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Scopus ID: 7003627408 **Google Scholar, ResearchGate:** Fernando Fraternali

Biographical sketch

Fernando Fraternali is Professor of Structural Mechanics in the Department of Civil Engineering at the University of Salerno (Diciv), Italy. He received his B.Sc. and M.Sc. degrees in Civil and Environmental Engineering from the University of Salerno, and a Ph.D. in Multiscale Mechanics from King's College London. F. Fraternali has participated as a PI or co-PI in various research projects funded by the Italian National Research Council, the Ministry of Education, the Ministry of Foreign Affairs and International Cooperation (Italy-USA scientific cooperation), and US research agencies. He is PI of the PRIN Research Project of National Relevance "Innovative Lattice Structures and Architectured Materials for civil engineering (ILAM)" (PRIN 2022 project 20224LBXMZ, years 2023-2025) granted by the Italian Ministry of University and Research (MUR). He is also PI of the Research Unit at the University of Salerno within the PRIN-PRRR 2022 Project of National Relevance "STABilization of contaminated SOILs (STABSOIL)" (project code P2022CR8AJ, years 2023 –202) granted by MUR. In the University of Salerno, Prof. Fernando Fraternali serves as Rectory Deputy to Graduate Programs for the Scientific Area; as Coordinator of the PhD Course on "Structural Engineering, Architecture and Cultural Heritage"; and as Delegate to Research and Doctorate Affairs of Diciv. Most of his research work concerns multiscale modeling and simulation of solids and structures, the nonlinear dynamics of materials and structures, and the design and engineering of sustainable materials at multiple scales. Prof. Fraternali was awarded a Fulbright Research Scholarship for the academic year 2005/06 and has been Visiting Professor at the Graduate Aerospace Laboratories of the California Institute of Technology since September 2005 (several periods), the Department of Mechanical and Aerospace Engineering of the University of California, San Diego, and the Department of Mechanical and Aerospace Engineering of the University of California, Irvine. Starting from 2017, he has been listed in the Elsevier data Repository of the *world's 100,000 top-cited scientists across all fields* according to the citation metrics presented in the article by John P.A. Ioannidis: "Updated science-wide author databases of standardized citation indicators", doi: 10.17632/btchxktzyw.7 (last update: v.7, August 2024). He is an elected member of the European Academy of Sciences (link), and has received the "Major Contributions to Tensegrity Systems Research" Award from the Texas A&M Laboratory on Tensegrity Systems (April 2018); the "Bdr2017 Award – Category Green Economy" for the University of Salerno spin-off Newmatt within the Startup Competition on Innovation and Entrepreneurship "Borsa della Ricerca 2017" (Fisciano, May 2017), and the"2015 Hetenyi Award" from the Society for Experimental Mechanics, Inc. (Bethel, CT 06801, USA). Prof. Fraternali is Associate Editor of Mechanics Research Communications (Elsevier, ISSN: 0093-6413), Frontiers in Materials (Frontiers Publishing, ISSN: 2296-8016) and Ingegneria Sismica - International Journal of Earthquake Engineering (Patron Editore, ISSN: 0393-1420). He is also on the Editorial Advisory Board of Curved and Layered Structures (De Gruyter Open, ISSN: 2353-7396) and Science and Engineering of Composite Materials (De Gruyter Open, ISSN: 2191-0359). F. Fraternali is Guest Editor of the special issues: "*Multi-Scale Modeling and Characterization of Innovative Materials and Structures*", Mechanics Research Communications, Volume 58, Pages 1-156 (June 2014, link); "*Composite Lattices and Multiscale Innovative Materials and Structures",* Composites Part B: Engineering (Elsevier, ISSN: 1359-8368), Volume 115, Pages 1-504 (15 April 2017, link); "*Multiscale lattices and composite materials: Optimal design, modeling and characterization*", Frontiers in Materials (August 2019, doi: 10.3389/fmats.2019.00199, link); "*Advances in Mechanical Metamaterials and Smart Structures*", Mechanics Research Communications, Volume 107, 2020, 103531 (July 2020, link);"*Recent Advances on Multiscale Engineered Metamaterials and Structures*", Mechanics Research Communications, Volume 131, 2023, 104159, doi: 10.1016/j.mechrescom.2023.104159 (August 2023, link).

Fernando Fraternali
Curriculum Vitae

Education

- MSc&BSc *(*"*Laurea magna cum laude - Laurea vecchio ordinamento*"*,* 5-year course), Civil and Environmental Engineering, University of Salerno, Italy, 1987. Advisors: Maurizio Angelillo, Luigi Ascione, Bruno Palazzo.
- PhD, Multiscale Mechanics, King's College London, UK, 2011 - PhD Dissertation title: "Multiscale Modeling of Biomembranes and Nanostructures". Advisors: Gianluca Marcelli, Christian D. Lorenz and Georgios Papadakis.

Professional Appointments (Department of Civil Engineering, University of Salerno)

- 05/2016-Present: Full Professor of Mechanics of Materials, Solids and Structures.
- 11/2001-04/2016: Associate Professor of Mechanics of Materials, Solids and Structures.
- 03/1990-10/2001: Assistant Professor of Mechanics of Materials, Solids and Structures.
- 01/1987-02/1990: Teaching Assistant and Research Scientist.

Visiting Appointments

- 09/2019 – 11/2019: Visiting Professor, Department of Materials Science & Engineering, University of Sheffield, UK
- 09/2018: Visiting Professor, Université Paris Diderot, Paris, France
- 07/2017 – 08/2017: Visiting Professor, Department of Mechanical and Civil Engineering, California Institute of Technology, USA
- 07/2014 – 08/2017 (several periods): Visiting Professor, Department of Mechanical and Aerospace Engineering, University of California, San Diego, USA
- 09/2005 – 02/2009: Visiting Associate in Aeronautics, Graduate Aerospace Laboratories, California Institute of Technology, USA
- 08/1991-12/1991: Visiting Research Scientist, Department of Engineering Science and Mechanics, Virginia Polytechnic Institute and State University, USA.

Courses Taught (University of Salerno)

- "Mechanics of Solids and Structures" ("Scienza delle Costruzioni"), BS in Civil and Environmental Engineering, 2001-present, (12 ECTS credits)
- "Mathematical and Mechanical Models for Engineering and Architectural Problems", PhD Course in "Structural Engineering, Architecture and Cultural Heritage", 2023-present, (6 ECTS credits)
- " Intellectual Property and Patent of Research Inventions", PhD Course in "Structural Engineering, Architecture and Cultural Heritage", 2023-present, (1 ECTS credit)

- "Fundaments of Mathematics" and "Mechanics of Structures", Bachelor of Professional Studies in Techniques for Construction and Territory, 2023-present, (6+6 ECTS credits, Avellino campus, in collaboration with Ada Amendola)
- "Advanced Computational Mechanics with Applications to Composite Materials and Structures", MS in Civil Engineering, 2016-2020, (6 ECTS credits)
- "Theory of Structures" ("Teoria delle Strutture"), MS in Civil and Environmental Engineering, 1998-2001, (12 ECTS credits)
- "Strength of Materials" ("Sicurezza ed Affidabilita' delle Costruzioni"), BS in Civil Engineering, 1996-1999, (6 ECTS credits)
- "Industrial Design and Strength of Materials" ("Disegno Industriale e Scienza delle Costruzioni" and "Sicurezza ed Affidabilita' delle Costruzioni"), BS in Chemical Engineering, 1994-1999, (6 ECTS credits)

Guest Lecturer:

- "Special Topics in Solid Mechanics: Linear and nonlinear waves in periodic media" (2012), California Institute of Technology (Ae/AM/ME 225)
- "Mechanics of Structures and Solids" (2008-2010), California Institute of Technology (Ae/AM/CE/ME 102).

Current Graduate Students and Postdoctoral Scholars

- Hazar Etteyeb, Univ. Salerno, PhD Student (XL cycle), "Innovative artificial intelligence technhiques for structural health monitoring".
- Giuseppina Di Chiara, Univ. of Catania and Univ. Salerno, PhD Student (XXXIX cycle), "On the mechanical stabilization of contaminated soils ".
- Hossein Honarvar, Univ. Salerno, PhD Student (XXXVIII cycle), "Mechanical modeling and experimental validation of sustainable materials for additive manufacturing".
- Giovanni Germano, Univ. Salerno, PhD Student (XXXVIII cycle), "Innovative sensors and actuators for civil engineering structures".
- Baidehi Das, Univ. of Catania and Univ. Salerno, PhD Student (XXXVIII cycle), "Mechanical modeling of innovative timber structures incorporating superelastic materials ".
- Valentina Adinolfi, Univ. Salerno, PhD Student (XXXVII cycle), "Using mechanical metamaterials for seismic isolation devices".

Selected Former Graduate Students and Postdoctoral Scholars Supervised

- Giuseppe Rocchetta, Univ. Salerno, Ph.D. Student 2000-2003, "Lumped stress models for masonry structures" . Currently: High School Teacher.
- Andrea Marino, Univ. Salerno, Ph.D. Student 2002-2005, "Energetic approaches to shape optimization". Currently: Officer of the Italian Fire and Rescue Service.
- Davide Zuppa, Univ. Salerno, Ph.D. Student 2004-2007, "Impact dynamics of soft material systems". Currently: Professional Engineer.
- Fabio Formato, Univ. Salerno, Ph.D. Student 2004-2007, "Theoretical-experimental study on the statics of masonry vaults" . Currently: Professional Engineer.

- Marco Picone, Univ. Salerno, M.Sc. Student 2005-2007, “Energy trapping in granular systems”. Currently: Research Engineer, Institute for Environmental Protection and Research (ISPRA), Rome, Italy.
- Luca Cardamone, Univ. Salerno, Ph.D. Student 2006-2008, “On the mechanics of arterial growth and remodeling”. Currently: Project Manager at Progetti Europa & Global S.p.A, Rome, Italy.
- Rosaria Chechile, Univ. Salerno, Ph.D. Student 2008-2011, “Mechanical and durability properties of ecosustainable concretes”. Currently: Project Manager, Real Edil s.p.a. Salerno, Italy.
- Nicholas Boechler – California Institute of Technology, Ph.D. Student, 2008-2011, “Granular crystals: controlling mechanical energy with nonlinearity and discreteness” (co-supervisor). Currently: Associate Professor, Department of Mechanical and Aerospace Engineering, University of California, San Diego, USA.
- Jordan R. Raney – California Institute of Technology, Ph.D. Student, 2009-2012, “Hierarchical structures of aligned carbon nanotubes as low-density energy-dissipative materials” (co-supervisor). Currently: Assistant Professor, Architected Materials Laboratory, University of Pennsylvania, School of Engineering and Applied Science, Philadelphia, PA, USA.
- Ivan Szelengowicz – California Institute of Technology, Ph.D. Student, 2008-2013, “Topology and material optimization for granular protective systems” (co-supervisor). Currently: Software developer at Medcurio, Inc, Pasadena, CA, USA.
- Andrea Leonard – California Institute of Technology, Ph.D. Student, 2008-2013, “Stress wave propagation in two-dimensional granular crystals” (co-supervisor). Currently: Senior Scientist at TreeFrog Therapeutics, Bordeaux, France.
- Thevamaran Ramathasan – California Institute of Technology, Ph.D. Student, 2009-2014, “Dynamics of carbon nanotube foams” (co-supervisor). Currently: Assistant Professor at the Department of Engineering Physics of the University of Wisconsin-Madison, WI, USA.
- Gerardo Carpentieri– Civil Engineering, Univ. Salerno, Ph.D. Student, 2012-2014, “On the mechanical modeling and the optimal design of tensegrity structures”. Currently: Officer at the City of Monselice (Padova), Italy.
- Ada Amendola – Civil and Environmental Engineering, Univ. Salerno, Ph.D. Student, 2014-2016, “On the mechanical modeling and the optimal design of tensegrity structures”. Currently: Associate Professor, Applied Mathematics and Mechanics of Solids and Structures, University of Salerno.
- Mariella De Piano – Civil and Environmental Engineering, Univ. Salerno, Ph.D. Student, 2016-2018, “Continuum and discrete approaches to the statics of masonry vaults”. Currently: Engineer at Geoconsult srl, Manocalzati (AV), Italy.
- Raffaele Miranda – Civil Engineering and Architecture, Univ. Salerno, Ph.D. Student, 2017-2019, “Modeling and development of innovative structures for smart façades of energy efficient buildings”, Currently: Officer of Regione Campania, Italy.
- Narinder Singh, Risk and Sustainability in Civil, Architectural and Environmental Engineering Systems, Univ. Salerno, Ph.D. Student, 2019-2022, “Design, mechanical modelling and testing of innovative seismic isolation devices”, Currently: Post-Doc Research Assistant, University of Naples “Parthenope”.
- Julia de Castro Motta, Risk and Sustainability in Civil, Architectural and Environmental Engineering Systems, Univ. Salerno, Ph.D. Student, 2022-2024, “Discrete and continuous approaches to the propagation of mechanical waves in non-linear elastic systems”, Currently: Post-Doc Research Assistant, University of Salerno.

Service Provided to the University of Salerno

- Rectory Deputy to Graduate Programs for the Scientific Area.
- Coordinator of the PhD Course on “Structural Engineering, Architecture and Cultural Heritage” (cycles XXXIX-XL, formerly “Risk and Sustainability in Civil, Architectural and Environmental Engineering Systems”, cycles XXXII-XXXVIII).
- Member of the Commission for Departmental Research Grants, Department of Civil Engineering.
- Member of the Commissions of the Department of Civil Engineering for Research and Doctorate Affairs and Post-Graduate Studies.
- Member of the Faculty Board of the PhD Course in Structural Engineering, Architecture and Cultural Heritage, Department of Civil Engineering.
- Scientific Director of the start-up company "NEWMATT: NEW MATerials and Techniques for sustainable engineering” https://www.newmatt.it/ (formerly approved academic spin-off of the University of Salerno, incubation period: February 2018 – February 2023).
- Co-Founder and Member of NANO_MATES (Research Centre for NANOMAterials and nano-TEchnology at Salerno), University of Salerno (from 2007 to present, http://www.nanomates.unisa.it).
- Director of the Rapid Prototyping Laboratory, Department of Civil Engineering.
- Senior Researcher: STRuctural ENGineering Test Hall (STRENGTH) - Structural Engineering Laboratory.
- Advisor and Lecturer for Ph.D. Programs in Structural and Civil Engineering.

Honors and Awards

- Elected member of the European Academy of Sciences, Engineering Division, Sept. 2024 (https://www.eurasc.eu/members/)
- Listed in the Elsevier Repository of the 100,000 top-cited scientists across all fields according to the composite citation index published in John P.A. Ioannidis, “August 2024 data-update for "Updated science-wide author databases of standardized citation indicators", Elsevier Data Repository, v7, doi: https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/7, both for the year 2023 and for the entire academic career up to 2023 (listed in this ranking since 2017, last update 16 Sept. 2024).
- "Major Contributions to Tensegrity Systems Research" Award, Texas A&M Laboratory on Tensegrity Systems (April 2018).
- Listed among Top Italian Scientists, Area: Engineering-Mechanics, since 2017 (http://www.topitalianscientists.org).
- “Bdr2017 Award – Category Green Economy” for the University of Salerno spin-off Newmatt (founder and CEO) within the Startup Competition on Innovation and Entrepreneurship “Borsa della Ricerca 2017” (Fisciano, May 2017, link).
- 2015 Hetényi Award from the Society for Experimental Mechanics, (Bethel, CT, USA) for the Best Research Paper published in the Journal of Experimental Mechanics (Springer, ISSN: 0014-4851) in the year 2013 (*paper “Directional Wave Propagation in a Highly Nonlinear Square Packing of Spheres”, A. Leonard, F. Fraternali, C. Daraio,, Experimental Mechanics, 53(3), 327-337, 2013*), June 2015, Costa Mesa, CA, USA.
- Start Cup Campania 2012, Business Plan Competition, 3rd prize, Project “New Materials and Techniques for Sustainable Engineering”, Salerno, Italy, Oct. 2012 (http://www.startcupcampania.unina.it/).

- "Contributions to the Variational Theory of Fracture" Award, Vibration and Wave Propagation Laboratory, Georgia Institute of Technology, Sept. 2012
- "Contributions to Understanding the Behavior of Waves in Granular Systems" Award, Granular Science Laboratory, New Jersey Institute of Technology, Aug. 2012
- Start Cup Campania 2011, Business Plan Competition, Finalist, "Environmentally-Sustainable Fiber-Reinforced Products for the Construction Industry", Napoli, Italy, Sep. 2011.
- Fulbright Research Scholarship, California Institute of Technology, Sep. 2005 - Sep. 2006.
- Province of Salerno Scholarship, California Institute of Technology, Aug. 2008 - Jan. 2009
- Italian National Research Council (CNR) Scholarship, California Institute of Technology, Oct. 2006.
- Distinguished Graduate Student Award, Celebrations for the 20th Anniversary of the Engineering Faculty, University of Salerno, Jul. 2003 (delivered by the Italian Minister of Education, University and Research).
- Italian Ministry of Education, University and Research (MIUR) Scholarship, Virginia Tech, Aug.-Dec. 1991.
- Special Mention of Honor for Scientific Interest of the Thesis and Publication ("Dignità di Stampa") Dec. 1986.

Journal Editorships

- Associate Editor of Mechanics Research Communications, Elsevier, ISSN: 0093-6413 (www.journals.elsevier.com/mechanics-research-communications/editorial-board)
- Associate Editor of Frontiers in Materials, Section: Mechanics of Materials, Frontiers Publishing, ISSN: 2296-8016 (www.frontiersin.org/journals/materials#editorial-board)
- Associate Editor of Ingegneria Sismica – International Journal of Earthquake Engineering, ISSN: 0393-1420 (ingegneriasismica.org/editorial-board/)
- Member of the Editorial Advisory Board of Curved and Layered Structures, De Gruyter Open, ISSN: 2353-7396 (www.degruyter.com/view/j/cls)
- Member of the Editorial Advisory Board of Science and Engineering of Composite Materials, De Gruyter Open, ISSN: 2191-0359 (www.degruyter.com/view/j/secm).
- Member of the Editorial Advisory Board of the World Journal of Engineering, Emerald Publishing, ISSN: 1708-5284 (emeraldgrouppublishing.com/products/journals/editorial_team.htm?id=wje).
- Guest Editor of the special issue of Mechanics Research Communications "Multiscale Methods for Innovative Materials and Structures", Volume 58, Pages 1-156, June 2014. (www.sciencedirect.com/science/journal/00936413/58)
- Guest Editor of the special issue of Composites Part B: Engineering "Composite Lattices and Multiscale Innovative Materials and Structures", Volume 115, Pages 1-504, April 2017. (www.sciencedirect.com/journal/composites-part-b-engineering/vol/115/suppl/C, ISSN: 1359-8368)
- Guest Editor of the research topic of Frontiers in Materials: Engineering "Multiscale lattices and composite materials: Optimal design, modeling and characterization", August 2019, doi: 10.3389/fmats.2019.00199 (www.frontiersin.org/research-topics/8136).
- Guest Editor of the special issue of Mechanics Research Communications "Advances in Mechanical Metamaterials and Smart Structures", Volume 107, 2020, 103531, July 2020 (www.sciencedirect.com/science/article/pii/S0093641320300604?via%3Dihub).

- Guest Editor of the special issue of Nanomaterials " Multiscale Innovative Materials and Structures", MDPI, ISSN: 2079-4991, January 2022, doi:10.3390/nano12010096, (www.mdpi.com/journal/nanomaterials/special_issues/Multiscale_Innovative_Materials_Structures).
  Guest Editor of the special issue of Mechanics Research Communications " Recent Advances on Multiscale Engineered Metamaterials and Structures" (Mechanics Research Communications, Volume 131, Agosto 2023, 104159, , doi: 10.1016/j.mechrescom.2023.104159).

Reviewer (Selection)

- ACS Nano
- Acta Mechanica
- Additive Manufacturing
- Advances in Materials and Processing Technologies
- AIAA Journal
- Applied Mathematical Modeling
- ASME Journal of Vibration and Acoustics
- Carbon
- Cement and Concrete Composites
- Biomechanics and Modeling in Mechanobiology
- Bulletin of the Polish Academy of Sciences
- Composites Part B: Engineering
- Composite Structures
- Computer and Structures
- Computer Methods in Applied Mechanics and Engineering
- Construction and Building Materials
- Continuum Mechanics and Thermodynamics
- Current Opinion in Solid State & Materials Science
- Energy and Buildings
- Engineering with Computers
- Engineering Structures
- Entropy
- European Journal of Mechanics / A Solids
- European Physical Journal – Plus
- Europhysics Letters
- Extreme Mechanics Letters
- Frontiers in Mechanics
- Frontiers in Built Environment
- International Journal of Architectural Heritage
- International Journal of Fracture
- International Journal of Solids and Structures
- International Journal of Space Structures
- Journal of Applied Physics
- Journal of Biomechanics
- Journal of Elasticity
- Journal of Geophysics and Engineering
- Journal of Manufacturing Processes

- Journal of Materials Engineering and Performance
- Journal of Materials Science
- Journal of the Mechanics and Physics of Solids
- Journal of Sound and Vibration
- Journal of Physics D: Applied Physics
- Journal of Polymers and the Environment
- Journal of Vibration and Control
- Materials Today
- Meccanica
- Mechanics of Advanced Materials and Structures
- Mechanics of Materials
- Mechanics Research Communications
- Mechanism and Machine Theory
- Nonlinear Dynamics
- Nonlinear Theory and Its Applications, IEICE (NOLTA)
- PLoS One
- Physica D: Nonlinear Phenomena
- Polymer Engineering & Science
- Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences
- Theoretical and Applied Fracture Mechanics
- Science and Engineering of Composite Materials
- Smart Materials and Structures
- Steel and Composite Structures
- Structural Engineering and Mechanics
- Waste Management
- Member of the External Advisory Board, Project Eva 4.0, Czech University of Life Sciences, Prague, 2018-2022
- Horizon 2020, M-era.Net and Swiss Science Foundation, Reviewer
- ERC projects, Reviewer

Selected Research Grants and Contracts

- PRIN 2022, Italian Ministry of University and Research, Research Projects of National Relevance, South Line, "Innovative Lattice Structures and Architectured Materials for civil engineering (ILAM)", Project code 20224LBXMZ, Years 2023 –2025, Total Funded Amount: 231.154 Eur, PI: Fernando Fraternali
- PRIN-PRRR 2022, Italian Ministry of University and Research, Research Projects of National Relevance, "STABilization of contaminated SOILs (STABSOIL)", Project code P2022CR8AJ, Years 2023 –2025, Total Funded Amount: 240.000 Eur, Local PI of the Research Unit at the University of Salerno.
- Joint Research Project as Part of Science and Technology Cooperation Between Italy and The United States of America, Italian Ministry of Foreign Affairs and International Cooperation, Project title: Next-generation green structures for natural disaster-proof building, grant number US23GR15. University of Salerno (Italy), University of Colorado Boulder and University of California Irvine (USA), Period: 01/01/2023-31/12/2025, Member of the research team, Total Funded Amount: 150.000,00 Eur (Italian PI: Ada Amendola, USA PI: Massimo Ruzzene)

- PRIN 2017, Italian Ministry of University and Research, Research Projects of National Relevance, South Line, "Multiscale Innovative Materials and Structures (MIMS)", Project code 2017J4EAYB, Years 2019 –2023, Total Funded Amount: 816.760 Eur, PI: Fernando Fraternali
- @Paestum – "Digital technologies in support of post-Covid recovery of the Paestum Archaeological Park and surrounding area", Alumni Small Grant 2020 from the US Mission to Italy. Years 2021-2022, Total Funded Amount: 14.438,00 Eur, PI: Fernando Fraternali
- Research Contract between the Department of Civil Engineering of the University of Salerno and AQUAFIL S.p.A. (Arco, Trento, Italy), "Development of innovative eco-compatible filaments for 3D printing", Period: 20/05/2016 – 31/12/2017, PI: Fernando Fraternali
- Laboratories University Network of Seismic Engineering (RELUIS), Executive Project 2014-2018, "Seismic retrofitting of masonry vaults" ("Rinforzi strutturali anti-sismici per volte in muratura"), Period: 01/02/2014 – 31/12/2018, Research Line PI: Valentino Berardi
- Joint Research Project as Part of Science and Technology Cooperation Between Italy and The United States of America, Italian Ministry of Foreign Affairs, Project title: Innovative structures for energy efficient buildings, University of Salerno (Italy) – University of California, San Diego (USA), Period: 01/01/2013-31/12/2015, Italian PI: Fernando Fraternali, USA PI: Mauricio de Oliveira
- FARB Projects 2012-2024, University of Salerno, Local funding for basic research, PI
- Research Contract between the University Centre for Risk Prediction and Prevention (CUGRI, Universities of Salerno and Napoli "Federico II") and Alenia Aeronautica (Pomigliano D'Arco, Napoli, Italy), "Experimentation of an innovative structural health monitoring technique through laser vibrometry" ("Sperimentazione di una procedura di structural health monitoring mediante vibrometro laser"), Period: 17/06/2010 -l 31/12/2010, PI: Fernando Fraternali
- Research Contract between the Department of Civil Engineering of the University of Salerno and CAPAROL Italiana GmbH & Co. KG (Vermezzo, Milano, Italy), "Durability and mechanical properties of hi-tech products for the protection and the reinforcement of concrete structures" ("Caratteristiche meccaniche e di durabilita' in ambienti aggressivi di prodotti per il risanamento e la protezione del calcestruzzo"), Period: 15/03/2010 – 15/03/2011, PI: Fernando Fraternali
- TENSEGRITY 2012, Province of Avellino, "Innovative systems for seismic engineering and structural health monitoring" ("Sistemi innovativi per l'ingegneria sismica ed il monitoraggio strutturale"), Period: 01/07/2012 – 15/03/2013, PI: Fernando Fraternali

Selected Meeting Chairmanships

- 2024, Advanced School on Tensegrity Systems: From Biomechanics to Mechanical Metamaterials, CISM, International Centre for Mechanical Sciences, Udine, 16-20 September 2024 (Co-coordinator https://cism.it/en/activities/courses/C2417/)
- 2024, International Workshop on the Mathematics and Mechanics of Innovative Materials and Structures (M&MIMS24), Salerno-Fisciano, July 11-26, 2024 (Chair www.multiscale.unisa.it).
- 2024, 3rd Int. Conference on Nonlinear Solid Mechanics (ICONSOM 2024), Cagliari, Italy, June 11-14, 2024 (Scientific Committee, http://www.memocsevents.eu/iconsom2024/commitees/scientific-commitee/)
- 2023, 9th Conference on Computational Methods in Structural Dynamics and Earthquake Engineering (COMPDYN 2023), Athens, Greece, 12-14 June 2023 (Scientific Committee, https://2023.compdyn.org/content/scientific-committee)
- 2022, 1st International Conference on Mechanics of Solids (MS 2022), Porto, Portugal, 3-4 November 2022 (Scientific Committee, https://web.fe.up.pt/~ms2022/)

- 2022, 2nd International Conf. on Nonlinear Solid Mechanics (ICoNSoM 2022), Alghero, Italy, June 13-16 2022 (Scientific Committee, http://www.memocsevents.eu/iconsom2022/committees/scientific-committee/)
- 2022, 4th International Workshop on Multiscale Innovative Materials and Structures (MIMS22), Cetara (SA), Italy, September 29- October 1st, 2022 (Chair & Editor, www.multiscale.unisa.it)
- 2021, 24th International Conference on Composite Structures (ICCS24), Porto, Portugal, June 14-18 2021 (Scientific Committee, https://eventi.unibo.it/iccs24/scientific-committee)
- 2021, 8h Conference on Computational Methods in Structural Dynamics and Earthquake Engineering (COMPDYN 2021), Streamed from Athens, Greece, 28-30 June 2021 (MS co-organizer)
- 2021, 8th International Conference on Materials, Mechanics & Modelling (ICMMM 2021), Streamed from Washington, USA, Sept. 25-27, 2021 (Scientific Committee).
- 2020, Joint 23rd International Conference on Composite Structures (ICCS23) & 6th International Conference on Mechanics of Composites (MECHCOMP6), Streamed form Porto, Portugal, Sept.1-4 2020 (Scientific Committee)
- 2019, 3rd International Workshop on Multiscale Innovative Materials and Structures (MIMS19), Cetara (SA), Italy, February 28- March 2, 2019 (Chair & Editor)
- 2019 International Conference on Nonlinear Solid Mechanics (ICoNSoM 2019), 16-19 June 2019, Rome, Italy (Scientific Committee and co-organizer of the minisymposium "Nonlinear Mechanics of Lattice Metamaterials")
- ICCM2018: 9th International Conference on Computational Methods, Rome, Italy, 6-10 August 2018 (local Co-Chairman and member of the International Scientific Advisory Committee)
- WCCM 2018: 13th World Congress in Computational Mechanics, New York City, USA, July 22-27 2018 (co-organizer with Vitali Nesterenko, Julian Rimoli and Bob Skelton of the minisymposium "Computational design of multifunctional lattice materials").
- ESMC 2018: 10th European Solids Mechanics Conference, Bologna, Italy, 2-6 July 2018 (co-organizer with Bob Skelton of the minisymposium "Mechanics of tensegrity structures and multifunctional lattice materials")
- Aimeta 2017: XXIII National Conference of the Italian Association of Theoretical and Applied Mechanics, Salerno, Italy. September 4-7, 2017 (Organizing Committee and Editor, https://salerno2017.aimeta.it/comitati.html)
- 2016 International Workshop on Multiscale Innovative Materials and Structures" (MIMS16), Cetara (SA), Italy, October 28-30, 2016 (Chair and Editor, www.multiscale.unisa.it).
- The Italian Steel Days 2015, XXV Congress of the Italian Association of Steel Engineering, Salerno, Italy, October 1-3, 2015 (Scientific Committee)
- 42th AIAS National Congress, Italian Association of Stress Analysis, Salerno, September 11-14-2013 (Scientific Committee, http://www.aiasnet.it/Convegni/Convegno-2013/Comitato-Scientifico)
- Workshop "Multiscale Modeling and Characterization of Innovative Materials and Structures" (MIMS13), Cetara (SA), Italy, May 1-5, 2013 (Chair and Editor, www.multiscale.unisa.it).
- Workshop "Carbon Nanotubes (CNTs) as Components in Bulk Materials", Universita' degli Studi di Salerno, Fisciano (SA), Italy, October 25 - November 4, 2011 (Chairman).
- Workshop "Analysis and Design of Innovative Network Structures", Universita' degli Studi di Salerno, Fisciano (SA), Italy, June 18-23 2011 (Chairman).
- Workshop "Ponteggiando", University of Salerno, Fisciano (SA), May 24, 2010 (Chairman).
- ICMMS'08, "International Conference on Multiscale Modeling and Simulation", Bangalore, India. January 2-4, 2008 (Session Chairman).
- ICSSD 2005, "Third International Conference on Structural Stability and Dynamics", Kissimmee, Florida, USA, June 2005 (Session Chairman).

- Workshop “Biomechanics of Soft Tissues”, Universita’ degli Studi di Salerno, Fisciano (SA), April 2005 (Chairman).
- Workshop “Contact Mechanics and Free Discontinuity Problems”, Universita’ degli Studi di Salerno, Fisciano (SA), July 2004 (Co-Chairman).
- ASEM 2002, “Second International Conference on Advances in Structural Engineering and Mechanics”, Busan, Corea, August 2002 (Session Chairman).
- Workshop “Engineering Applications of Fracture Mechanics”, ”, Universita’ degli Studi di Salerno, Fisciano (SA), July 2002 (Chairman).
- RRRTEA '04, “International Conference of Restoration, Recycling and Rejuvenation Technology for Engineering and Architecture Application”, Cesena, June 2004 (Comitato Scientifico e Session Chairman).
- Mesomechanics 2000, “International Conference on Role of Mesomechanics for Development of Science and Technology”, June 2000, Xi'an, Cina (Session Chairman).

Selected Invited Lectures

- Frequency bandgaps and solitary waves in tensegrity lattices, Spring 2025 Seminar Series, University of Southampton, UK, February 19, 2025 (Invited Distinguished Lecture)
- On the nonlinear wave dynamics of tensegrity metamaterials, ICONSOM 2024, 3rd International Conference on Nonlinear Solid Mechanics, June 11-14, 2024, Cagliari, Italy (Plenary lecture: https://www.memocsevents.eu/iconsom2024/plenary-speakers/)
- Designing Seismic Isolators through Lattice Metamaterials, 2nd Italian Workshop on Shell and Spatial Structures (IWSS 2023), Valentino Castle, Turin, Italy, 26th - 28th June 2023 (Keynote lecture: https://sites.google.com/view/iwss/iwss2023/fraternali?authuser=0)
- Computational Modeling of Biomimetic Seismic Metaisolators, 3rd International Conference on Computations for Science and Engineering, 20-23th September, Naples, Italy (Keynote lecture: https://events.unibo.it/iccse/keynote-speakers-iccse3)
- Experimental Testing of Innovative, Biomimetic Seismic Metaisolators, 2023, 9th Conference on Computational Methods in Structural Dynamics and Earthquake Engineering (COMPDYN 2023), Athens, Greece, 12-14 June 2023 (Invited lecture, Minisymposium 30)
- On the Wave Dynamics of Composite Tensegrity Metamaterials, Joint event ICCS26 - 26th International Conference on Composite Structures & MECHCOMP8 - 8th International Conference on Mechanics of Composites, FEUP - Faculty of Engineering, University of Porto, Portugal, 27-30 June 2023 (Invited lecture)
- Employing Metamaterial Concepts for Seismic Isolation, META 2022, 12th International Conference on Metamaterials, Photonic Crystals and Plasmonics, Torremolinos, Spain, July 19 – 22, 2022 (Invited talk in collaboration with Ada Amendola, https://metaconferences.org/META/)
- Innovative Seismic Isolators, Euromech Colloquium 610 “Emerging Topics in Acoustic and Mechanical Metamaterials”, 25 April – 27 April 2022, Castellón de la Plana, Spain (Invited lecture, https://610.euromech.org/speakers/).
- Tensegrity Metamaterials, 4th International Workshop on Multiscale Innovative Materials and Structures (MIMS22), Cetara (SA), Italy, Sept. 29- Oct. 1st, 2022 (Keynote lecture, in collaboration with Ada Amendola, http://www.multiscale.unisa.it/).
- On the Compact Wave Dynamics of Tensegrity Metamaterials, META-MAT.ORG Webinar no. 31**,** March 02, 2021 (https://meta-mat.org/previous-seminars/season1/).
- Computational Design of Tensegrity Metamaterials, ICCSE - 1st Int. Conference on Computations for Science and Engineering, June 19 2021, Porto, PT (Keynote lecture, https://eventi.unibo.it/iccse/keynote-lectures).

- Innovative Cement Composite Materials for Energy Efficient Buildings, 12th International Conference on Materials Processing and Characterization, Oct. 7, 2021. NITTTR Chandigart, India (Keynote lecture).
- 3D Printing Services for Pandemic Prevention, Conference on Fulbright Fellows' Contribution to the Fight against Covid-19, Celebrations for the 75th anniversary of the Fulbright Program, Embassy of Italy in Washington D.C., USA (Invited lecture, https://ambwashingtondc.esteri.it/ambasciata_washington/it).
- Solitary Wave Dynamics of Tensegrity Metamaterials, Joint MEMOCS Workshop on Models of Complex Materials and Systems, 20-23 June 2019, Arpino, Italy (Invited lecture, http://www.memocsevents.eu/wordpress/cossevita/joint-memocs-workshop-talks/).
- Novel acoustic applications of tensegrity structures, International Workshop on Multiscale Innovative Materials and Structures (MIMS19), Cetara (SA), Italy, February 28- March 2, 2019 (Keynote lecture, http://www.multiscale.unisa.it/).
- On the Dynamics of Highly Nonlinear Lattice Materials, 9th International Conference on Computational Methods (ICCM2018), Rome, Italy, 6-10 August 2018 (Thematic Plenary Lecture, http://www.sci-en-tech.com/ICCM2018/PL&TPL%20List.pdf).
- Highly Nonlinear Tensegrity Metamaterials, Workshop on Advances in Mechanical Metamaterials "From Ultrasonic to Seismic applications", 15-16 May 2018, Imperial College London (Invited Lecture, http://www.imperial.ac.uk/plasmonics-metamaterials/advances-in-metamaterials/).
- Series of Invited Lectures on the subject of "Waste management by three dimensional/ four dimensional printing", Global Initiatives of Academic Networks, Ministry of Human Resource Development, Government of India, Guru Nanak Dev Engineering College, Ludhiana, India, 18-22 December 2017, (http://www.gian.iitkgp.ac.in/ccourses/approvecourses2).
- On the Mechanics and Engineering of Composite Lattices, 3rd International Conference on Mechanics of Composites (MECHCOMP3), University of Bologna, Italy, 4-7th July 2017 (Plenary Lecture, https://events.unibo.it/mechcomp3/speakers).
- Selected Lecture, Dynamics and control of tensegrity structures and multifunctional materials (in collaboration with Robert Skelton), 2016 International Workshop on Multiscale Innovative Materials and Structures" (MIMS16), Cetara (SA), Italy, October 28-30, 2016 (Selected Lecture, www.multiscale.unisa.it).
- Innovative Materials, Structures and Algorithms for Energy Efficient Buildings, Department of Civil Engineering, Université de Pau et des Pays de l'Adour, France, May 19, 2015
- Wave Dynamics of Innovative Nonlinear Lattices, Colloquium Series "Nonlinear Analysis", University of Augsburg, Germany, Dec. 04, 2014
- Multiscale Variational Modeling and Characterization of Materials and Structures, Department of Civil Engineering, KU Leuven, Belgium, Dec. 02 2014
- Multiscale Approaches to Computational Mechanics, Department of Mechanical Engineering, University of Melboune, Australia, April 04. 2014
- Dynamics of Energy Transport in Phononic Crystals, 2014 Colloquium Series "Granular and Multiphase Flows", Granular Science Laboratory, New Jersey Institute of Technology, Feb. 19 2014.
- Special session "Tensegrity, Tensile, Textile and Unconventional Structures", XXIV Giornate Italiane della Costruzione in Acciaio, Torino, Oct. 2013 (Keynote lecture).
- On the optimal design of acoustic metamaterials, University of Sheffield, Department of Material Science and Engineering (room HB-LT20), March 8, 2013.
- On the Nonlinear Dynamics of Granular Lattices, SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, June 2013.

- Development and Convergence Analysis of Computational Models in Variational Fracture, Vibration and Wave Propagation Laboratory, Georgia Institute of Technology, Oct. 2012
- On the Highly Nonlinear Dynamics of 1D Granular Materials and Tensegrity Systems, 2012 Colloquium Series “Granular and Multiphase Flows”, Granular Science Laboratory, New Jersey Institute of Technology, Oct. 2012.
- On the Convergence of Numerical Models in Variational Fracture Mechanics. IUTAM 2012 International Symposium on "Fracture Phenomena in Nature and Technology", Brescia, Italy, July 2012.
- Multiscale modelling of membrane networks, Graduate Aerospace Laboratories, California Institute of Technology, Pasadena, California, Sept. 2011.
- Multiscale mass-spring models of carbon nanotube foams, Graduate Aerospace Laboratories, California Institute of Technology, Pasadena, California, Sept. 2010.
- Some recent results in computational variational fracture, Graduate Aerospace Laboratories, California Institute of Technology, Pasadena, California, Jan. 2010.
- An equilibrium fluctuation approach to the elastic moduli of red blood cells, Nanomaryland ’09, University of Salerno, Italy, Dec. 2009.
- Modeling brittle fracture through eigendeformations and variational element erosion, Technical University of Munich, Germany, Nov. 2009.
- Optimal thermalization of composite granular systems, Laboratoire Lagrange Colloquium Lagrangianum 2008/2009, Maratea, Italy, Feb. 2009.
- On a Variational Approach to Finite Element Erosion in Brittle Solids, Graduate Aerospace Laboratories, California Institute of Technology, Pasadena, California, Nov. 2008.
- An Eigendeformation Approach to Brittle Fracture, Seminar ‘Materials’, Max-Planck Institute for Mathematics in the Sciences, Leipzig, Germany, June 2008.
- Biomechanics of Brain Injuries, Graduate Aerospace Laboratories, California Institute of Technology, Pasadena, California, Feb. 2007.
- Free Discontinuity Finite Element Models in Fracture Mechanics, Workshop on Free Discontinuity Problems: From Image Processing to Material Science, Baton Rouge-New Orleans, Louisiana, Jan. 2007.
- Free Discontinuity Approaches to Fracture and Folding, Department of Mathematics, Louisiana State University, Baton Rouge, Louisiana, Aug. 2006.
- Discontinuous Finite Elements for Crack Propagation, Graduate Aerospace Laboratories, California Institute of Technology, Pasadena, California, Sep. 2005.
- Limit analysis of reinforced masonry walls, RRRTEA 2004, International Conference of Restoration, Recycling and Rejuvenation Technology for Engineering and Architecture Application, Cesena, Italy, Jun. 2004.
- Variational formulation of the equilibrium problem of masonry-like bodies, AIAS Conference ‘03, University of Salerno, Italy, Sep. 2003.
- Evolutionary Variational Approaches to Linear Elastic Fracture Mechanics, Workshop on Computational and Variational Problems In Fracture Mechanics, SISSA, Trieste, Italy, Nov 2002.
- A Lumped Stress Method for Plane Masonry-Like Bodies, University of Ferrara, Italy, Oct. 2001.

- A New Variational Approach for Plane Elastic Problems with Singularities, Mesomechanics 2000, Xi'an, China, Jul. 2000.

Patents and Invention Disclosures

- "*Suncreen Device with Variable Geometry" ("Dispositivo Frangisole a Geometria Variable")* F. Fraternali, A. Amendola, PCT International Patent Application No. PCT/IB2023/0572724, Filed July 17, 2023.
- "*Deformable Sunscreen Device*" ("*Dispositivo Frangisole di Tipo Deformabile"*) F. Fraternali, A. Amendola, Italian Patent No. 102022000004784, Filed March 11, 2022, Granted on March 01, 2024.
- "*Seismic isolator device*" ("*Dispositivo di isolamento sismico*"), F. Fraternali, Italian Patent No. 102015000015521, Granted Oct. 25, 2017, Filed May 18,2015. European Patent No. EP3298217, Granted on May 1, 2019 (PCT publication number WO2016185376).
- "*Multiscale Structural Element*" ("*Elemento Strutturale a Geometria Multiscala"*) F. Fraternali, F. Fabbrocino, I. Farina, Italian Patent Application No.102015000044896, Filed August 17, 2015.
- *"Method and Apparatus for Wave Generation and Detection Using Tensegrity Structures", C.* Daraio, F. Fraternali, US Pat. No. 8,616,328, Granted on December 31, 2013. (DOI: 10.13140/2.1.2224.4166)
- *"Design of a deployable tensegrity lamp*", F. Fraternali, R.E. Skelton, Registered European Community Design. Registration No: 002058255-0001, Filed June 14, 2012. (DOI: 10.13140/2.1.4485.4084)
- "*Reinforcing element for composite materials: design and technology*" ("*Elemento di rinforzo per materiali compositi e relativo metodo di produzione*"), F. Fraternali, Italian Patent Application No. RM2012A000333, Filed July 13, 2012.

Technology Transfer

- Scientific Director of the innovative start-up "NEWMATT: NEW MATerials and Techniques for sustainable engineering", https://www.newmatt.it/ (formerly approved academic spin-off of the University of Salerno, incubation period: February 2018 – February 2023).

Professional Memberships

- AIMETA, Italian Association of Theoretical and Applied Mechanics (Associazione Italiana di Meccanica Teorica ed Applicata), Member of the Executive Board and Manager of international affairs, https://www.aimeta.it/index.php/en/about-us/organization
- European Mechanics Society (EUROMECH)
- Italian Association of Theoretical and Applied Mechanics (AIMETA)
- European Academy of Sciences (EurASc)
- UK Acoustic Network (UKAN)
- U.S. Green Building Council (USGBC)
- Board Member - Association of Engineers of the Province of Avellino, Italy.

Research Experience

Materials and Structural Testing Laboratory, University of Salerno, Italy
1990 to present
Seismic design of structures. Collapse spectra. Development and assessment of mechanical theories of laminated composite structures. Effects of moderately large rotations and bimodular material behavior. Local-global stability analysis and post buckling response. Mechanical models of FRP-reinforced structures. Modeling of delamination effects. Service life and failure behavior. Experimental validation. Interlaminar stress measurement. Design and experimentation of junctions for FRP reinforcements. Delamination tests on composite beams. Testing of real scale models of FRP-reinforced structures. Failure test of reinforced concrete beams strengthened with FRP plates and wrappings. Construction, instrumentation, testing and modeling of a FRP-reinforced pavilion vault in masonry bricks. Stress measurement through instrumented bricks. From discrete to continuum variational methods in computational mechanics. Unilateral materials and structures (no-tension/no-compression materials and structures). Structural optimization via variational methods and evolutionary strategies. Free discontinuity models in fracture mechanics. Buckling tests of thin-walled cylinders and tubes. Crack tracking in elastic and no-tension structures.

Division of Engineering and Applied Science & GALCIT - Graduate Aeronautical Labs, CalTech, Pasadena, CA, USA
2005 to present
Collaboration with Michael Ortiz's research group, the Solid Dynamics group of the Center for the Simulation of the Dynamic Response of Materials (ASC), and the Caltech's Center for Advanced Computing Research (CACR). Formulation of constitutive models for the dynamics of polymers and soft biological tissue. Variational multiscale models for fracture and fragmentation of brittle and cohesive materials. Dynamics, damage and fragmentation of composite structures under blast and ballistic loadings. Simulation of traumatic head injuries. Prediction of mechanical and physiological damage to brain tissue. Collaboration with Chiara Daraio's research group on the mechanical and numerical modeling of strongly nonlinear phononic crystals. Multiscale analysis of wave propagation in granular materials. Study of solitary wave propagation, anomalous wave reflections, shock disintegration, tunability of wave properties. Particle methods for the numerical analysis of granular systems. Design of optimal composite granular protectors and granular band-gap materials by computation. Use of solitary waves for non-destructive evaluation. Multiscale mechanical modeling of nanostructures composed of carbon nanotube foams and polymeric films. Study of strain localization, dynamic instability on the micro scale and rate-independent hysteresis on the macro scale. Analysis of the Gamma-convergence of proposed models and their validation against experimental results on compression tests in statics and dynamics.

Vibrations and Wave Propagation Laboratory
University of Colorado, Boulder (USA)
2022 to present
Collaboration with the research group directed by Massimo Ruzzene. Propagation of mechanical waves in metamaterials and metastructures. Collaboration framed within the Italy-USA Joint Research Project, Italian Ministry of Foreign Affairs, Project title: Next-generation green structures for natural disaster-proof building, grant number US23GR15, Period: 01/01/2023-31/12/2025.

Samueli School of Engineering,
University of California, Irvine (USA)
Jan. 2023 to present
Collaboration with the research group directed by Julian Rimoli. Design and mechanical modelling of innovative tensegrity structures. Collaboration framed within the Italy-USA Joint Research Project, Italian

Ministry of Foreign Affairs, Project title: Next-generation green structures for natural disaster-proof building, grant number US23GR15, Period: 01/01/2023-31/12/2025.

Department of Structural Engineering & Department of Mechanical and Aerospace Engineering, University of California, San Diego, USA
2012 to present
Collaboration with Robert Skelton and Vitali Nesterenko research groups. Building and testing of real-scale models of tensegrity structures. Optimal design of minimum mass tensegrity structures with parametric architecture. Innovative structures for energy efficient buildings. Computational design and experimentation of soft tensegrity metamaterials.
Collaboration with the Caltrans Seismic Response Modification Device (SRMD) Test Facility on the experimental testing of prototypes on novel seismic isolation devices based on lattice metamaterials.

Department of Mechanical and Process Enginering, ETH Zurich, CH
2013 to present
Collaboration with Chiara Daraio's research group on the design and engineering of acoustic metamaterials based on granular materials and tensegrity lattices. Modeling and testing of carbon nanotube structures and hierarchical materials. Tensegrity actuators and sensors.

Department of Materials Science and Enginering - Mercury Centre for Advanced Manufacturing Technology & Production, University of Sheffield, UK
2013 to present
Collaborations with Conny Rodenburg and Russel Goodall. Plasma irradiation and particle mask treatments to enhance the surface roughness of polymeric materials. 3D printing of periodic lattices based on tensegrity structures and shape memory metals.

Biomechanics Laboratory, University of Salerno, Italy
2003 to present
Characterization of the mechanical behavior of brain tissue. Measurement of regional and directional mechanical properties of brain pig specimens through tensile tests. Development of constitutive models of brain tissue. Construction of a finite element model of the human head from MRI and CT scans. Validation against laboratory data. Simulations of traumatic brain injuries. Head injury criteria. Experimentation of honeycomb materials and foams for use as dissipative fillers in head protection devices. Falling weight impact tests.

King's College, London, UK, Biological Physics & Soft Matter Group
2008 through 2011
Multiscale models of biomembranes and nanostructures, with applications to the red blood cell membrane and carbon nanotube assemblies. Variational multiscale approach. Continuum limits of the interaction potentials acting at the microscopic scale. Modeling of membrane networks as point particles interacting via harmonic and dihedral potentials. Modeling of carbon nanotube structures as chains of nanoparticles interacting via bistable spring potentials. In situ characterization of the mechanical properties of biomembranes and carbon nanotube structures.

Virginia Tech, Dept. Engineering Science and Mechanics, Blacksburg, VA, USA
Aug-Dec 1991
Development of mechanical models of laminated composite shells.

Current/Recent International Collaborations

College of Engineering and Applied Sciences, University of Colorado, Boulder, USA
Samueli School of Engineering, University of California, Irvine, USA
Division of Engineering and Applied Science and Graduate Aeronautical Laboratories, California Institute of Technology, USA
Department of Structural Engineering and Department of Mechanical and Aerospace Engineering, University of California, San Diego, USA
Department of Materials Science and Engineering, University of Sheffield, UK
Faculty of Natural, Mathematical & Engineering Sciences, King's College, London, UK
Schools of Aerospace and Mechanical Engineering, Georgia Institute of Technology, USA
Department of Mechanical Engineering, New Jersey Institute of Technology, USA

Fernando Fraternali
List of Publications
(PDFs of selected publications are available at www.fernandofraternaliresearch.com)

Scopus Author ID: 7003627408
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Refereed Journal Articles

J1. [AF90] Ascione, L., **Fraternali, F.** On the Mechanical Behavior of Curved Composite Beams. Reprint ATTI DELLA ACCADEMIA NAZIONALE DEI LINCEI. RENDICONTI DELLA CLASSE DI SCIENZE FISICHE, MATEMATICHE E NATURALI, I (S. IX), 223-233, 1992. ISSN: 0392-7881.

J2. [AF92] Ascione, L., **Fraternali, F.** A Penalty Model for the Analysis of Composite Curved Beams. COMPUTERS & STRUCTURES, 45, 985-999, 1992. ISSN: 0045-7949.

J3. [FR93] **Fraternali, F.,** Reddy, J.N.. A Penalty Model for the Analysis of Laminated Composite Shells. INTERNATIONAL JOURNAL OF SOLIDS AND STRUCTURES, 30, 3337-3355, 1993. ISSN: 0020-7683.

J4. [AF94a] Ascione, L., **Fraternali, F.** A Moderate Rotation Theory of Laminated Composite Curved Beams. INTERNATIONAL JOURNAL FOR ENGINEERING ANALYSIS AND DESIGN, 1, 161-176, 1994. ISSN: 0971-541X (currently International Journal of Computational Methods in Engineering Science and Mechanics).

J5. [AF94a] Ascione, L., **Fraternali, F.** A Finite Element Analysis of the Stability of Bimodular Composite Curved Beams. INTERNATIONAL JOURNAL FOR ENGINEERING ANALYSIS AND DESIGN, 1, 315-334, 1994. ISSN: 0971-541X (currently International Journal of Computational Methods in Engineering Science and Mechanics).

J6. [Fra96] **Fraternali, F.** Energy Release Rates for Delamination of Composite Beams. THEORETICAL AND APPLIED FRACTURE MECHANICS, 25, 225-232, 1996. ISSN: 0167-8442.

J7. [FB97] **Fraternali, F.**, Bilotti, G. Non-Linear Elastic Stress Analysis in Curved Composite Beams. COMPUTERS & STRUCTURES, 62, 837-869, 1997. ISSN: 0045-7949.

J8. [FF00] **Fraternali, F.,** Feo, L. On a Moderate Rotation Theory of Thin-Walled Composite Beams. COMPOSITES. PART B, ENGINEERING, 31, 141-158, 2000. ISSN: 1359-8368.

J9. [Fra01] **Fraternali, F.** Complementary Energy Variational Approach for Plane Elastic Problems with Singularities. THEORETICAL AND APPLIED FRACTURE MECHANICS, 35, 129-135, 2001. ISSN: 0167-8442.

J10. [FAF02] **Fraternali, F.,** Angelillo, M., Fortunato, A.. A Lumped Stress Method for Plane Elastic Problems and the Discrete-Continuum Approximation. INTERNATIONAL JOURNAL OF SOLIDS AND STRUCTURES, 39, 6211-6240, 2002. ISSN: 0020-7683.

J11. [AFF05] Ascione, L., Feo, L., **Fraternali, F.** Load Carrying Capacity of 2D FRP/Strengthened Masonry Structures. COMPOSITES. PART B, ENGINEERING, 36, 619-626, 2005. ISSN: 1359-8368.

J12. [VFA06] Velardi, F., **Fraternali, F.,** Angelillo, M. Anisotropic Constitutive Equations and Experimental Tensile Behavior of Brain Tissue. BIOMECHANICS AND MODELING IN MECHANOBIOLOGY. 5(1), 53-61, 2006. ISSN: 1617-7959. DOI: 10.1007/s10237-005-0007-9

J13. [Fra07a] **Fraternali, F.** Error Estimates for a Lumped Stress Method for Plane Elastic Problems, MECHANICS OF ADVANCED MATERIALS AND STRUCTURES, 14 (4), 309-320, 2007. ISSN: 1537-6494. DOI: 10.1080/15376490600845587.

J14. [Fra07b**] Fraternali, F.** Free Discontinuity Finite Element Models in Two-Dimensions for In-Plane Crack Problems. THEORETICAL AND APPLIED FRACTURE MECHANICS, 47, 274-282, 2007. ISSN: 0167-8442. DOI: 10.1016/j.tafmec.2007.01.006.

J15. [EMFO08b] Elsayed, T., Mota, A., **Fraternali, F.,** Ortiz, M. A Variational Constitutive Model for Soft Biological Tissues, JOURNAL OF BIOMECHANICS. 41(7), 1458-1466, 2008. ISSN: 0021-9290. DOI: 10.1016/j.jbiomech.2008.02.023.

J16. [EMFO08a] Elsayed, T., Mota, A., **Fraternali. F.,** Ortiz, M.. Biomechanics of Traumatic Brain Injury. COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING, 197 (51), 4692-4701, 2008. ISSN: 0045-782. DOI: 10.1016/j.cma.2008.06.006.

J17. [EMM+09] El Sayed, T., Mock, W., Mota, A., **Fraternali, F.,** Ortiz M. Computational Assessment of Ballistic Impact on a High Strength Structural Steel/Polyurea Composite Plate. COMPUTATIONAL MECHANICS, 43(4), 525-534, 2009. ISSN: 0178-7675 (Print) 1432-0924 (Online). DOI: 10.1007/s00466-008-0327-6.

J18. [SFO09] Schmidt, B, **Fraternali, F.,** Ortiz, M. Eigenfracture: An Eigendeformation Approach to Variational Fracture. MULTISCALE MODELING & SIMULATION, 7 (3), 1237-1266, 2009. ISSN: 1540-3459. DOI: 10.1137/080712568.

J19. [DFP09] Daraio, C, **Fraternali, F.,** Porter, M.A. Stress Wave Mitigation in Granular Chains. BULLETIN OF THE AMERICAN PHYSICAL SOCIETY, 54 (1), Q14.00004, 2009. ISSN: 0003-0503

J20. [FPD10] **Fraternali, F.,** Porter, M.A., Daraio, C, Optimal Design of Composite Granular Protectors. MECHANICS OF ADVANCED MATERIALS AND STRUCTURES, 17 (1); 1-19, 2010. ISSN: 1537-6494, DOI: 10.1080/15376490802710779

J21. [Fra10] **Fraternali. F.** A Thrust Network Approach to the Equilibrium Problem of Unreinforced Masonry Vaults via Polyhedral Stress Functions. MECHANICS RESEARCH COMMUNICATIONS, 37, 198-204, 2010. ISSN: 0093-6413, DOI: 10.1016/j.mechrescom.2009.12.010

J22. [DNNF10] Daraio, C.; Ngo, D, Nesterenko, V. F., **Fraternali, F.** Highly Nonlinear Pulse Splitting and Recombination in a Two Dimensional Granular Network. PHYSICAL REVIEW E, 82, 036603, 2010. DOI: 10.1103/PhysRevE.82.036603

J23. [FNO10] **Fraternali, F.,** Negri, M, Ortiz, M. On the Convergence of 3D Free Discontinuity Models in Variational Fracture. INTERNATIONAL JOURNAL OF FRACTURE,166 (1-2), 3-11, 2010.ISSN: 0376-9429, DOI: 10.1007/s10704-010-9462-0

J24. [FCR+10] **Fraternali, F.**, Ciancia, V., Rizzano, G., Feo, L., Hui, D. Experimental Analysis of the Thermo-Mechanical Properties of Recycled PET Fiber Reinforced Concrete. WORLD JOURNAL OF ENGINEERING, 7, p. 1-2, 2010. ISSN: 1708-5284

J25. [FBAD10] **Fraternali, F.,** Blesgen, T., Amendola, A., Daraio, C. Multiscale Mass-Spring Models of Carbon Nanotube Foams. JOURNAL OF THE MECHANICS AND PHYSICS OF SOLIDS, 59, 89-102, 2011. ISSN: 0022-5096. DOI: 10.1016/j.jmps.2010.09.004.

J26. [FMEDC11] **Fraternali, F.,** Marino, A., Elsayed, T., Della Cioppa, A. On the structural shape optimization via variational methods and evolutionary algorithms. MECHANICS OF ADVANCED MATERIALS AND STRUCTURES, 18:225-243, 2011. ISSN: 1537-6494, DOI: 10.1080/15376494.2010.483319

J27. [RFAD11] Raney, J.R., **Fraternali, F.,** Amendola, A., Daraio, C. Modeling and In Situ Identification of Material Parameters for Layered Structures based on Carbon Nanotube Arrays. COMPOSITE STRUCTURES 93:3013–3018, 2011. ISSN: 0263-8223. DOI: 10.1016/j.compstruct.2011.04.034.

J28. [FCC+11a] **Fraternali, F.,** Ciancia, V., Chechile, R., Rizzano, G., Feo, L., Incarnato, L. Experimental Study of the Thermo-Mechanical Properties of Recycled PET Fiber Reinforced Concrete. COMPOSITE STRUCTURES, 93, 2368–2374, 2011. ISSN: 0263-8223, DOI: 10.1016/j.compstruct.2011.03.025.

J29. [FCC+11b] **Fraternali, F.,** Ciancia, V., Chechile, R., Rizzano, G., Feo, L., Incarnato, L. Studio Sperimentale sulle Proprietà Termo-Meccaniche di Calcestruzzi Rinforzati con Fibre di Plastica da Riciclo. IN CONCRETO, 110, 116-119, 2011. ANCE CODE: E188137 (In Italian). http://ita.zinio.com/

J30. [Fra11] **Fraternali. F.** A Mixed Lumped Stress – Displacement Approach to the Elastic Problem of Masonry Walls. MECHANICS RESEARCH COMMUNICATIONS, 38, 176-180, 2011. ISSN: 0093-6413, DOI: 10.1016/j.mechrescom.2011.03.008.

J31. [FLM12] **Fraternali, F.,** Lorenz, C.D., Marcelli, G. On the estimation of the curvatures and bending rigidity of membrane networks via a local maximum-entropy approach. JOURNAL OF COMPUTATIONAL PHYSICS, 231, 528-540, 2012. ISSN: 0021-9991. DOI: 10.1016/j.jcp.2011.09.017.

J32. [SF12] Schmidt, B., **Fraternali, F.** Universal formulae for the limiting elastic energy of membrane networks. JOURNAL OF THE MECHANICS AND PHYSICS OF SOLIDS, 60, 172-180, 2012. ISSN: 0022-5096. DOI: 10.1016/j.jmps.2011.09.003.

J33. [FM12] **Fraternali, F.,** Marcelli, G. A multiscale approach to the elastic moduli of biomembrane networks. BIOMECHANICS AND MODELING IN MECHANOBIOLOGY, 11 (7), 1097-1108, 2012. ISSN: 1617-7959. DOI: 10.1007/s10237-012-0376-9.

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