

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

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, L^AT_EX.
- ★ 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)



April, 2020