Supervisor (relatore) for the Master’s Thesis in Civil Engineering (LM23) by Fabiana Ambrosio, titled “Metmateriale composito con architettura pantografica: modellazione e applicazioni”.

Name and Address of Institution: University of Cagliari – Via Università, 40 – Cagliari

Department: Department L.240/2010 of Civil, Environmental, and Architectural Engineering

2024 – 2025 Supervisor (relatore) for the Master’s Thesis in Civil Engineering (LM23) by Mattia Vacca, titled “Studio di metamateriali pantografici con il modello non lineare di trave di Eulero-Bernoulli nell’ambito dell’Ingegneria Civile”.

Name and Address of Institution: University of Cagliari – Via Università, 40 – Cagliari

Department: Department L.240/2010 of Civil, Environmental, and Architectural Engineering

2024 – 2025 Co-supervisor (correlatore) for the Master’s Thesis in Civil Engineering (LM23) by Luca Toro, titled “Modellazione numerica di strutture auxetiche”.

Name and Address of Institution: University of Cagliari – Via Università, 40 – Cagliari

Department: Department L.240/2010 of Civil, Environmental, and Architectural Engineering

2023 – 2024 Supervisor (relatore) for the Master’s Thesis in Civil Engineering (LM23) by Alessio Saba, titled “Modelli per la descrizione di materiali compositi e tecniche di produzione di campioni mediante stampa 3D per applicazioni nell’ambito della sostenibilità”.

Name and Address of Institution: University of Cagliari – Via Università, 40 – Cagliari

Department: Department L.240/2010 of Civil, Environmental, and Architectural Engineering

2023 – 2024 Co-supervisor (correlatore) for the Master’s Thesis in Civil Engineering (LM23) by Mario Pistis, titled “Analisi di strutture composte da sistemi di funi / Structural analysis of cable systems”.

Name and Address of Institution: University of Cagliari – Via Università, 40 – Cagliari

Department: Department L.240/2010 of Civil, Environmental, and Architectural Engineering

2023 – 2024 External reviewer (controrelatore) for the Master’s Thesis in Civil Engineering (LM23) by Marta Saccone, titled “Applicazioni strutturali dei materiali compositi in fibra di lino”.

Name and Address of Institution: University of Cagliari – Via Università, 40 – Cagliari

Department: Department L.240/2010 of Civil, Environmental, and Architectural Engineering

- **TEACHING ACTIVITIES**

2020 – current Professor for the course SSD ICAR/08 Corso di Laurea Ingegneria Civile LM Insegnamento Modulo: Teoria delle Strutture (60-hour course, 6CFU). Facoltà di Ingegneria e Architettura, Università di Cagliari

2019 – 2020 Substitute Professor for the course SSD ICAR/08 Corso di Laurea Ingegneria Civile LM Insegnamento Modulo: Scienza delle Costruzioni (60-hour course, 6CFU). Facoltà di Ingegneria e Architettura, Università di Cagliari

2019 Energy Methods in Mechanics of Metamaterials course (15-hour module on Homogenization and Solution of Discrete Systems) at Warsaw University of Technology, Poland

2019 Energy Methods in Mechanics of Metamaterials (15-hour module on Continuum Mechanics) at Warsaw University of Technology, Poland

2018 – 2019 64 hours of lectures at the University of Paris Université Paris 13

2017 – 2018 64 hours of lectures at the University of Paris Université Paris 13

- **ORGANIZATION OF SCIENTIFIC MEETINGS**

2025 **Local organizer of The International Workshop on Seismic Anisotropy 2025**
IWSA2025 2025, June 9 to June 12, 2025, Cagliari, Italy

<https://sites.google.com/kaust.edu.sa/25iwsa>

- 2024 **Local organizer of the International Conference on Nonlinear Solid Mechanics**
ICoNSoM 2024, June 11 to June 14, 2024, Cagliari, Italy
<http://www.memocsevents.eu/iconsom2024/committees/local-organizing-committee/>
- 2019 **MiniSymposium-28 Perspectives in Generalised Continua**
L. Placidi, S. Forest, I. Giorgio and M. Spagnuolo
In ICoNSOM 2019 (June 16 to June 19, 2019, Roma, Italy)

- **REVIEWING ACTIVITIES**

Reviewer for the Journals:

- i. Continuum Mechanics and Thermodynamics;
- ii. Mathematics and Mechanics of Solids;
- iii. International Journal of Solids and Structures.

Member of the Editorial Boarding of International Journal of Hydromechatronics
(<https://www.inderscience.com/jhome.php?jcode=ijhm>)

- **MEMBERSHIPS OF SCIENTIFIC SOCIETIES**

2016 – current Member of the META working group on metamaterials of the LIA Coss & Vita Laboratory
<http://www.memocsevents.eu/wordpress/cossevita/organization/mmocs-teams>

- **LIST OF PUBLICATIONS**

1. Cazzani, A., Elishakoff, I., Eremeyev, V., Spagnuolo, M., & Ulukhanian, A. (2025). Critical re-examination and numerical verification of Sorokin and Arkhipov's approach to free transversal vibrations of beams using plane elasticity theory. *Applied Mathematical Modelling*, 116293.
2. Sanna, G., Pistis, M., Giorgio, I., Eremeyev, V. A., & Spagnuolo, M. (2025). New hinge design for fibrous metamaterial enables for filament 3D printing. *Mechanics Research Communications*, 104452.
3. Spagnuolo, M., Eremeyev, V.A., D'Annibale, F., Hild, F. (2025). Rescaling and mesoshear deformations of lattice metamaterials, *International Journal of Solids and Structures*, 315, 113349, <https://doi.org/10.1016/j.ijsolstr.2025.113349>
4. Kwaśniewski, A., Bak, S., Ciężowski, P., Knap, L., Maciejewski, J., Bialas, M., & Spagnuolo, M. (2025). Visual tracking of plate compactor trajectories and soil compaction through metamaterial-inspired approach. *Continuum Mechanics and Thermodynamics*, 37(3), 1-19.
5. Spagnuolo, M., Stilz, M., Eugster, S.R., dell'Isola, F. (2025). Exegesis of Some Excerpts of Mechanical Problemata. In: dell'Isola, F., Eugster, S.R., Stilz, M. (eds) *The Principle of Virtual Work in the Sources of Mechanical Sciences. Advanced Structured Materials*, vol 224. Springer, Cham. https://doi.org/10.1007/978-3-031-74967-4_1
6. dell'Isola, F., Stilz, M., Spagnuolo, M. (2025). Who Was the First to Formulate the Principle of Virtual Work?. In: dell'Isola, F., Eugster, S.R., Stilz, M. (eds) *The Principle of Virtual Work in the Sources of Mechanical Sciences. Advanced Structured Materials*, vol 224. Springer, Cham. https://doi.org/10.1007/978-3-031-74967-4_2
7. Spagnuolo, M. (2024). To consider second gradient continua as constrained microstructured continua à la Germain simplifies numerical analysis of metamaterials. *ZAMM-Journal of Applied Mathematics and Mechanics/Zeitschrift für Angewandte Mathematik und Mechanik*, 104(11), e202400045. DOI:10.1002/zamm.202400045
8. Giorgio, I., Spagnuolo, M., Greco, L., D'Annibale, F. and Cazzani, A. (2024). A Variational Approach to Address the Problem of Planar Nonlinear Beams. In: Vadim Silberschmidt (ed) *Comprehensive Mechanics of Materials (First Edition)*, pp. 67-97. Elsevier, DOI:[10.1016/B978-0-323-90646-3.00027-7](https://doi.org/10.1016/B978-0-323-90646-3.00027-7)

9. Valmalle, M., Smaniotto, B., Spagnuolo, M., Ciallella, A., Hild, F. (2023). Mesoscale DVC analyses and parameter calibration for pantographic block in 3-point flexure. *European Journal of Mechanics - A/Solids*, 105063, <https://doi.org/10.1016/j.euromechsol.2023.105063> .
10. La Valle, G., Spagnuolo, M., Turco, E., Desmorat, B. A new torsional energy for pantographic sheets (2023) *Zeitschrift fur Angewandte Mathematik und Physik*, 74 (2), art. no. 67.
11. Spagnuolo, M. Symmetrization of Mechanical Response in Fibrous Metamaterials through Micro-Shear Deformability (2022) *Symmetry*, 14 (12), art. no. 2660
12. Bersani, A.M., Cazzani, A., Eremeyev, V.A., Giorgio, I., Spagnuolo, M. To Francesco dell'Isola (2022) *Mathematics and Mechanics of Solids*, 27 (10), pp. 1871-1875.
13. Ciallella, A., Scerrato, D., Spagnuolo, M., Giorgio, I. A continuum model based on Rayleigh dissipation functions to describe a Coulomb-type constitutive law for internal friction in woven fabrics (2022) *Zeitschrift fur Angewandte Mathematik und Physik*, 73 (5), art. no. 209.
14. Bersani, A.M., Cazzani, A., Giorgio, I., Spagnuolo, M. Maestro and his pupils: History of a scientific production (2022) *Mathematics and Mechanics of Solids*, 27 (10), pp. 1876-1887.
15. Spagnuolo, M., Reccia, E., Ciallella, A., Cazzani, A. Matrix-embedded metamaterials: Applications for the architectural heritage (2022) *Mathematics and Mechanics of Solids*, 27 (10), pp. 2275-2286.
16. Valmalle, M., Vintache, A., Smaniotto, B., Gutmann, F., Spagnuolo, M., Ciallella, A., Hild, F. Local-global DVC analyses confirm theoretical predictions for deformation and damage onset in torsion of pantographic metamaterial (2022) *Mechanics of Materials*, 172, art. no. 104379
17. Spagnuolo, M., Yildizdag, M.E., Pinelli, X., Cazzani, A., Hild, F. Out-of-plane deformation reduction via inelastic hinges in fibrous metamaterials and simplified damage approach (2022) *Mathematics and Mechanics of Solids*, 27 (6), pp. 1011-1031.
18. Lai, M., Eugster, S.R., Reccia, E., Spagnuolo, M., Cazzani, A. Corrugated shells: An algorithm for generating double-curvature geometric surfaces for structural analysis (2022) *Thin-Walled Structures*, 173, art. no. 109019
19. Spagnuolo, M., dell'Isola, F., Gerber, B., Cazzani, A. Translation of Heiberg's Prolegomena (2022). In: dell'Isola, F., Eugster, S.R., Spagnuolo, M., Barchiesi, E. (eds) *Evaluation of Scientific Sources in Mechanics*. pp.75-97. Springer, Cham.
20. Spagnuolo, M., Ciallella, A., Scerrato, D. The Loss and Recovery of the Works by Piola and the Italian Tradition of Mechanics (2022). In: dell'Isola, F., Eugster, S.R., Spagnuolo, M., Barchiesi, E. (eds) *Evaluation of Scientific Sources in Mechanics*. pp.315-340. Springer, Cham.
21. Spagnuolo, M., dell'Isola, F., Cazzani, A. The Study of the Genesis of Novel Mathematical and Mechanical Theories Provides an Inspiration for Future Original Research (2022). In: dell'Isola, F., Eugster, S.R., Spagnuolo, M., Barchiesi, E. (eds) *Evaluation of Scientific Sources in Mechanics*. pp.1-73. Springer, Cham.
22. Laudato, M., Manzari, L., Giorgio, I., Spagnuolo, M., Göransson, P. Dynamics of pantographic sheet around the clamping region: experimental and numerical analysis (2021) *Mathematics and Mechanics of Solids*, 26 (10), pp. 1515-1537.
23. Auger, P., Lavigne, T., Smaniotto, B., Spagnuolo, M., dell'Isola, F., Hild, F. Poynting effects in pantographic metamaterial captured via multiscale DVC (2021) *Journal of Strain Analysis for Engineering Design*, 56 (7), pp. 462-477.

24. Spagnuolo, M., Andraeus, U., Misra, A., Giorgio, I., Hild, F. Mesoscale modeling and experimental analyses for pantographic cells: Effect of hinge deformation (2021) *Mechanics of Materials*, 160, art. no. 103924
25. Spagnuolo, M., Cazzani, A.M. Contact interactions in complex fibrous metamaterials: A proposal for elastic energy and Rayleigh dissipation potential (2021) *Continuum Mechanics and Thermodynamics*, 33 (4), pp. 1873-1889.
26. Giorgio, I., Spagnuolo, M., Andraeus, U., Scerrato, D., Bersani, A.M. In-depth gaze at the astonishing mechanical behavior of bone: A review for designing bio-inspired hierarchical metamaterials (2021) *Mathematics and Mechanics of Solids*, 26 (7), pp. 1074-1103.
27. Spagnuolo, M., Barchiesi, E. Do We Really Need Pantographic Structures? (2021). In: Marmo, F., Sessa, S., Barchiesi, E., Spagnuolo, M. (eds) *Mathematical Applications in Continuum and Structural Mechanics*. pp. 253-268. Springer, Cham.
28. Franciosi, P., Spagnuolo, M. Homogenization-Based Mechanical Behavior Modeling of Composites Using Mean Green Operators for Infinite Inclusion Patterns or Networks Possibly Co-continuous with a Matrix (2021). In: dell'Isola, F., Igumnov, L. (eds) *Dynamics, Strength of Materials and Durability in Multiscale Mechanics*. pp. 245-280. Springer, Cham.
29. Spagnuolo, M., Yildizdag, M.E., Andraeus, U., Cazzani, A.M. Are higher-gradient models also capable of predicting mechanical behavior in the case of wide-knit pantographic structures? (2021) *Mathematics and Mechanics of Solids*, 26 (1), pp. 18-29.
30. Desmorat, B., Spagnuolo, M., Turco, E. Stiffness optimization in nonlinear pantographic structures (2020) *Mathematics and Mechanics of Solids*, 25 (12), pp. 2252-2262.
31. Spagnuolo, M., Franciosi, P., dell'Isola, F. A Green operator-based elastic modeling for two-phase pantographic-inspired bi-continuous materials (2020) *International Journal of Solids and Structures*, 188-189, pp. 282-308.
32. Spagnuolo, M., Scerrato, D. The Mechanical Diode: On the Tracks of James Maxwell Employing Mechanical–Electrical Analogies in the Design of Metamaterials (2020). In: Abali, B., Giorgio, I. (eds) *Developments and Novel Approaches in Biomechanics and Metamaterials*. Pp. 459-469. Springer, Cham.
33. Spagnuolo, M. Circuit Analogies in the Search for New Metamaterials: Phenomenology of a Mechanical Diode (2020). In: Altenbach, H., Eremeyev, V., Pavlov, I., Porubov, A. (eds) *Nonlinear Wave Dynamics of Materials and Structures*. pp. 411-422. Springer, Cham.
34. Spagnuolo, M., Peyre, P., Dupuy, C. Phenomenological aspects of quasi-perfect pivots in metallic pantographic structures (2019) *Mechanics Research Communications*, 101, art. no. 103415
35. dell'Isola, F., Seppecher, P., Spagnuolo, M., et al. Advances in pantographic structures: design, manufacturing, models, experiments and image analyses (2019) *Continuum Mechanics and Thermodynamics*, 31 (4), pp. 1231-1282.
36. De Angelo, M., Spagnuolo, M., D'Annibale, F., Pfaff, A., Hoschke, K., Misra, A., Dupuy, C., Peyre, P., Dirrenberger, J., Pawlikowski, M. The macroscopic behavior of pantographic sheets depends mainly on their microstructure: experimental evidence and qualitative analysis of damage in metallic specimens (2019) *Continuum Mechanics and Thermodynamics*, 31 (4), pp. 1181-1203.
37. dell'Isola, F., Seppecher, P., Alibert, J.J., Lekszycki, T., Grygoruk, R., Pawlikowski, M., Steigmann, D., Giorgio, I., Andraeus, U., Turco, E., Gołaszewski, M., Rizzi, N., Boutin, C., Eremeyev, V.A., Misra, A., Placidi, L., Barchiesi, E., Greco, L., Cuomo, M., Cazzani, A., Corte, A.D., Battista, A., Scerrato, D., Eremeeva, I.Z., Rahali, Y., Ganghoffer, J.-F., Müller, W., Ganzosch, G., Spagnuolo, M.,

- Pfaff, A., Barcz, K., Hoschke, K., Neggers, J., Hild, F. Pantographic metamaterials: an example of mathematically driven design and of its technological challenges (2019) *Continuum Mechanics and Thermodynamics*, 31 (4), pp. 851-884.
38. Franciosi, P., Spagnuolo, M., Salman, O.U. Mean Green operators of deformable fiber networks embedded in a compliant matrix and property estimates (2019) *Continuum Mechanics and Thermodynamics*, 31 (1), pp. 101-132.
 39. dell'Isola, F., Giorgio, I., Placidi, L., Spagnuolo, M., Peyre, P., Dupuy, C., Dirrenberger, J., Pawlikowski, M., Igumnov, L. Pantographic metamaterials: A view towards applications (2019) *Materials Physics and Mechanics*, 42 (5), pp. 637-645.
 40. Yildizdag, M.E., Tran, C.A., Barchiesi, E., Spagnuolo, M., dell'Isola, F., Hild, F. A multi-disciplinary approach for mechanical metamaterial synthesis: a hierarchical modular multiscale cellular structure paradigm (2019). In: Altenbach, H., Öchsner, A. (eds) *State of the Art and Future Trends in Material Modeling*. pp. 485-505. Springer, Cham.
 41. Barchiesi, E., Spagnuolo, M., Placidi, L. Mechanical metamaterials: a state of the art (2019) *Mathematics and Mechanics of Solids*, 24 (1), pp. 212-234.
 42. Spagnuolo, M., Andreaus, U. A targeted review on large deformations of planar elastic beams: extensibility, distributed loads, buckling and post-buckling (2019) *Mathematics and Mechanics of Solids*, 24 (1), pp. 258-280.
 43. Andreaus, U., Spagnuolo, M., Lekszycki, T., Eugster, S.R. A Ritz approach for the static analysis of planar pantographic structures modeled with nonlinear Euler–Bernoulli beams (2018) *Continuum Mechanics and Thermodynamics*, 30 (5), pp. 1103-1123.
 44. di Cosmo, F., Laudato, M., Spagnuolo, M. Acoustic metamaterials based on local resonances: Homogenization, optimization and applications (2018). In: Altenbach, H., Pouget, J., Rousseau, M., Collet, B., Michelitsch, T. (eds) *Generalized Models and Non-classical Approaches in Complex Materials 1*. pp. 247-274. Springer, Cham.
 45. Abd-alla, A.-E.-N.N., Alshaikh, F., Del Vescovo, D., Spagnuolo, M. Plane waves and eigenfrequency study in a transversely isotropic magneto-thermoelastic medium under the effect of a constant angular velocity (2017) *Journal of Thermal Stresses*, 40 (9), pp. 1079-1092.
 46. Spagnuolo, M., Barcz, K., Pfaff, A., dell'Isola, F., Franciosi, P. Qualitative pivot damage analysis in aluminum printed pantographic sheets: Numerics and experiments (2017) *Mechanics Research Communications*, 83, pp. 47-52.
 47. Abbas, I.A., Abdalla, A.-E.-N.N., Alzahrani, F.S., Spagnuolo, M. Wave propagation in a generalized thermoelastic plate using eigenvalue approach (2016) *Journal of Thermal Stresses*, 39 (11), pp. 1367-1377.

- **CONFERENCES AND PRESENTATIONS**

1. XXV Convegno AIMETA (September 4 to 8, 2022, Palermo, Italy) 2022 “Reducing out-of-plane warping by using inelastic joints in fibrous metamaterials”
2. ICoNSOM 2022 (June 13 to June 16, 2022, Alghero, Italy) “Micro-shear deformation influence on macro-behavior of lattice metamaterial”
3. M&MoCS Workshop on Structural Mechanics 2021 (20 to 23 September 2021, Arpino, Italy) “Out-of-plane deformation reduction via inelastic hinges in fibrous metamaterials and simplified damage approach”

4. Joint MEMOCS Workshop on Models of Complex Materials and Systems (20 to 23 June 2019, Arpino, Italy) “Mean Green operator-based elastic modeling for pantographic-inspired biphasic materials”
5. ICoNSOM 2019 (June 16 to June 19, 2019, Roma, Italy) “Pivots damage mechanisms in metallic pantographic structures: an overview”
6. ICoNSOM 2019 (June 16 to June 19, 2019, Roma, Italy) “Out-of-plane deformation in standard pivots and in-plane deformation in quasi-perfect pivots pantographic structure: a DIC analysis”
7. Nonlinear Instabilities and localization in materials, geomaterials, metamaterials and structures 8-12 April 2019, Arpino, Italy “The role of the pivots in damage in pantographic structures”
8. Conférence MATERIAUX 2018 - 19 au 23 novembre – Strasbourg “Qualitative analysis of damage and fracture of pivots in aluminum pantographic structures”
9. ICACM – 11th US-France Symposium – Paris “Mechanics and physics of solids at micro- and nanoscales” “Modelling Fiber Networks Embedded (or not) in Soft Matrix”
10. Workshop “Encounter of the third kind” on “Generalized continua and microstructures” 3-7 April 2018, Arpino, Italy “Geometrical microstructure descriptors in strained co-continuous matrix embedded regular networks”
11. EUROMECH Colloquium 579, Arpino, Italy. 3-8 April 2017 “Qualitative pivot damage analysis in aluminum printed pantographic sheets: numerics and experiments”