Patrizia Trovalusci

CURRICULUM VITAE

http://dsg.uniroma1.it/trovalusci
patrizia.trovalusci@uniroma1.it

Department of Structural Engineering and Geotechnics, 'Sapienza' University of Rome, V. Gramsci 53 – 00197 Rome

Status

- Married with two sons.

Academic background and Position

- 1987 Laurea in Architecture *Cum Laude*, 'Sapienza' University of Rome
- 1984-1992 Research Fellow, Department of Structural Engineering and Geotechnics, 'Sapienza' University of Rome.
- 1992 PhD in *Structures and Architecture (History of Building Sciences and Techniques),* University of Florence.
- 1992 Assistant Professor of *Solids and Structural Mechanics*, 'Sapienza' University of Rome.
- 2000 Associate Professor of *Solids and Structural Mechanics*, 'Sapienza' University of Rome.
- 2013 National Academic Qualification as Full Professor of *Solids and Structural Mechanics*

Research Areas

- Continuum mechanics; non-standard continua; mechanics of masonry materials and structures; mechanics of composite materials; multiscale constitutive models; molecular theory of elasticity; elastic wave propagation; theory of plasticity and non-standard limit analysis; non-linear mathematical programming; non-linear finite element analysis; structural architecture.

Main Research Directions

- *Mechanical models for Lagrangian systems with non-linear behaviour*: (a) experimental analysis on block masonry walls; (b) finite element formulation for rigid blocks interacting through non-linear and non-conservative deformable elements; (c) limit analysis of (2D and 3D) rigid block structures with unilateral constraints and friction via mathematical programming.
- *Multiscale constitutive models for complex materials as multifield continua:* (a) constitutive functions for generalized continua; (b) block masonry materials as continua with rigid local structure; (c) damaged materials as continuous with affine microstructure (d) composite materials as three fields continua; (e) non-linear behaviour of masonry materials with internal structure.
- *The molecular theory of elasticity. Origins and current developments.*
- *The "tectonic" or art of building*: the relations among mechanics (of solids and structures), mathematics and, historical and contemporary, architectural design.

Scientific Committees Membership

- 2003-2006 Scientific Committee of the *International Conference on Processing & Manufacturing of Advanced Materials* (*THERMEC06-09-11*).
- 2006-2009 International Advisory Committee of *THERMEC09.*
- 2008- Commette of the PhD Program in Structural Engineering, Department of Structural Engineering and Geotechnics, 'Sapienza' University of Rome.
- 2008-2009 Scientific Steering Committee for the Advanced Course of *Masonry Constructions: Modelling, Seismic Safety and Conservation of common and monumental Buildings*, PhD in Structural Engineering and Doctoral School in Civil Enginering and Architecture, J 'Sapienza' University of Rome

- 2009-2011 International Executive Committee of *THERMEC11.*
- 2010-2016 Scientific Committee of the *2nd International Conference on Structures and Architecture* (*ICSA2013, ICSA2016*: http://www.icsa2013.arquitectura.uminho.pt).
- 2012 Scientific Committee of the Computational Structural Mechanics Association (*CSMA 2013:* http://csma2013.csma.fr/index.php?page=comites.php#csinternational), linked to the European Council of Computational Mechanics (ECCM) and the International Association for Computational Mechanics.
- 2014 Scientific Committee of the Italian Association of Theoretical and Applied Mechanics (*AIMETA 2015*).

Scientific Evaluation Panels

- 2000- Member of several evaluation committees (assistant professors, Ph.D's.,etc.. Universities: Sapienza, Federico II Naples, Pisa).
- 2009 Georgia National Science Foundation. Peer-reviewer.
- 2013- Remote Referee for the European Research Council (ERC Advanced Grant 6th Call – 2013).

Scientific Society Membership

- 1992- Italian Association of Theoretical and Applied Mechanics (*AIMETA*).
- 1994- European Mechanics Society (*EUROMECH*).
- 2002- Italian Group of Computational Mechanics (*GIMC*).
- 2010- European Community on Computational Methods in Applied Sciences (*ECCOMASS*).
- 2013- Italian Group of Mechanics of Materials (*GMA*)
- 2014-15 International Masonry Society (*IMS*)

Editorial Boards

- 2010- Editorial Board Member of *ISRN Mechanical Engineering Journal* (http://www.isrn.com/journals/me/editors/, ISSN 2090-5122).
- 2012- Editorial Board Member of *Journal of Civil Engineering and Science* (http://www.ij-ces.org/editorialBoard.aspx, ISSN: 2227-4634, 2227-4626).

Guest Editorship

- 2006-2007 P. Trovalusci, 'Multiscale Mechanical Modelling of Complex Materials and Engineering Applications', Special Issue of *International Journal for Multiscale Computational Engineering*, **5**(2)
- 2009-2011 P. Trovalusci and M. Ostoja-Starzewski, 'Multiscale Mechanical Modelling of Complex Materials and Engineering Applications 2', Special Issue of *International Journal for Multiscale Computational Engineering*, **9**(5).
- 2010-2012 P. Trovalusci and B. Schrefler, 'Multiscale Mechanical Modelling of Complex Materials and Engineering Applications 3', Special Issue of *International Journal for Multiscale Computational Engineering*, Special Issue of *International Journal for Multiscale Computational Engineering*, **10** (6).
- 2012 - T. Sadowski and P. Trovalusci: *Multiscale and Multiphysics Modelling of Complex Materials. Phenomenological, theoretical and computational aspects*, CISM International Centre for Mechanical Sciences **556**, 'Courses and Lectures', Springer. (Authors: R. de Borst; G. Del Piero; S. Ghosh; M. Ostoia-Starzewski; T. Sadowski; R. Tarleja; P. Trovalusci..).
- 2014 - T. Sadowski, P. Trovalusci, B. Schrefler, R. de Borst: 'Multiscale and Multiphysics Modelling for Complex Materials', Special Issue of *Meccanica* , **49**(9).
- 2014 - P. Trovalusci: '*Materials with Internal Structure. Multiscale and Multifield Modelling and Simulation.* Springer-Briefs Series. (Authors: R. de Borst; G. Cailletaud; V. Eremeyev; S. Ghosh, P. Chakraborty; M. Ostoja-Starzewski; C. Picu, T; Sadowski, B. Schrefler, X. Li; P.Trovalusci). In progress.

Reviewer Journals / Books

- *Advanced Powder Technology, Computer and Geotechnics; Applied Mathematical Modelling Engineering Fracture Mechanics; Engineering Structures; International Journal of Architectural Heritage; European Journal of MechanicsA/Solids; International Journal for Numerical Methods in Engineering; International Journal of Mechanical Sciences; International Journal for Multiscale Computational Engineering; Journal of Mechanics of Materials and Structures; International Journal of Solids and Structures; Journal of Structural Engineering; Meccanica.*
- *Mc-Graw-Hill.*

Organization Chair

- 2006 Coordinator of the Mini-symposium: *Multiscale Mechanical Modelling of Complex Materials and Engineering Applications*, within the International Conference on Processing & Manufacturing of Advanced Materials (MCM-THERMEC06), Vancouver (Canada), July.

Minisimposia/

- 2009 Topic Principal Coordinator of the Mini-symposium: *Multiscale Mechanical Modelling of Complex Materials and Engineering Applications-2*, within the International Conference on Processing & Manufacturing of Advanced Materials (MCM2-THERMEC09), with M. Ostoja-Starzewski, Berlin (Germany), August (http://thermec.uow.edu.au/).
- 2010 Topic Principal Coordinator of the Mini-symposium: *Multiscale and Multiphysics Computational Methodologies for Complex Materials,* within the 4th European Conference on Computational Mechanics (M2CM2-ECCM2010), with T. Sadowski, V. Sansalone and B. Schrefler, Paris (France), May.
- 2010 Coordinator of the Mini-symposium *On the "Tectonics" in Architecture: between Aesthetics and Ethics,* within the 1st International Conference on Structures & Architecture (TAAE-ICSA2010). University of Minho, Guimarães (Portugal), July.
- 2011-2012 Co-coordinator of the Mini-symposium on *Multiscale and Multiphysics Modelling for Complex Materials,* within the European Congress on Computional Methods in Applied Sciences and Engineering (MMCM4-ECCOMAS2012), with T. Sadowski, R. de Borst, B. Schrefler, Wien, September 2012.
- 2011-2013 Topic Principal Coordinator of the Mini-symposium *On the "Tectonics" in Architecture: between Aesthetics and Ethics* 2, with M. A. Chiorino, within the 2st International Conference on Structures & Architecture (TAAE2-ICSA2013). University of Minho, Guimarães (Portugal), July 2013.
- 2012-2014 Coordinator of the Mini-symposium on *Multiscale and Multiphysics Modelling for Complex Materials*, within the 11th World Congress on Computational Mechanics (WCCM XI), the 5th European Conference on Computational Methods (ECCM V) and the 6th European Conference on Computational. Fluid Dynamics (ECFD VI), (MMCM5-WCCM2014), to be held in Barcelona (Spain) on July 2014. At the Invitation of the Chairpersons E. Oñate, X. Oliver, A. Huerta. The co-organizer will be T. Sadowski, B.Schrefler, R. de Borst.

Advanced Courses, seminars orgsnized (selected)

- 2008 *Two lectures on theories of DNA elasticity: A rapidly evolving branch of the new discipline called Bio-Mechanics*, Seminars by B. C. Coleman (Rutgers University): School of Engineering, 'Sapienza' University of Rome, July 16, 18.
- 2009 *Masonry Constructions. Modelling, Seismic Safety and Conservation of common and monumental Buildings*. Advanced course (coordinated by L. Decanini). Doctoral School of Engineering and Architecture, 'Sapienza' University of Rome, July, October, November .
- 2011 *Fractal Geometry of Materials versus Continuum Mechanics,* seminar by M. Ostoja-Starzewski (Urbana University of Illinois): School of Engineering, 'Sapienza' University of Rome, June 10.
- 2012 *Multiscale Modelling of Complex Materials,* Advanced Course at International Centre for Mechanical Sciences (*CISM*), May 21-25, with T. Sadowski (Lublin University of Technology). Lecturers: G. del Piero (Univ. of Ferrara, Italy); S. Ghosh (Johns Hopkins Univ., MD, USA); M. Ostoja-Starzewski, Univ. Of Illinois at Urbana-Champaign, IL, USA; Ramesh Tarleja – Texas A&M University, TX, USA)., T. Sadowski, P. Trovalusci.
- 2014 *Spherically convergent shear waves during blunt head trauma fractals; randomness in mechanics of materiasl,* seminars by M. Ostoja-Starzewski (Urbana University of Illinois), March 14.

Seminars, Lectures, Invited talks, Keynotes

- 1990 *La meccanica delle strutture in muratura; il calcolo a rottura per strutture a blocchi con contatti unilaterali con attrito infinito; la statica dei sistemi voltati; la storia dei modelli proposti nel XVIII e nel XIX secolo per l'analisi delle fabbriche murarie.* Series of lectures and seminars, School of Architecture, 'Sapienza' University of Rome (invitation by A. Giuffré). January-June.
- 1991 *Sperimentazione e modellazione numerica di pannelli murari.* Seminar, School of Engineering, University of Rome 'Tor Vergata' (Invitation by M. Como).
- 1993 *Sulla modellazione dei mezzi murari come sistemi dotati di struttura.* Seminar, School of Engineering, University of Pisa (invitation by S. Bennati). October.
- 1994 *I metodi dei vincoli interni e del riscalamento per lo studio dei gusci elastici di spessore sottile,* School of Engineering 'Sapienza' University of Rome (Invitation by N. L. Rizzi). February-May.
- 1994 *Murature a blocchi come continui dotati di struttura.* Seminar, School of Engineering, University of Rome 'Tor Vergata', (invitation by P. Podio-Guidugli). November.
- 1998 *A molecular approach in the derivation of the constitutive equations for continua with microstructure.* Seminar, Yale University, CN, New Haven, USA (invitation by E. T. Onat), July.
- 1998 *Continui multi-campo per la modellazione di mezzi murari ed altri materiali eterogenei.* Seminar, School of Engineering, University of Calabria, October. (Invitation by R. Casciaro).

- 2001 *Continuum micropolar modelling of discontinuous masonry-like systems*, 6th Nat. Congr. on Mechanics, Thessaloniki (Greece). Invited presentation (by E. Aifantis, Aristotle University of Thessaloniki).
- 2003 Elastic waves in microcracked bodies as multi-field materials', *5th European Solid Mechanics Conf.*, Thessaloniki (Greece). Invited presentation (by E. Aifantis, Aristotle University of Thessaloniki).
- 2008 *Multiscale-multifield models for the mechanical description of 'complex' materials: origins and current developments*. Seminar, School of Engineering University of Genoa (invitation by L. Gambarotta). May 29.
- 2008 *The Structural Conception in Architecture. Reflections on the relations among the art of building, structural mechanics, mathematics and architectural design*. 1. The constructive dimension (influence of structural language in 'making' architecture); 2. The mathematical dimension (influence of mechanic-mathematic language in architectural design), Conference. School of Architecture, University of Genoa, (invitation by L. Gambarotta). May 30.
- 2009 *Mechanical Models for historic masonry*. 1. Notes on the mechanical modelling of masonry. 2. Mechanical models for masonry. 3. Masonry as discontinuous system. 4. Masonry as multiscale/multifield continuum. 5. Origins of the collapse analysis. Elasto-plastic materials. Limit analysis for discrete systems, 4. ALMA, A computer code for the Limit Anaysis of Frictional Masonry. Lectures for the advanced course of *Masonry Constructions. Modelling, Seismic Safety and Conservation of common and monumental buildings*. School of Engineering and Architecture, 'Sapienza' University of Rome, July, October, November. (http://w3.disg.uniroma1.it/corsomuratura09/index.php?option=com_content&task=view&id=26&Itemid=49, password: CFSM09-PATTROVA).
- 2009 *A multiscale-multifield approach to 'complex' materials: theoretical modelling and computational results*, 18th Conference on 'Computer Methods in Mechanics', Zielona-Gora (Poland), May. Invited presentation (by T. Sadowsky, Lublin University of Technology).
- 2010 *A generalized Voigt's approach to multiscale-multifield modelling of "complex" materials*, IV European Conference on Computational Mechanics, Paris, May. Key-note lecture (invitation by B. Schrefler, University of Padua).
- 2011 *La concezione strutturale in architettura. Il recupero di un'etica 'tettonica' attraverso la lezione di P.L.* Nervi. two lectures in:
  - Workshop "Pier Luigi Nervi: l'approccio globale al progetto di architettura", Palazzetto dello Sport – Flaminio, Roma, February 17 (Invitation by G. Rega, Sapienza-University of Rome);
  - Workshop "Pier Luigi Nervi – Arte e scienza del costruire", Accademia delle Scienze, Torino, May 2. (Invitation by M. A. Chiorino , Torino Polytechnic).
- 2011 *Materials with Flaws and Inclusions: Non-Classical Discrete-Continuum Description*, International Conference on Material Modelling *(ICCM2)*, École des Mines, Paris, August. Invited presentation (by S. Forest, Mines - Paris Tech).
- 2012 *Molecular approaches for multifield continua. Origins and actual developments with applications to fibre composites and masonry-like materials*. 1. 19th Century molecular models 3. A mention to modern discrete-continuum. 3. Multifield continua 4. A Molecular/multifield approach for composites. Lectures for the CISM Course 'Multiscale Modelling of Complex Materials', Udine, May 21-25.
- 2013 *Generalized continua for discontinuous complex materials.A Voigt–like approach using the principle of virtual works,* International Conference on Material Modelling *(ICCM3)*, Warsav (Poland), ugust. Invited presentation (by S. Forest, Mines - Paris Tech).
- 2014 *Molecular approaches for multifield continua: origins and actual developments with applications to fibre composites and masonry-like materials.* Seminar, School of Engineering Polytechnical University of Marche (invitation by S. Lenci). March 24.
- 2014 The recovery of the ethic of constructions: P. L. Nervi vs. S. Musmeci, two structural conceptions compared. Invited Lecture (by L. Gambarotta). 1rst International Symposium 'Form After Form'. School of Architecture, University of Genoa. September 22.
- 2015 *Coarse–graining approaches for particulate composites as micromorphic continua*, 6th International Conference on Computational Methods (ICCM2015), Invitation for a Key-note presentation, Auckland, New Zealand.
- 2015 *Discrete to scale-dependent continua for complex materials. A generalized Voig approach using the principle of virtual powers*. Invitation for a Key-note lecture, EUROMECH Colloquium 577, "Micromechanics of Metal Ceramic Composites", Stuttgard (Germany), March 2 – 5.

Funding ID

- International (EU) Research Grants

EU

2010-2013 "Centre of Excellence for Modern Composites Applied in Aerospace and Surface Transportation", coordinated by T. Sadowski, Department of Solid Mechanics (Lublin University of Technology, Poland: EU grant No. FP7-245479). Participant.

- MIUR-PRIN National Government Grants

MIUR Government

2007 "Modellazione ed analisi, su base prestazionale, di strutture non lineari", coordinated by R. Casciaro (University of Calabria, Italy). Participant.

2012 "Models and algorithms for the nonlinear analysis of structures and the validation of performance-based design rules", coordinated by R. Casciaro (University of Calabria). Coordinator of the Research Unit of Rome-Sapienza.

- MIUR-FIRB, National Government Grants

2007 New trends for multiscale-multifield analysis of composite materials. Phenomenological, theoretical and computational approaches, coordinated by M.L. De Bellis ('Sapienza' University of Rome). Grant application. (Project selected for the national competition). Participant.

University

- MIUR National Government Grants, 'Sapienza' University of Rome

2001 "Modelli costitutivi lineari e non-lineari per materiali da costruzione innovativi e tradizionali", coordinated by R. Masiani. Participant.

2002-2003 "Architetture monumentali ed edifici in muratura. Modelli statici e modelli dinamici per la risposta sismica", coordinated by R. Masiani. Participant.

2005-2006 "Analisi statica e dinamica del comportamento sismico delle costruzioni in muratura", coordinated by R. Masiani. Participant.

2007-2008 "Analisi sismica delle costruzioni murarie esistenti: modelli per la valutazione del comportamento statico e dinamico", coordinated by R. Masiani. Participant.

2010 "Modelli multiscala-multicampo per lo studio di materiali compositi. applicazioni all'ingegneria e all'architettura'. Coordinator.

2011 "Materiali compositi nell'ingegneria e nell'architettura: modelli costitutivi multiscala-multicampo per la descrizione della risposta strutturale statica e dinamica. Coordinator.

2013 "Modelli meccanici avanzati per l'analisi di mezzi compositi: aspetti fenomenologici, teorici e computazionali". Coordinator.

2013 Funding for Conferences: "On the 'Tectonics' in Architecture: between Aesthetics and Ethics (TAAE3), an International Symposium". Coordinator.

- MIUR National Government Grants, Federated University Humanities, Arts and Environment, 'Sapienza' University of Rome

2007-2008 "Modelli meccanici per la muratura storica: aspetti costitutivi e sicurezza strutturale". Coordinator.

2009 "Modelli multiscala-multicampo per la descrizione meccanica di materiali "complessi": origini e sviluppi attuali". Coordinator.

Faculty

- MIUR National Government Grants, School of Architecture, 'Sapienza' University of Rome

2000-2001 " Architetture storiche: modelli meccanici e sicurezza strutturale ". Coordinator.

2002-2003 "Fabbriche murarie d'interesse storico e monumentale: modelli per l'analisi e il progetto strutturale". Coordinator.

2004-2005-2006 "Modelli costitutivi con microstruttura per lo studio di materiali innovativi nell'architettura", Coordinator.

- MURST, National Government Grants

1996-2000. National Government Grants, School of Architecture, 'Sapienza'University of Rome: other financed researches.

Academic Institutional Offices/ Services

- 2011- President of the Bachelor Degree Courses ('Sapienza' University of Rome) in:
  - *Sciences of Architecture;*
  - *Architecture and Building Techniques;*
  - *Restoration and Conservation of Historical Architectures*, School of Architecture,

- 1995-2005 Scientific Coordinator in charge of the Department Library, Department of Structural Engineering and Geotechnics, 'Sapienza' University of Rome.
- 2000-2006 Member of the Research Grant Committee, School of Architecture, 'Sapienza' University of Rome.
- 2003 Member of the Faculty Board of Governors, School of Architecture, 'Sapienza' University of Rome.
- 2000-2007 Member of the Department Board of Governors, Department of Structural Engineering and Geotechnics, 'Sapienza' University of Rome.
- 2005- Member of the Teaching Advisory Board Committee, School of Architecture, 'Sapienza' University of Rome.
- 2007-2009 Member of the Faculty Financial Resources Committee, School of Architecture, 'Sapienza' University of Rome.
- 2010- Member of the Faculty Committee for the 'Development, Communication and Coordination of Cultural Activities', School of Architecture, 'Sapienza' University of Rome.

h-index

- ISI – WOS: 10
- Scopus: 9

4 most cited papers: 42, 35, 33, 32 citations.

Teaching

- 1992 - *Solid and Structural Mechanics*.
- 2001-2003 *Statics*.
- 2005 - *Behaviour of Masonry Materials in Historical Structures*.

MSc Degree Courses in: Architecture UE; Architecture/Restoration and Bachelor Degrees in: Sciences of Architecture; Architecture and Building Techniques; Restoration and Conservation of Achitectural Heritage. School of Architecture, 'Sapienza' University of Rome.

Promotor Phd/

- 2009 - 'Historical masonry as complex material: micropolar modelling of periodic and random assemblies'. Phd Thesis in Structural Engineering, by A. Murrali, 'Sapienza' University of Rome. In the final progress. The research featured the collaboration of Prof. M. Ostoja Starzewski and stochastical support of dr. S. Marcelli (Banca d'Italia); the thesis has been completed at the École des Mines (Prof. S. Forest) and École des Ponts (Prof. Karam Sab).
- 2011 - 'The behaviour of Concrete Filled Fiber Reinforced Polymer Tubes – CFFT under thermal loading'. PhD thesis in Structural Engineering, by M. Ramondetta , 'Sapienza' University of Rome. In progress.

Honour MSc-BSc Thesis

- 2003 'Fabbriche murarie di interesse storico: modelli per l'analisi strutturale', MSc thesis in *Architecture* UE, by S. Martorana, School of Architecture, 'Sapienza' Univerisity of Rome.
- 2003 'L'uso di modelli matematici nella creazione di nuove forme per l'architettura', MSc Degree in *Architecture* UE, by G. Ruggeri, School of Architecture, 'Sapienza' University of Rome.
- 2005 'Il calcolo a rottura per la muratura in *opus quadratum*: il caso del Ponte Loreto nella campagna lanuvina', MSc Degree in *Architecture-Restoration*, by G. Caldarelli, School of Architecture. 'Sapienza' Univerisity of Rome.
- 2008 "Strutturisti-Costruttori, Strutturisti-Matematici, Architetti-Strutturisti. Il ruolo della matematica nell'invenzione di architetture resistenti per forma", MSc Degree in *Architecture-Restoration*, by I. Pallai. School of Architecture, 'Sapienza' University of Rome.
- 2008 'Strutturisti-Costruttori, Strutturisti-Matematici, Architetti-Strutturisti. L'evoluzione della 'concezione strutturale' nella progettazione delle cupole nell'età moderna', MSc Degree in *Architecture-Restoration,* by A. Ulivi. School of Architecture, 'Sapienza' Univerisity of Rome.
- 2010 'Il castello Eurialo a Siracusa: un approccio interdisciplinare per la conservazione e la valorizzazione', MSc Degree in *Architecture-Restoration*, by M. Ramondetta, School of Architecture, 'Sapienza' University of Rome.
- 2012 'I dissesti strutturali delle Mura Aureliane: un approccio interdisciplinare per la conservazione', Bachelor Degree in *Restoration and Conservation of Historical Architectures*, by M. Doria, School of Architecture, 'Sapienza' University of Rome.
- 2013 'Matematica e Architettura. Ottimizzazione strutturale e invenzione della forma', Bachelor Degree in *Architecture and Building Techniques*, by F. Pilla, School of Architecture, 'Sapienza' University of Rome.
- 2013 'Studio meccanico di archi in muratura. Il caso dei cuniculi di Claudio nel bacino del lago Fucino',

Bachelor Degree in *Sciences of Architecture*, by S. Iarussi, School of Architecture, 'Sapienza' University of Rome.

- 2014 'Modelli Matematici in Architettura. Origini e Sviluppi AttualiSviluppi Attuali'. Bachelor Degree in *Sciences of Architecture*, by S. Vadidar, School of Architecture, 'Sapienza' University of Rome.

List of publications

A. Journal Articles

[A1] R. Masiani, N. Rizzi, P. Trovalusci,
Masonry as structured continuum, *Meccanica*, **30**, 1995, 673-683 (DOI: 10.1007/BF00986573; WOS:A1995TL29400002; Scopus: 0000741917).

[A2] R. Masiani, P. Trovalusci,
Cosserat and Cauchy materials as continuum models of brick masonry, *Meccanica*, **31**, 1996, 421-432 (DOI: 10.1007/BF00429930; WOS:A1996VD52700004; Scopus: 0030214344).

[A3] P. Trovalusci, R. Masiani,
Strain rates of micropolar continua equivalent to discrete systems, *Meccanica*, **32**(6), 1997, 581-583 (DOI: 10.1023/A:1004252426652,; WOS:000071327400011; Scopus: 2342646882).

[A4] C. Baggio, P. Trovalusci,
Limit analysis for no-tension and frictional three-dimensional discrete systems, *Mechanics of Structures and Machines*, **26** (3), 1998, 287-304 (DOI: 10.1080/08905459708945496; WOS:000075964000004; Scopus:0032141962).

[A5] P. Trovalusci, G. Augusti,
A continuum model with microstructure for materials with flaws and inclusions, *Journal de Physique IV*, 1998, **Pr8** 383-390 (DOI: 10.1051/jp4:1998847; WOS:000077547500048; Scopus: 11744307640).

[A6] P. Trovalusci, R. Masiani,
Material symmetries of micropolar continua equivalent to lattices, *International Journal of Solids and Structures*, **36**(14), 1999, 2091-2108 (DOI: 10.1016/S0020-7683(98)00073-0; WOS:000078639000004; Scopus: 0002317252).

[A7] P. M. Mariano, P. Trovalusci,
Constitutive relations for elastic microcracked bodies: from a lattice model to a multifield continuum description, *International Journal of Damage Mechanics*, **8**, 1999, 153-173 (DOI:10.1177/105678959900800204; Scopus: 0033108021).

[A8] C. Baggio, P. Trovalusci,
Collapse behaviour of three-dimensional brick-block systems using non linear programming, *Structural Engineering and Mechanics,* **10**(2), 2000, 181-195 (WOS:000088722900007; Scopus: 0033714509).

[A9] G. Rega, P. Trovalusci,
Strutturisti-costruttori, strutturisti-matematici e…architetti-strutturisti?, Riflessioni sulle relazioni tra l'"arte del costruire", la meccanica (dei solidi e delle strutture) e la progettazione strutturale nell'architettura, *Rassegna di Architettura e Urbanistica*, **101/102**, 2001, 134-143.

[A10] P. Trovalusci, R. Masiani,
Non-linear micropolar and classical continua for anisotropic discontinuous materials, *International Journal of Solids and Structures*, **40**(5), 2003, 1281-1297 (DOI: 10.1016/S0020-7683(02)00584-X; WOS:000181264500012; Scopus: 0037372584).

[A11] P. Trovalusci,
A multiscale continuum for damaged fibre composites, *Materials Science Forum*, **426**-432, 2003, 2133-2138 (WOS:000183626400340; Scopus: 0038677535).

[A12] P. Trovalusci, R. Masiani,
A multi-field model for blocky materials based on multiscale description, *International Journal of Solids and Structures*, **42**, 2005, 5778-5794 (DOI: 10.1016/j.ijsolstr.2005.03.027, WOS:000231437200011; Scopus: 23244457174).

[A13] V. Sansalone, P. Trovalusci, F. Cleri,
Multiscale modelling of composite materials by a multifield finite element method, *International Journal for Multiscale Computational Engineering*, **3**(4), 2005, 463-480 (DOI: 10.1615/IntJMultCompEng.v3.i4.20; WOS:000236605800005).

[A14] V. Sansalone, P. Trovalusci, F. Cleri,
Multiscale modelling of materials by a multifield approach: microscopic stress and strain distribution in fiber-matrix composites, *Acta Materialia*, **54**, 2006, 3485-3492 (DOI: 10.1016/j.actamat.2006.03.041; WOS:000239823800009; Scopus: 33745898253).

[A15] P. Trovalusci, V. Sansalone, F. Cleri,
A multiscale approach for composite materials as multifield continua, *Materials Science Forum*, **539**-543, 2007, 2551-2556 (DOI: 10.4028/www.scientific.net/MSF.539-543.2551; WOS:000245106102069; Scopus: 38349160241).

[A16] P. Trovalusci, G. Rega,
Elastic waves in heterogeneous materials as in multiscale-multifield continua, *Proceedings of the Estonian Academy of Sciences Physics, Mathematics,* **56**, 2, 2007, 100–107 (WOS:000254909500005; Scopus: 34347379166).

[A17] V. Sansalone, P. Trovalusci,
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