MATTEO PEZZULLA
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Date of Birth: August 3, 1988
Citizenship: Italian

Summary of qualifications & assets

I am a Postdoctoral Associate in the flexLab at EPFL.

My current research involves aspects of fluid-structure interactions relevant to the understanding of the behavior of porous wings at low Reynolds numbers. I also keep an interest on the theoretical and applied mechanics of thin shells. I work among solid mechanics, fluid mechanics, and differential geometry and I am interested in analytical, numerical, and experimental methods.

I am a member of the Italian Research Group in Mathematical Physics (GNFM) and the American Physical Society (APS).

Experience

Nov 2017 – currently	Postdoctoral Associate at École Polytechnique Fédérale de Lausanne Supervisor: Prof. Pedro M. Reis
Nov 2015 – Oct 2017	Postdoctoral Associate at Boston University Supervisor: Prof. Douglas P. Holmes

Education

February 2016	Ph.D. in Theoretical and Applied Mechanics, Sapienza - Università di Roma with honors Focus: Morphing of Thin Soft Structures Driven by Geometry and Swelling Advisor: Prof. Paola Nardinocchi
Aug – Dec 2014	Visiting Scholar at Boston University Advisor: Prof. Douglas P. Holmes
October 2012	M.Sc. in Space Engineering, Sapienza - Università di Roma 110/110 cum laude Thesis: "On the control of the large deformations occurring in IPMCs" Advisor: Prof. Paola Nardinocchi
October 2010	B.Sc. in Aerospace Engineering, Sapienza - Università di Roma 110/110 cum laude Thesis: "Bending deformations in ionic polymer metal composites induced by mechano-electro-chemical interactions" Advisor: Prof. Paola Nardinocchi

Talks, Presentations & Posters

2019 M. Pezzulla, P. Leroy-Catalayud, F. Gallaire, and P. M. Reis. "Fluid-Structure Interactions in Bristled Insect Wings" at APS/DFD 2019, Seattle, USA, November, 23–26.

2019 M. Pezzulla, F. Gallaire, and P. M. Reis. "Fluid-Structure Interactions in Bristled Insect Wings" at Fluids and Elasticity 2019, Malaga, Spain, June, 24–26.

2018 M. Pezzulla, L. Siconolfi, F. Gallaire, and P. M. Reis. "To Leak or not to Leak through Holey Sheets" at APS/DFD 2018, Atlanta, USA, November, 18–20.

2018 M. Pezzulla, E. Strong, H. Karimi, and P. M. Reis. "Deformation of perforated elastic sheets due to the hydrodynamic loading by a viscous fluid" at ESMC 2018, Bologna, Italy, July, 2–6.

2018 M. Pezzulla, E. Strong, H. Karimi, and P. M. Reis. "Deformation of perforated elastic sheets due to the hydrodynamic loading by a viscous fluid" at APS March Meeting 2018, Los Angeles, California, USA, March, 5–9.

2018 D. Yan, A. Lee, M. Pezzulla, F. Lopez Jimenez, J. Marthelot, D. P. Holmes, and P. M. Reis. "For Better or For Worse: Self-tuning of the buckling strength of active bilayer shells" at APS March Meeting 2018, Los Angeles, California, USA, March, 5–9.

2017 M. Pezzulla, N. Stoop, M. Steranka, A. Bade, M. Trejo, and D. P. Holmes. "Global Curvature Buckling and Snapping of Spherical Shells" at APS March Meeting 2017, New Orleans, Louisiana, USA, March, 13–17.

2016 M. Pezzulla and D. P. Holmes. "Geometry and Instabilities in Growing Shells" at NEW.Mech 2016, Harvard University, USA, October, 22.

2016 M. Pezzulla and D. P. Holmes. "Morphing and Instabilities of Growing Sheets" at PHASME 2016, Cargese, Corsica, August, 8–20.

2016 M. Pezzulla, G. P. Smith, P. Nardinocchi, and D. P. Holmes. "Geometry and Mechanics of Thin Growing Bilayers" at APS March Meeting 2016, Baltimore, Maryland, USA, March, 13–18.

2015 D. P. Holmes, M. Pezzulla, P. Nardinocchi, and S. A. Shillig. "Morphing and snapping of plates and shells via swelling" at APS March Meeting 2015, San Antonio, Texas, USA, March, 2–6.

2014 M. Pezzulla, S. A. Shillig, P. Nardinocchi, and D. P. Holmes. "Morphing of geometric composites via residual swelling" at 61st New England Complex Fluids Meeting, Harvard University, USA, December, 5.

2014 P. Nardinocchi, M. Pezzulla and L. Teresi. "Anisotropic swelling of thin gel films" at NEW.Mech 2014, University of Massachusetts Amherst, USA, October, 18.

2014 P. Nardinocchi, M. Pezzulla and L. Teresi. "Anisotropic swelling in fibrous materials" at the 17th U.S. National Congress on Theoretical and Applied Mechanics, Michigan State University, USA, June, 15–20.

2013 A. Lucantonio, P. Nardinocchi, M. Pezzulla and L. Teresi. "Electromechanical model and motion control of soft bio-hybrid systems" at the INdAM Meeting "The Mathematics of Cells and Tissues", Cortona, Italy, September, 2–6.

2013 A. Lucantonio, P. Nardinocchi, M. Pezzulla, V. Pugliese and L. Teresi. "Modeling Tools for Soft Robotics" at the Soft Robotic Conference, Ascona, Switzerland, July (Poster).

2013 Y. Cha, P.Nardinocchi, M. Pezzulla and M. Porfiri. "Giant displacement in IPMC–based structures: a preliminary study" at the 6th ECCOMAS Thematic Conference on Smart Structures and Materials (SMART2013), Torino, Italy, June, 24–26.

Invited Seminars

2020 Towards Fluid-Shells Interactions. Aarhus University, Aarhus, Denmark, April.

2016 Geometry and Instabilities in Growing Shells. Sapienza - Università di Roma, Rome, Italy, December.

2016 Geometry and Instabilities in Growing Shells. Physical Mathematics Seminar, MIT, Cambridge, MA, October

2015 Morphing of geometric composites. Form Finding Workshop, Roma Tre University, Rome, Italy, April.

2014 Morphing of Geometric Composites via Residual Swelling. Bertoldi Group Meeting, Harvard University, Cambridge, MA, December.

Submitted Publications or Publications in Preparation

2020 M. Pezzulla, P. Leroy-Catalayud, and P. M. Reis. Fluid-Structure Interactions in Bristled Strips. *In preparation*

2020 T. G. Sano, M. Pezzulla, and P. M. Reis. A Reduced Theory for Magnetic Rods. *In preparation*

2020 M. Pezzulla, D. Yan, A. Abbasi, and P. M. Reis. A Reduced Theory for Magnetic Shells. *In preparation*

2020 D. Yan, M. Pezzulla, L. Cruveiller, and P. M. Reis Tuning the Buckling Strength of Magnetically-active Elastic Shells. *In preparation*

2020 M. Pezzulla, E. F. Strong, F. Gallaire, and P. M. Reis. Drag on Porous Flexible Strips at Low and Moderate Reynolds Numbers. *Submitted*

2020 D. P. Holmes, J.-H. Lee, H. S. Park, and M. Pezzulla. The nonlinear buckling behavior of a complete spherical shell under uniform external pressure and homogenous natural curvature. *Submitted*

Journals & Conference Proceedings

* Papers with alphabetical ordering of authors in which I gave a *first author* contribution.

2020 D. Yan, M. Pezzulla, and P. M. Reis. Buckling of pressurized spherical shells containing a through-thickness defect. *J. Mech. Phys. Solids* 138, 103923 (2020)

2019 M. Pezzulla and P. M. Reis. A Weak Form Implementation of Nonlinear Axisymmetric Shell Equations with Examples. *ASME. J. Appl. Mech.* 86(12): 124502, (2019)

2019 E. F. Strong, M. Pezzulla, F. Gallaire, P. M. Reis, and L. Siconolfi. Hydrodynamic loading of perforated disks in creeping flows. *Phys. Rev. Fluids* 4, 084101, (2019)

2019 A. Lee, D. Yan, M. Pezzulla, D. P. Holmes, and P. M. Reis. Evolution of critical buckling conditions in imperfect bilayer shells through residual swelling. *Soft Matter* 15, 6134-6144, (2019)

2019 L. Stein-Montalvo, P. Costa, M. Pezzulla and D. P. Holmes. Buckling of Geometrically Confined Shells. *Soft Matter* 15, 1215-1222, (2019)

2018 X. Jiang, M. Pezzulla, S. Wei, T. K. Ghosh, and D. P. Holmes. Snapping of Bistable, Prestressed Cylindrical Shells. *Europhys. Lett.* 122, 64003, (2018)

2018 M. Pezzulla, N. Stoop, M. P. Steranka, A. J. Bade, and D. P. Holmes. Curvature-Induced Instabilities of Shells. *Phys. Rev. Lett.* 120, 048002, (2018)

2017 M. Pezzulla, N. Stoop, X. Jiang, and D. P. Holmes. Curvature-Driven Morphing of Non-Euclidean Shells. *Proc. R. Soc. A* 473(2201), 20170087, (2017)

2016 M. Pezzulla, G. P. Smith, P. Nardinocchi, and D. P. Holmes. Geometry and Mechanics of Thin Growing Bilayers. *Soft Matter* 12, 4435-4442, (2016)

2015 P. Nardinocchi, M. Pezzulla, and L. Teresi. Steady and transient analysis of anisotropic swelling in fibered gels. *J. Appl. Phys.* 118, 244904, (2015)

2015 M. Pezzulla, S. A. Shillig, P. Nardinocchi, and D. P. Holmes. Morphing of geometric composites via residual swelling. *Soft Matter* 11, 5812-5820, (2015) [Inside Front Cover]

2015 *P. Nardinocchi, M. Pezzulla, and L. Teresi, Mechanics of bio-hybrid systems. *Procedia IUTAM* 12, pp. 145-153, (2015)

2015 *P. Nardinocchi, M. Pezzulla, and L. Teresi, Anisotropic swelling of thin gel sheets. *Soft Matter* 11, 1492-1499, (2015)

2014 A. Lucantonio, P. Nardinocchi, and M. Pezzulla. Swelling–induced and controlled curving in layered gel beams. *Proc. R. Soc. A* 470(2171), 20140467, (2014)

2014 *A. Lucantonio, P. Nardinocchi, M. Pezzulla, and L. Teresi. Multiphysics of bio–hybrid systems: shape control and electro–induced motion. *Smart Mater. Struct.* 23(4), 045043, (2014)

2014 P. Nardinocchi, M. Pezzulla, B.J. Akle, M. Guenther, and T. Wallmersperger. Actuation and buckling effects in IPMCs. *Proc. SPIE* 9056, (2014)

2013 Y. Cha, P. Nardinocchi, M. Pezzulla, and M. Porfiri. Giant displacements in IPMC–based structures: a preliminary study. *Adv. Mat. Res.* 745, 119–128, (2013)

2013 *P.Nardinocchi and M. Pezzulla. Curled actuated shapes of ionic polymer metal composites. *J. Appl. Phys.* 113, 224906, (2013)

2011 *P. Nardinocchi, M. Pezzulla, and L. Placidi. Thermodynamically based multiphysic modeling of ionic polymer metal composites. *J. Intel. Mat. Syst. Str.* 22(16), 1887–1897, (2011)

Honors

2016 PHASME 2016 Travel Grant, ICAM (USD 1K),

2014 Research Project Grant *Giovani Ricercatori*, INdAM (€ 1.6K), "Corrugamento di travi bistrato di gel polimerico"

2014 Research Project Young Investigator Grant, Sapienza University (€ 2K), "Shaping of bio-hybrid systems: reduced models and numerical simulations"

2013–2015 Graduate Research Fellowship, Italian Ministry of Education

2012 ADISU M.Sc. degree award

2010 ADISU B.Sc. degree award

2007–2012 ADISU scholarship

Teaching and Service

2019 Preparation of the lectures on shells for the class on *Mechanics of Slender Structures* EPFL, Instructor: Prof. Pedro M. Reis

2017 Guest Lecture on the Buckling of Columns for the class on *Mechanics of Materials* Boston University, Instructor: Prof. Harold S. Park

2015-2019 Reviewer for *Journal of Intelligent Materials Systems and Structures*, *Journal of Applied Mechanics, Proceedings of the Royal Society A*, *International Journal of Solids and Structures*, *Soft Matter*

2015 Teaching Assistant for the class on *Mechanics of Solids and Structures* (Instructor: Prof. P. Nardinocchi)

2012–2015 Co–advisor for bachelor theses in Aerospace Engineering and master theses in Aeronautical Engineering (Advisor: Prof. P. Nardinocchi)

Mentoring

Michele Curatolo	Ph.D. Student in Mechanical Engineering, Roma Tre University *Adhesion and Swelling of an Elastica*
Paul Costa	Master Student in Mechanical Engineering, École Polytechnique *Curvature Buckling of Constrained Shells*
Lucia Stein-Montalvo	Ph.D. Student in Mechanical Engineering, Boston University *Theory and Numerical Simulations on Plates and Shells*
Xin Jiang	Ph.D. Student in Mechanical Engineering, Boston University *Theory and Numerical Simulations on Plates and Shells*
Jay Shunter	Ph.D. Student in Mechanical Engineering, Boston University *Differential Geometry and the Elastica*
Mark Steranka	Undegraduate Student in Mechanical Engineering, Boston University *Experiments on Spherical Snapping Bilayer Shells*
Abdikhalaq Bade	Undegraduate Student in Mechanical Engineering, Boston University *Experiments on Spherical Buckling Bilayer Shells and setup of a 3D scanner*
Eric Fu	High School Student - RISE program *Fabrication of Conical Bilayer Shells and* *Realization of an Experimental Setup for Image Processing*
Marco Rossi	Master Student in Aeronautical Engineering, Sapienza - Università di Roma *Numerical, Analytical and Experimental investigation on Ionic Polymer Metal Composites*
Lorenzo Teofili	Master Student in Space Engineering, Sapienza - Università di Roma *Motion Control Analysis Of a Bio-Hybrid Actuator*
Andrea Pitzalis	Undergraduate Student in Aerospace Engineering, Sapienza - Università di Roma *Material Characteristics of IPMCs: Calibration Tests*
Francesco Saltari	Undergraduate Student in Aerospace Engineering, Sapienza - Università di Roma *Bending Modes in IPMCs Induced by Non Homogeneous Differences in Voltage*
Giulia Murzilli	Undergraduate Student in Aerospace Engineering, Sapienza - Università di Roma *An Analytical Model for Bio-hybrid Beams*
Virginia Notaro	Undergraduate Student in Aerospace Engineering, Sapienza - Università di Roma *Nonlinear Analytical Modeling of Buckling in IPMCs*

Language & Programming Skills

⋆ Mother tongue: Italian. Fluent in English. Intermediate knowledge of French and Spanish.

⋆ Experience programming in C, Fortran, and Python.

⋆ Experience with mathematical software such as Matlab, Mathematica, LabView, LaTeX.

⋆ Experience with FE software such as COMSOL Multiphysics, ADINA, Nastran.

⋆ Experience with Adobe Illustrator, Blender, MeshLab, Paraview and ImageJ.

References

⋆ Douglas P. Holmes, *Boston University*, Boston, USA (dpholmes@bu.edu)

⋆ Paola Nardinocchi, *Sapienza - Università di Roma*, Roma, Italy (paola.nardinocchi@uniroma1.it)

⋆ Pedro M. Reis, *EPFL*, Lausanne, Switzerland (pedro.reis@epfl.ch)

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