

Fernando Fraternali

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Biographical sketch

Fernando Fraternali is Professor of Structural Mechanics in the Department of Civil Engineering at the University of Salerno, 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 (Italy-USA scientific cooperation), and US research agencies. Most of his research work concerns multiscale modeling and simulation of materials and structures and the design and engineering of innovative materials and structures. 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), and the Department of Mechanical and Aerospace Engineering, University of California, San Diego, USA, from August 2012 through to the present. Recently, he 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, [link](#)); the "2015 Hetenyi Award" from the Society for Experimental Mechanics, Inc. (Bethel, CT 06801, USA; June 2014); the "Contributions to the Variational Theory of Fracture" Award from the Vibration and Wave Propagation Laboratory of the Georgia Institute of Technology (Sept. 2012); and the "Contributions to Understanding the Behavior of Waves in Granular Systems" Award from the Granular Science Laboratory of the New Jersey Institute of Technology (Aug. 2012). Prof. Fraternali is on the Board of Editors of the International Journals: Mechanics Research Communications (Elsevier, ISSN: 0093-6413); Frontiers in Materials (Frontiers Publishing, ISSN: 2296-8016); Curved and Layered Structures (De Gruyter Open, ISSN: 2353-7396); Ingegneria Sismica - International Journal of Earthquake Engineering (Patron Editore, ISSN: 0393-1420); and the World Journal of Engineering (Emerald Publishing, ISSN: 1708-5284). F. Fraternali is Guest Editor of the special issue "Multi-Scale Modeling and Characterization of Innovative Materials and Structures" of Mechanics Research Communications (Elsevier, ISSN: 0093-6413). Volume 58, Pages 1-156 (June 2014, [link](#)), and the special issue "Composite Lattices and Multiscale Innovative Materials and Structures" of Composites Part B: Engineering (Elsevier, ISSN: 1359-8368), Volume 115, Pages 1-504 (15 April 2017, [link](#)).

Fernando Fraternali
Curriculum Vitae

Education/Habilitations

- 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.
- Research habilitation (“*Conferma nel ruolo di Ricercatore*”), Italian Ministry of Education, University and Research, March 1993, Habilitation area: Mechanics of Solids and Structures (“*Scienza delle Costruzioni*”).
- Associate Professor Habilitation (“*Conferma nel ruolo di Professore di II Fascia*”), Italian Ministry of Education, University and Research, March 2004, Habilitation area: Mechanics of Solids and Structures (“*Scienza delle Costruzioni*”).
- 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.
- Full Professor Habilitation (“*Abilitazione Scientifica Nazionale per Professore di I Fascia*”), Italian Ministry of Education, University and Research, January 2014, Habilitation area: Mechanics of Solids and Structures (“*Scienza delle Costruzioni*”).

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

- 05/2016-Present: Full Professor of Mechanics of Solids and Structures
- 11/2004-04/2016: Tenured Associate Professor of Mechanics of Solids and Structures.
- 11/2001-10/2004: Tenure-Track position of Associate Professor.
- 03/1993-10/2001: Tenured Assistant Professor of Mechanics of Solids and Structures.
- 03/1990-02/1993: Tenure-Track position of Assistant Professor.
- 01/1987-02/1990: Teaching Assistant and Research Scientist.

Visiting Appointments

- 09/2005 – 02/2009: Visiting Associate in Aeronautics, Graduate Aerospace Laboratories, California Institute of Technology, USA
- 03/2009 – Present: Guest, Aerospace Laboratories, California Institute of Technology, USA
- 07/2014 – 08/2014 and 08/2012 – 12/2012: Visiting Academic Scholar, Department of Mechanical and Aerospace Engineering, University of California, San Diego, 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)

- “Industrial Design and Strength of Materials” (“Disegno Industriale e Scienza delle Costruzioni” and “Sicurezza ed Affidabilità delle Costruzioni”), BS in Chemical Engineering, 1994-1999, (6 ECTS credits)
- Strength of Materials” (“Sicurezza ed Affidabilità delle Costruzioni”), BS in Civil Engineering, 1996-1999, (6 ECTS credits)
- “Theory of Structures” (“Teoria delle Strutture”), MS in Civil and Environmental Engineering, 1998-2001, (12 ECTS credits)
- “Mechanics of Solids and Structures” (“Scienza delle Costruzioni”), BS in Civil and Environmental Engineering, 2001-present, (12 ECTS credits)
- “Multiscale Mechanics of Materials and Structures”, seminar class (3 ECTS credits), PhD school in Structural Engineering, 2008-present.

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

- Ada Amendola, Univ. Salerno, Postdoctoral Scholar, “Design, modeling and testing of innovative mechanical metamaterials”.
- Magdalini Titirla, Aristotle University of Thessaloniki and Univ. Salerno (joint appointment), Postdoctoral Scholar, “Dynamic and Seismic Response of Lattice Materials”.
- Veronika Auer, Aristotle University of Augsburg (Germany), PhD Student, 3rd year, “An Eigenfracture Model with Damage in Variational Fracture” (co-supervisor).
- Maria Chiara Cimmino, Univ. Salerno, Ph.D. Student, 3rd year, “Solar facades with tensegrity architecture”.
- Elena De Chiara, Univ. Salerno, Ph.D. Student, 3rd year, “Lumped stress modeling of masonry structures”.
- Mariella De Piano, Univ. Salerno, Ph.D. Student, 2nd year, “Advanced techniques for the reinforcement of masonry vaults and domes”.
- Raffaele Miranda, Univ. Salerno, Ph.D. Student, 1st year, “Dynamics of Tensegrity Structures with Application to Kinetic Facades of Energy Efficient Buildings”.
- Francesco Nunziata, Univ. Salerno, M.Sc. Student, 1st year, “Modeling and Characterization of Innovative Materials for Additive Manufacturing”.
- Giuseppe Picientino – Civil Engineering, Univ. Salerno, Postdoctoral Scholar, “Mechanics of Innovative Materials for Civil Engineering Applications”.
- Annalisa Di Palma – Environmental Engineering, Univ. Salerno, Postdoctoral Scholar, “Evolutionary design of no-tension structures”.

- Filippo Vetrale – Environmental Engineering Univ. Salerno, Postdoctoral Scholar, “Engineering applications of Lidar data”.
- Giuseppe Rocchetta – Civil and Environmental Engineering, Univ. Salerno, Postdoctoral Scholar, “Design by computation of no-tension membranes”.

Current Undergraduate Students

- Alessio Zambrano, Civil & Environmental Engineering, Univ. Salerno, B.Sc. Student, 3rd year.
- Lucia Senatore, Civil & Environmental Engineering, Univ. Salerno, B.Sc. Student, 3rd year.
- Cristian Santomauro, Civil & Environmental Engineering, Univ. Salerno, B.Sc. Student, 3rd year.

Selected Former Graduate Students and Postdoctoral Scholars Supervised

- Giuseppe Rocchetta, Univ. Salerno, Ph.D. Student 2000-2003, “Lumped stress models for masonry structures” . Currently: Postdoctoral scholar, University of Salerno, Italy.
- Andrea Marino, Univ. Salerno, Ph.D. Student 2002-2005, “Energetic approaches to shape optimization”. Currently: Professional Engineer.
- 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: Postdoctoral scholar, International School for Advanced Studies (ISAS-SISSA), Trieste, 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.
- Tamer El Sayed – California Institute of Technology, Ph.D. Student, 2003-2007, “Constitutive models for polymers and soft biological tissues” (co-supervisor). Currently: Assistant Professor, Mechanical Engineering, King Abdullah University of Science And Technology, Saudi Arabia.
- Nicholas Boechler – California Institute of Technology, Ph.D. Student, 2008-2011, “Granular crystals: controlling mechanical energy with nonlinearity and discreteness” (co-supervisor). Currently: Assistant Professor, Department of Mechanical Engineering, University of Washington, Seattle, WA, 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: Postdoctoral Scholar, Lewis Group “3D printing of heterogeneous materials”, Harvard University, Cambridge, MA, 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, Serj Solutions, USA.
- Andrea Leonard – California Institute of Technology, Ph.D. Student, 2008-2013, “Stress wave propagation in two-dimensional granular crystals” (co-supervisor). Currently: Postdoctoral Scholar, Sniadecki’s Biomechanics Laboratory, University of Washington, Seattle, WA, USA.

- Thevamaran Ramathasan – California Institute of Technology, Ph.D. Student, 2009-2014, “Dynamics of carbon nanotube foams” (co-supervisor). Currently: Postdoctoral Scholar, Post doctoral research associate, Dept. of Materials and Nano Engineering, Rice University, Houston, TX, USA.
- Gerardo Carpentieri– Civil and Environmental Engineering, Univ. Salerno, Ph.D. Student, 2011-2014, “On the mechanical modeling and the optimal design of tensegrity structures”. Currently: Analyst and Software developer, Acca Software, Bagnoli Irpino (Avellino), Italy.

Selected Former Undergraduate Students Supervised

- Vincenzo Ciancia, Civil & Environmental Engineering, Univ. Salerno, Univ. Salerno.
- Angelo Esposito, Civil & Environmental Engineering, Univ. Salerno, Univ. Salerno.
- Ada Amendola, Civil & Environmental Engineering, Univ. Salerno, Univ. Salerno.
- Rossella Giordano, Civil & Environmental Engineering, Univ. Salerno, Univ. Salerno.
- Filippo Vetrone, Civil & Environmental Engineering, Univ. Salerno, Univ. Salerno.
- Ilaria Rendina, Civil & Environmental Engineering, Univ. Salerno, Univ. Salerno.
- Elena De Chiara, Civil & Environmental Engineering, Univ. Salerno, Univ. Salerno.
- Luca Cardamone, Mechanical Engineering, Univ. Salerno.
- Daniele Socci, Mechanical Engineering, Univ. Salerno.

Service Provided to the University of Salerno

- Delegate of the Department of Civil Engineering to Research and Doctorate Affairs.
- Supervisor of Departmental Programs for Basic Research, Department of Civil Engineering.
- Member of the Scientific Directive Board of the PhD Course in Risk and Sustainability in Civil, Environmental and Building Systems, Department of Civil Engineering.
- Legal representative of the Academic Spin Off "NEWMATT: NEW MATerials and Techniques for sustainable engineering” (October 2012 to present).
- 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>).
- Supervisor of the Laboratory for Parallel Computing (LAPC) of the University Centre for Risk Prediction and Prevention (CUGRI).
- Senior Researcher: Structural Engineering and Injury Biomechanics Laboratories.
- Advisor and Lecturer for Ph.D. Programs in Structural and Civil Engineering.
- Delegate for Regulation Affairs, Civil and Environmental Engineering Academic Division.
- Member of the Commission for Equal Opportunity Programs, Civil and Environmental Engineering Academic Division.
- Consultant Engineer for the Engineering Development Offices at the University of Salerno.
- Relations manager between the University of Salerno and the city of Avellino.

Honors and Awards

- "Major Contributions to Tensegrity Systems Research" Award, Texas A&M Laboratory on Tensegrity Systems (April 2018).
- Listed among Top Italian Scientists, Area: Engineering-Mechanics, 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

- Member of the Board of Editors of Mechanics Research Communications, Elsevier (<http://www.journals.elsevier.com/mechanics-research-communications/>, ISSN: 0093-6413)
- Guest Editor of the special issue of Mechanics Research Communications "Multiscale Methods for Innovative Materials and Structures", Volume 58, Pages 1-156, June 2014. (<http://www.sciencedirect.com/science/journal/00936413/58>)
- Member of the Editorial Advisory Board of the World Journal of Engineering, Emerald Publishing (http://emeraldgrouppublishing.com/products/journals/editorial_team.htm?id=wje, ISSN: 1708-5284)

- Associate Editor of Frontiers in Materials, Section: Mechanics of Materials, Frontiers Publishing (<https://www.frontiersin.org/journals/materials#editorial-board>, ISSN: 2296-8016)
- Member of the Editorial Advisory Board of Curved and Layered Structures, De Gruyter Open (<http://www.degruyter.com/view/j/cls>, ISSN: 2353-7396).
- Associate Editor of Ingegneria Sismica – International Journal of Earthquake Engineering (<http://ingegneriasismica.org/editorial-board/>, ISSN: 0393-1420)

Reviewer (Selected Journals)

- ACS Nano
- Acta Mechanica
- AIAA Journal
- Applied Mathematical Modeling
- Applied Sciences
- Carbon
- Cement and Concrete Composites
- Biomechanics and Modeling in Mechanobiology
- Composites Part B: Engineering
- Composite Structures
- Computer Methods in Applied Mechanics and Engineering
- Continuum Mechanics and Thermodynamics
- Engineering with Computers
- European Physical Journal – Plus
- Europhysics Letters
- Extreme Mechanics Letters
- Frontiers in Mechanics
- International Journal of Architectural Heritage
- International Journal of Fracture
- International Journal of Solids and Structures
- Journal of Applied Physics
- Journal of Biomechanics
- Journal of Geophysics and Engineering
- 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
- KSCE Journal of Civil Engineering
- Materials
- Materials Today
- Meccanica
- Mechanics of Advanced Materials and Structures
- Mechanics Research Communications
- Nonlinear Theory and Its Applications, IEICE (NOLTA)
- PLoS One
- Physica D: Nonlinear Phenomena
- Polímeros

- Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences
- Theoretical and Applied Fracture Mechanics
- Smart Materials and Structures
- Steel and Composite Structures
- Structural Engineering and Mechanics
- Symmetry
- Waste Management
- World Journal of Engineering

Recent Research Grants and Contracts

- 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 -1 31/12/2010, PI: Fernando Fraternali
- Research Contract between the Department of Civil Engineering of the University of Salerno and QUAFIL S.p.A.. (Arco, Trento, 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
- Research Contract between the Department of Civil Engineering of the University of Salerno and CAPAROL Italiana GmbH & Co. KG (Vermezzo, Milano, Italy), “DEVELOPMENT OF INNOVATIVE ECOCOMPATIBLE FILAMENTS FOR 3D PRINTING” (“SVILUPPO DI NUOVI FILAMENTI ECOCOMPATIBILI PER LA STAMPA 3D”), Period: 20/05/2016 – 31/12/2017, 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
- 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
- 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
- FARB 2012-2017, University of Salerno, Local funding for basic research, Years 2012 –2016, PI: Fernando Fraternali

Selected Meeting Chairmanships

- 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)
- 2016 International Workshop on Multiscale Innovative Materials and Structures" (MIMS16), Cetara (SA), Italy, October 28-30, 2016 (Chairman, 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", Cetara (SA), Italy, May 1-5, 2013 (Chairman).
- Workshop "Carbon Nanotubes (CNTs) as Components in Bulk Materials", Università degli Studi di Salerno, Fisciano (SA), Italy, October 25 - November 4, 2011 (Chairman).
- Workshop "Analysis and Design of Innovative Network Structures", Università 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", Università degli Studi di Salerno, Fisciano (SA), April 2005 (Chairman).
- Workshop "Contact Mechanics and Free Discontinuity Problems", Università degli Studi di Salerno, Fisciano (SA), July 2004 (Co-Chairman).
- ASEM 2002, "Second International Conference on Advances in Structural Engineering and Mechanics", Busan, Korea, August 2002 (Session Chairman).
- Workshop "Engineering Applications of Fracture Mechanics", ", Università 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

- Dynamics and Band Gaps of Composite Metamaterials, 21st International Conference on Composite Structures (ICCS21), University of Bologna, Italy, 4-7 September 2018 (Plenary Lecture, <https://events.unibo.it/iccs21/plenary-lectures>).
- 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-entech.com/ICCM2018/PL&TPL%20List.pdf>).

- 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 Melbourne, 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 Eigendeforamation 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

- *"Multiscale Structural Element"* (*"Elemento Strutturale a Geometria Multiscala"*) F. Fraternali, F. Fabbrocino, I. Farina, Italian Patent Application No.102015000044896, Filed August 17, 2015.
- *"Seismic isolator device"* (*"Dispositivo di isolamento sismico"*), F. Fraternali, Italian Patent No. 102015000015521, Granted Oct. 25, 2017, Filed May 18, 2015. European Patent Application No. EP16734731.9, Filed May 17, 2016 (PCT application number: PCT/IB2016/052854, PCT publication number WO2016185376).
- *"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

- CEO of the Academic Spin Off “NEWMATT: NEW MATerials and Techniques for sustainable engineering”, Approved by the Senate of the University of Salerno on March 27, 2013, and by the Board of Directors of the University of Salerno on March 28, 2013.

Professional Memberships

- International Association for Computational Mechanics (IACM)
- International Society of Mesomechanics (ISM).
- European Mechanics Society (EUROMECH).
- Bioengineering Society (UK)
- European Research Center "Laboratoire Lagrange".
- Italian Association of Theoretical and Applied Mechanics (AIMETA).
- Italian Association for Stress Analysis (AIAS).
- United States Association for Computational Mechanics (USACM)
- 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.

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.

**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.

**Department of Mechanical and Process Engineering, 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 Engineering - 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, Biomedical Engineering
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 Collaborations

- Institutions

Graduate Aeronautical Laboratories, California Institute of Technology, USA

Department of Mechanical and Aerospace Engineering, University of California, San Diego, USA

Department of Materials Science and Engineering, University of Sheffield, UK

Division of Engineering, 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

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Fernando Fraternali
List of Publications

(PDFs of selected publications are available at www.fernandofraternaliresearch.com)

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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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/10.1007/s10237-012-0376-9).
- J34. [NFD12] Ngo, D, **Fraternali, F.**, Daraio, C. Highly Nonlinear Solitary Wave Propagation in Y-Shaped Granular Crystals with Variable Branch Angles. *PHYSICAL REVIEW E*, 85, 036602-1-10, 2012. DOI: [10.1103/PhysRevE.85.036602](https://doi.org/10.1103/PhysRevE.85.036602)
- J35. [FSD12] **Fraternali, F.**, Senatore, L., Daraio, C. Solitary waves on tensegrity lattices. *JOURNAL OF THE MECHANICS AND PHYSICS OF SOLIDS*, 60, 1137–1144, 2012. ISSN: 0022-5096 DOI: [10.1016/j.jmps.2012.02.007](https://doi.org/10.1016/j.jmps.2012.02.007)
- J36. [BFR+12] Blesgen, T., **Fraternali, F.**, Raney, J.R., Amendola, A., Daraio, C. Continuum Limits of Bistable Spring Models of Carbon Nanotube Arrays accounting for Material Damage. *MECHANICS RESEARCH COMMUNICATIONS*, 45, 58-63, 2012. ISSN: 0093-6413, DOI: [10.1016/j.mechrescom.2012.07.006](https://doi.org/10.1016/j.mechrescom.2012.07.006).

- J37. [FRD12] **Fraternali, F.**, Raney, J.R., Daraio, C. Modeling microscale instabilities in compressed carbon nanotube bundles using multistable spring models. COMPOSITE STRUCTURES, 96, 745-750, 2013. ISSN: 0263-8223, DOI: [10.1016/j.compstruct.2012.09.013](https://doi.org/10.1016/j.compstruct.2012.09.013).
- J38. [FFP+12] **Fraternali, F.**, Farina, I., Polzone, C., Pagliuca, E., Feo, L. On the use of R-PET strips for the reinforcement of cement mortars. COMPOSITES. PART B, ENGINEERING, 46, 207-210, 2013. ISSN: 1359-8368, DOI: [10.1016/j.compositesb.2012.09.070](https://doi.org/10.1016/j.compositesb.2012.09.070).
- J39. [LFD13] Leonard, A., **Fraternali, F.**, Daraio, C. Directional wave propagation in a highly nonlinear square packing of spheres. EXPERIMENTAL MECHANICS, 53(3), 327-337, 2013. ISSN: 00144851. DOI: [10.1007/s11340-011-9544-6](https://doi.org/10.1007/s11340-011-9544-6).
- J40. [FSA13] **Fraternali, F.**, Spadea, S., Ascione, L. Buckling behavior of curved composite beams with different elastic response in tension and compression. COMPOSITE STRUCTURES, 100, 280-289, 2013. ISSN: 0263-8223, DOI: [10.1016/j.compstruct.2012.12.021](https://doi.org/10.1016/j.compstruct.2012.12.021).
- J41. [ACF+13] Ardovino, M., Castaldi, M.A., **Fraternali, F.**, Ardovino, I., Colaurci, N., Signoriello, G., Cobellis, L. Bidirectional barbed suture in total laparoscopic hysterectomy and lymph node dissection for endometrial cancer: technical evaluation and one-year follow-up of 61 patients. JOURNAL OF LAPAROENDOSCOPIC AND ADVANCED SURGICAL TECHNIQUES, 23 (4), 347-350, 2013. ISSN: 10926429. DOI: [10.1089/lap.2012.0079](https://doi.org/10.1089/lap.2012.0079).
- J42. [RFD13] Raney, J.R., **Fraternali, F.**, Daraio, C. Rate independent dissipation and loading direction effects in compressed carbon nanotube arrays. NANOTECHNOLOGY, 24, 255707 (10pp), 2013. ISSN: 0957-4484. DOI: [10.1088/0957-4484/24/25/255707](https://doi.org/10.1088/0957-4484/24/25/255707).
- J43. [BFRD13] Blesgen, T., **Fraternali, F.**, Raney, J.R., Daraio, C. Multiscale Mass-Spring Spring Models of Carbon Nanotube Arrays accounting for Mullins-Like Behavior And Permanent Deformation. MULTISCALE MODELING & SIMULATION, 11(2), 545–565, 2013. ISSN: 1540-3459. DOI: [10.1137/12087311X](https://doi.org/10.1137/12087311X).
- J44. [ACF+13_2] Ardovino, M., Castaldi, M.A., **Fraternali, F.**, Ardovino, I., Colaurci, N., Signoriello, G., Cobellis, L. Bidirectional barbed suture in laparoscopic myomectomy: Clinical features. JOURNAL OF LAPAROENDOSCOPIC AND ADVANCED SURGICAL TECHNIQUES, 23 (12), 1006-1010, 2013. ISSN: 10926429. DOI: [10.1089/lap.2013.0103](https://doi.org/10.1089/lap.2013.0103).
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