

## Università Degli Studi di Milano

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# Giulia Bevilacqua

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## Personal Information

Full name Giulia Bevilacqua

Born May 11<sup>th</sup>, 1993 in Manerbio (BS), Italy

Citizenship Italian

Languages Italian (Mother tongue)

English (Fluent - B2)

French (Fluent - B2)

Spanish (Basic knowledge)

## Academic position

JUL 2021 **Postdoctoral Researcher**, Istituto Nazionale di Alta Matematica - *Assegno postdottorale di collaborazione e attività di ricerca*, Università Cattolica del Sacro Cuore - Dipartimento di Matematica e Fisica Niccolò Tartaglia.

Principal Investigator: Prof. ALFREDO MARZOCCHI

## Past Position

MAR 2021 - **Postdoctoral Researcher**, supported by *Ermenegildo Zegna Founder's Scholarship*, Online  
JUN 2021 research.

Principal Investigator: Prof. ANTONIO DE ROSA

## Education

NOV 2017 - **Ph.D student in Mathematical Models and Methods in Engineering**, Politecnico di Milano,  
OCT 2020 *Milano (Italy), Self-organization and pattern formation in soft matter*, Date of the thesis defense:  
11<sup>th</sup> February 2021.

Advisor: Prof. PASQUALE CIARLETTA

OCT 2015 - **Master's degree in Mathematics**, Università Cattolica del Sacro Cuore, Brescia (Italy), *The  
JUL 2017 Kirchhoff-Plateau problem with elastic moving loop*, 110/110 cum laude.

Supervisors: Prof. ALFREDO MARZOCCHI and Prof. LUCA LUSSARDI

- OCT 2012 - **Bachelor's degree in Mathematics**, *Università Cattolica del Sacro Cuore, Brescia (Italy)*, *Wall-bounded shear flows: experimental results and modeling examples*, 110/110 cum laude.  
 JUL 2015 Supervisor: Prof. GIULIO GIUSEPPE GIUSTERI
- NOV 2008 - **Master's degree in Music**, *Conservatory of Luca Marenzio, Brescia (Italy)*, 8.50/10.  
 JUN 2013 Instrument: Oboe
- SEP 2007 - **Diploma Liceo Linguistico**, *Liceo Veronica Gamba, Brescia (Italy)*, 100/100.  
 JUN 2012 Languages: English, French and Spanish

## Abroad visiting period

- SET 2019 - **Visiting Ph.D student**, *Laboratoire Jacques-Louis Lions (LJLL - Sorbonne Université)*, Paris  
 FEB 2020 (France).  
 Supervisor: Prof. BENOÎT PERTHAME

## Awards

- JUN 2020 **Ermenegildo Zegna Founder's Scholarship**, *Research program at the University of Maryland (USA)*.
- JUL 2019 **LYSM**, Ypatia Laboratory of Mathematical Sciences, Funding (3500 €) for a long mission in Paris at Sorbonne Université (France).
- NOV 2018 **Agostino Gemelli Prize**, *Università Cattolica del Sacro Cuore*, best graduated in the Faculty of Science of Università Cattolica del Sacro Cuore, year 2017.
- OCT 2017 **Master Scholarship**, *Università Cattolica del Sacro Cuore, Brescia (Italy)*, obtained by merit for academic achievement.
- OCT 2015 **Bachelor Scholarship**, *Università Cattolica del Sacro Cuore, Brescia (Italy)*, obtained by merit for academic achievement.

## Founded project

- FEB 2021 - **"Progetto Giovani" GNFM 2020**, *Transizioni di forma nella materia biologica e attiva (Shape transitions in biological and active matter)*, Principal Investigator: Dr. Davide Riccobelli, Amount: 4170 €.

## Research Interests

My research can be divided into two main groups. On a hand I am interested in the mathematical and physical modeling of soft biological tissues, in particular in shape instabilities and mechanical phenomena in the embryo. On the other hand, I am studying the Plateau problem which asks whether there exists a surface with minimal area that spans a given boundary. This problem has a lot of applications, for example the description of the protein absorption by cellular membranes.

## Publications

### In preparation

- G. Bevilacqua, A. Giorgini; *Complex fluids*
- G. Bevilacqua, A. De Rosa, L. Lussardi; *Boundary regularity for the Kirchhoff-Plateau problem*
- G. Bevilacqua, L. Lussardi, A. Marzocchi; *Euler-Lagrange Equations for the Kirchhoff-Plateau problem*
- M. Gandolfi, G. Bevilacqua, P. Ciarletta, A. Quarteroni; *Role of pressure in the c-looping of the heart tube*
- G. Bevilacqua, D. Ambrosi, P. Ciarletta; *A geometrical principle enforcing mechanical balance can explain the orientation of the mitotic spindle in embryo*

## Submitted

- G. Bevilacqua, L. Lussardi, A. Marzocchi; *Variational analysis of inextensible elastic curves*, [arxiv.org/abs/2106.01659.pdf](https://arxiv.org/abs/2106.01659.pdf)

## Journal papers

- [1] G. Bevilacqua, L. Lussardi, A. Marzocchi; *Soap film spanning electrically repulsive elastic protein links*, Atti Accad. Peloritana Pericolanti Cl. Sci. Fis. Mat. Natur. 96 (2018), suppl. 3, A1, 13 pp.
- [2] G. Bevilacqua, L. Lussardi, A. Marzocchi; *Soap film spanning an elastic link*, Quart. Appl. Math. (2019) 77(3), 507-523, doi:10.1090/qam/1510.
- [3] D. Riccobelli, G. Bevilacqua; *Surface tension controls the onset of gyrification in brain organoids*, J. Mech. Phys. Solids (2020) 134, 103745, doi:10.1016/j.jmps.2019.103745.
- [4] G. Bevilacqua, L. Lussardi, A. Marzocchi; *Dimensional reduction of the Kirchhoff-Plateau problem*, J. Elasticity (2020) 140(1), 135-148, doi:10.1007/s10659-020-09763-y.
- [5] G. Bevilacqua, X. Shao, J. R. Saylor, J. B. Bostwick, P. Ciarletta; *Faraday waves in soft elastic solids*, Proc. Royal Soc. A (2020) 476(2241), 20200129, doi.org/10.1098/rspa.2020.0129.
- [6] X. Shao, G. Bevilacqua, P. Ciarletta, J. R. Saylor, J. B. Bostwick; *Experimental observation of Faraday waves in soft gel*, (2020) Physical Review E 102(6), 060602, doi: 10.1103/PhysRevE.102.060602.
- [7] G. Bevilacqua, P. Ciarletta, A. Quarteroni; *Morphomechanical model of the torsional c-looping in the embryonic heart*, SIAM Journal on Applied Mathematics (2021), 81(3), 897-918, doi: 10.1137/20M1370720.
- [8] G. Bevilacqua; *Symmetry break in the eight bubble compaction*, Mathematics in Engineering, 2022, 4(2): 1-24. doi: 10.3934/mine.2022010.
- [9] G. Bevilacqua, B. Perthame, M. Schmidtchen; *The Aronson-Bénilan estimate in Lebesgue spaces*, Accepted on Annales de l'Institut Henri Poincaré - Analyse non lineaire, [arxiv.org/pdf/2007.15267.pdf](https://arxiv.org/pdf/2007.15267.pdf).

## Memberships

2017 - Gruppo Nazionale per la Fisica Matematica (INdAM group)  
current

## Review activity

International Journal of Nonlinear Mechanics, Journal of Nonlinear Science

## Talks

- SEP 2021 **Active Materials: from Mechanobiology to Smart Devices - INDAM Meeting**, *C-looping of the heart tube*, Cortona (Italy), [Invited](#).
- SEP 2021 **Variational methods and applications**, *The Kirchhoff-Plateau problem and its generalizations*, Centro Ennio De Giorgi, Pisa (Italy), [Invited](#).
- SEP 2021 **SIMAI 2020+21**, *C-looping of the heart tube*, Parma (Italy), [Invited](#) to the Minisymposium: *Soft tissue biomechanics: from experiments to mathematical modeling*.
- MAY 2021 **RIT on Applied PDE - Department of Mathematics - University of Maryland**, *Faraday waves in soft elastic solids*, online event, [Invited](#).
- FEB 2021 **Eccellenza DISMA - Dipartimento di Scienze Matematiche G.L. Lagrange - Politecnico di Torino**, *The Kirchhoff-Plateau problem and its generalizations*, online event, [Invited](#).
- DIC 2020 **Dottorandi in Ateneo - Accademia di Scienze, Lettere ed Arti**, *Self-organization and pattern formation in soft matter*, online event, [Invited](#).

- FEB 2020 **Group de Travail de Thésard**, *The Kirchhoff-Plateau problem*, LJLL, Sorbonne Université - Paris (Italy), [Invited](#).
- DIC 2019 **Mathlab seminar**, *The Kirchhoff-Plateau problem*, SISSA, Trieste (Italy), [Invited](#).
- SET 2019 **Mathematical Biology on the Mediterranean Conference**, *Surface tension controls the onset of gyrification in brain organoids*, University of the Aegean, Karlovasi, Samos, (Greece).
- SET 2019 **The Mechanics of cell aggregates: experiments and models**, *Surface tension controls the onset of gyrification in brain organoids*, Politecnico di Torino (Italy), [Invited](#).
- JUL 2019 **ICIAM**, *Geometry and mechanics in the embryo at the 8-cell stage*, Valencia (Spain), [Invited](#) to the Minisymposium: *Mathematical Models for Solid Mechanics and Soft Structures*.
- JUN 2019 **Insalate di matematica**, *Mathematical modeling of soft and active matter at small length-scales*, Università di Milano-Bicocca (Italy), [Invited](#).
- JUN 2019 **Maths from the body II**, *Geometry and mechanics in the embryo at the 8-cell stage*, Venice (Italy), [Invited](#).
- MAY 2019 **PhD Colloquia**, *Mathematical modeling of soft and active matter at small length-scales*, Politecnico di Milano (Italy).
- NOV 2018 **Mathematical modeling of growth and tissue repair**, *Geometry and mechanics in the embryo at the 8-cell stage*, Treilles Foundation (France), [Invited](#).
- SEP 2018 **XLIII Summer School on Mathematical Physics**, *From Plateau to Poisson problem for biological membrane*, Ravello (Italy).
- SEP 2017 **Mathematical Modeling of Self-Organizations in Medicine, Biology and Ecology: from micro to macro**, *The Kirchhoff-Plateau problem with elastic moving loop*, Giardini Naxos - ME (Italy), [Invited](#).
- SEP 2017 **XLII Summer School on Mathematical Physics**, *The Kirchhoff-Plateau problem with elastic moving loop*, Ravello (Italy).
- [Poster section](#)
- NOV 2019 **Modélisation, analyse et simulation – Le Laboratoire Jacques-Louis Lions fête ses 50 ans**, *Symmetry break in the eight bubble compaction*, LJLL - Sorbonne Université, Paris, (France).

## Summer Schools and Attended Workshops

- FEB 2021 **Trends in Continuum Mechanics of Complex and Biological Materials**, organized by Dipartimento di Matematica e Fisica "Niccolò Tartaglia", Università Cattolica del Sacro Cuore, Brescia (Italy), online event.
- FEB 2020 **Recent Advances in Degenerate Parabolic Systems with Applications to Mathematical Biology**, Laboratoire Jacques-Louis Lions, Sorbonne Université, Paris (France).
- NOV 2019 **Modélisation, analyse et simulation – Le Laboratoire Jacques-Louis Lions fête ses 50 ans**, Laboratoire Jacques-Louis Lions, Sorbonne Université, Paris (France).
- NOV 2019 **Shape analysis in biology**, Laboratoire Jacques-Louis Lions, Sorbonne Université, Paris (France).
- NOV 2019 **LIA COPDESC and Lions Magenes Days**, *French-German-Italian meetings*, Laboratoire Jacques-Louis Lions, Sorbonne Université, Paris (France).
- SEP 2019 **Mathematical Biology on the Mediterranean Conference**, *Workshop week*, University of the Aegean, Karlovasi, Samos, (Greece).
- SEP 2018 **XLII Summer School on Mathematical Physics**, Ravello (Italy).
- AUG 2018 **The Mathematics of Mechanobiology**, Cetraro (Italy).
- MAY 2018 **Introduction to Non-linear Elasticity**, Università Cattolica del Sacro Cuore, Brescia (Italy).
- FEB 2018 **The Mathematics of Mechanobiology and Cell Signaling**, Oberwolfach (Germany), Invited to participate.

- SEP 2017 **XLIII Summer School on Mathematical Physics**, Ravello (Italy).
- AUG 2017 **Mathematical Physics of Living Systems**, Cortona (Italy), Invited to participate.
- MAY 2017 **Maths from the Body**, Università Cattolica del Sacro Cuore, Brescia (Italy).
- JAN 2017 **Non-linear propagation and non-equilibrium thermodynamics**, Università Cattolica del Sacro Cuore, Brescia (Italy).
- JUL 2016 **PBM 2016: Physically-Based modeling of Polyatomic Gases and Phase Transition**, Okinawa Institute of Science and Technology Graduate University, Okinawa (Japan).

## Mentoring

- MAR 2020 - **Co-advisor of the master thesis of Martina Gandolfi**, *Politecnico di Milano - Mathematical Engineering*, main advisor Pasquale Ciarletta, Topic: C-looping of the heart tube.
- APR 2021

## Teaching Activity

- SEP 2021 **Lecturer of the course *Precorso di Matematica***, *Series of lessons for students of mathematics who starts their first year (15h)*, Università Cattolica del Sacro Cuore, Brescia (Italy).
- SPRING 2020 **Teaching assistant for the course *Mathematical and Physical Modeling in Engineering***, *Master's Degree in Mathematical Engineering (20h)*, Politecnico di Milano, Milano (Italy).  
Course in English
- SPRING 2020 **Teaching assistant for the course *Rational Mechanics***, *Bachelor's Degree in Materials and Nanotechnology Engineering (20h)*, Politecnico di Milano, Milano (Italy).
- SPRING 2019 **Teaching assistant for the course *Mathematical and Physical Modeling in Engineering***, *Master's Degree in Mathematical Engineering (20h)*, Politecnico di Milano, Milano (Italy).  
Course in English
- SPRING 2019 **Teaching assistant for the course *Rational Mechanics***, *Bachelor's Degree in Materials and Nanotechnology Engineering (20h)*, Politecnico di Milano, Milano (Italy).
- FALL 2019 **Tutor assistant for the course *Calculus I***, *Bachelor's Degree in Mathematics (10h)*, Università Cattolica del Sacro Cuore, Brescia (Italy).
- SPRING 2018 **Teaching assistant for the course *Rational Mechanics***, *Bachelor's Degree in Materials and Nanotechnology Engineering (20h)*, Politecnico di Milano, Milano (Italy).
- JUNE 2018 **Solving PDEs with FEniCS**, *PhD course (4h)*, Università Cattolica del Sacro Cuore, Brescia (Italy).

## Communication Skills

- JAN 2019 **Trainings for *Disfida Matematica***, *Istituto Blaise Pascal, Manerbio (BS) - Italy*.  
A series of meetings addressed to young students to prepare them for a team competition called *Disfida Matematica*.
- FEB 2017 **Applied physics lessons**, *Università Cattolica del Sacro Cuore, Brescia (Italy)*.  
A series of lessons addressed to high school students, where they performed some basic experiments about relativity and modern physics.
- 2016 - 2017 **Academic tutor**, *Università Cattolica del Sacro Cuore, Brescia (Italy)*.  
A series of meetings addressed to young students to support them in their academic career.
- 2013 - 2018 **Oboe lessons in private music schools**, *"Scuola di Musica Lorenzo Manfredini", "Scuola di Musica Vincenzo Capirola" & "Scuola di Musica Stella Polare"*, Manerbio, Leno & Verolanuova, Brescia (Italy).

## Computer skills

*Operative systems*: Mac, Linux  
*Programming languages*: Python, C

*Python packages and libraries:* FEniCS, Numpy, Scipy  
*Scientific software:* Mathematica, Paraview, MATLAB, Igor Pro  
*Others:* Mathematica, L<sup>A</sup>T<sub>E</sub>X, Office Suite

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## Artistic Skills

- 2012 - NOW **Musician** in some bands and wind orchestra in the province of Brescia and Cremona
- APRIL 2017 First price at **Flicorno d'Oro, International Wind Orchestra Competition** with "Orchestra di Fiati Brixiae Harmoniae", *Attendance in the first category*
- JULY 2011 Second price at **Sinnai International Wind Orchestra Competition**, with "Njcabanda" - band of Favignana (TP), *Attendance in the young category*

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## References

- **Prof. Pasquale Ciarletta**, *Full Professor in Mathematical Physics at MOX - Mathematical Department "Francesco Brioschi", Politecnico di Milano (Milan - Italy)*, Ph.D Advisor, [pasquale.ciarletta@polimi.it](mailto:pasquale.ciarletta@polimi.it).
- **Prof. Antonio De Rosa**, *Assistant Professor (tenure track) at Department of Mathematics, University of Maryland, College Park, MD, (USA)*, Postdoctoral supervisor, [anderosa@umd.edu](mailto:anderosa@umd.edu).
- **Prof. Alfredo Marzocchi**, *Full Professor in Mathematical Physics at Mathematical and Physical Department "Niccolò Tartaglia", Università Cattolica del Sacro Cuore (Brescia - Italy)*, Master thesis advisor, [alfredo.marzocchi@unicatt.it](mailto:alfredo.marzocchi@unicatt.it).
- **Prof. Luca Lussardi**, *Associate Professor in Analysis at DISMA, Dipartimento di Scienze Matematiche "G.L. Lagrange", Politecnico di Torino (Turin - Italy)*, Master thesis co-advisor, [luca.lussardi@polito.it](mailto:luca.lussardi@polito.it).
- **Prof. Benoît Perthame**, *Full Professor at Laboratoire J.L. Lions - Sorbonne Université (Paris - France)*, I spent 6 months at LJLL working with him, [benoit.perthame@ljll.math.upmc.fr](mailto:benoit.perthame@ljll.math.upmc.fr).

Manerbio (BS), 21/10/2021