

# Ariel Surya Boiardi

## Curriculum Vitæ et Studiorum

*gutta cavat lapidem*

### Professional experience

- November 2025 – present  
**Postdoctoral Scholar**, *Okinawa Institute of Science and Technology*, Onna, Okinawa, Japan  
Research on the dynamics of magnetic chains and on the stability of magnetic spheres assemblies.  
host Prof. E. Fried
- October 2025 – November 2025  
**Visiting scientist**, *SISSA – International School for Advanced Studies*, Trieste, Italy  
Scientific collaboration on the study of periodic active structures  
host Prof. G. Noselli

### Education

- 2021–2025  
**Ph.D. in Mathematical Analysis, Modelling, and Applications**, *SISSA – International School for Advanced Studies*, Trieste, Italy  
Awarded *cum laude* distinction  
thesis Nonreciprocal dynamics in soft active structures: From swimming robots to odd periodic systems  
supervisor Prof. G. Noselli
- 2019–2021  
**M.Sc. in Mathematics**, *University of Parma*, Parma, Italy  
110/110 *summa cum laude*
- 2015–2019  
**B.Sc. in Mathematics**, *University of Parma*, Parma, Italy  
106/110
- 2010–2015  
**Maturità classica**, *Liceo L. Ariosto*, Reggio Emilia, Italy  
100/100

### Schools and workshops

- March 2026  
**OIST-Keio Showcase 10**, *Diverse Approaches to Fluid Dynamics*, Okinawa, Japan, March 11-12 2026  
Presented poster *Biomimetic Hydrogels Swimmer driven by Flutter Instability*
- July 2025  
**Stability, Multiaxial Fatigue and Fatigue Life Prediction in Statics and Dynamics of Innovative Structural and Material Coupled Systems**, *CISM*, Udine, Italy, September 9-11 2025
- July 2025  
**NHISMEH25**, *New Horizons In Structural Mechanics, Elasticity and Homogenization*, Lucca, Italy, July 28-31 2025  
Best Poster Award
- February 2024  
**RAM3 - Recent Advances in Mechanics and Mathematics of Materials**, *Sapienza University of Rome*, Rome, Italy
- September 2023  
**XLVIII Summer School on Mathematical Physics**, *GNFM*, Ravello, Italy
- June 2023  
**Interfacial Flows - The Power and Beauty of Asymptotic Methods**, *CISM*, Udine, Italy
- July 2022  
**Geometric Deep Learning**, *First Italian School*, Pescara
- July 2020  
**Transport and Fluids**, *Scuola Matematica Interuniversitaria*, Cortona, Online

### Conferences

- 2025  
**ESMC2025**, 12<sup>th</sup> *European Solid Mechanics Conference*, Lyon, France, July 7-11 2025

- 2024 **ICTAM 2024**, 26<sup>th</sup> International Congress of Theoretical and Applied Mechanics, Daegu, Korea, August 25-30 2024
- 2024 **ICoNSoM 2024**, 3<sup>rd</sup> International Conference on Nonlinear Solid Mechanics, Cagliari, June 11-14, 2024
- 2023 **GIMC, GMA e GBMA 2023**, Conference of the AIMETA Groups GIMC, GMA and GBMA, Reggio Calabria, July 12-14, 2022
- 2022 **FAATNA20>22**, Functional Analysis, Approximation Theory and Numerical Analysis, Matera, July 5-8, 2022

## Invited talks

- Dec 11 2025 *Nonreciprocal dynamics of active structures*, OIST, Okinawa, Japan.
- Jun 23 2025 *Functional shape change of soft active structures*, LIPhy, Grenoble, France.
- May 31 2024 *Swimming the unstable way - or: How flutter instability allows for minimal actuation and control of a soft hydrogel-based artificial swimmer*, SISSA, Trieste, Italy.
- Nov 18 2022 *IGA-Energetic BEM for wave scattering problems in the space-time domain*, SISSA, Trieste, Italy.

## Publications

- 2024 A. S. Boiardi and R. Marchello. "Breaking the left-right symmetry in fluttering artificial cilia that perform nonreciprocal oscillations". In: *Meccanica* (2024). DOI: 10.1007/s11012-024-01765-7.
- 2024 A. S. Boiardi and G. Noselli. "Minimal actuation and control of a soft hydrogel swimmer from flutter instability". In: *Journal of the Mechanics and Physics of Solids* (2024), p. 105753. DOI: 10.1016/j.jmps.2024.105753.
- 2022 A. Aimi and A. S. Boiardi. "IGA-Energetic BEM: An Effective Tool for the Numerical Solution of Wave Propagation Problems in Space-Time Domain". In: *Mathematics* 10.3 (2022). DOI: 10.3390/math10030334.

## Participation to research projects

- 2023 - 2025 **PRIN 2022 DISCOVER**, *Unveiling embodied intelligence in natural systems for bioinspired actuator design*  
PI G. Noselli
- 2022 **GNCS 2022**, *Verso nuove frontiere dell'analisi isogeometrica*  
PI Francesca Pelosi (Università di Roma "Tor Vergata")

## Experience

### Teaching

- 2024 **Mathematical Analysis I**, B.S. in Industrial Engineering, University of Trieste  
Exercise lessons and tutoring.
- 2024 **Applied Mathematics: an Introduction to Scientific Computing by Numerical Analysis**, M.Sc. in Data Science and Scientific Computing, SISSA and University of Trieste  
Hands-on sessions with Python coding; homework exam text and grading.
- 2021 **Numerical Calculus**, B.S. in Computer Science, University of Parma  
Homework exercises and exam exercises.
- 2020 **Numerical Analysis**, B.S. in Mathematics, University of Parma  
Homework exercises with guided solutions.

### Miscellaneous

- 2023-present **Webmaster**, SISSA, Trieste
- 2024 **ITCS Helpdesk**, SISSA, Trieste
- 2010-2014 **Electronics repair**, Reggio Emilia

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## Organizing activity

- 2025 **SIMAI2025**, Trieste, Italy, Corresponding organizer (with R. Marchello and D. Riccobelli) of the mini-symposium ISO26 - Mathematical Modelling in Soft Matter.
- 2024 **ICTAM2024**, Daegu, Korea, Co-moderator (with D. Riccobelli) for the thematic session SM13 *Stability and instability of materials and structures*.
- 2022-2023 **Analysis Junior Seminars**, SISSA, Organizer

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## Languages

Italian	Native
English	Proficient
Japanese	Basic (learning)

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## Technical skills

Operating systems	I am a knowledgeable user of all major operating systems; I do most of my daily work on macOS and Rocky Linux.
Scientific computing	I know quite well MATLAB and MATHEMATICA. In my research work I often use COMSOL multiphysics for FEM simulations.
Programming	I used Python for numerical analysis and machine learning, Fortran and MPI for my M.Sc. thesis. More recently, I used C++ for GUI and embedded (Arduino) development.
CAD and 3D print	I design with Solidworks and Autodesk Inventor and Fusion360. I print with a Markforged Mark Two (filament) and a Nanoscribe GT2 system (2PP).
Electronics	I have used Arduino boards in many experimental setups. Familiar with serial and I2C communication protocols. Experience with simple circuits and signal acquisition and analysis. For my latest work I have designed and realised a millimetre-scale torsional actuator.
Imaging devices	Experience with microscopes (upright, inverted and stereo) and optical lenses. Familiar with a variety of imaging techniques (fluorescence, dark field). Design of imaging setups.
Digital typography and graphics	I know the major graphics and digital typography instruments, namely Adobe Photoshop, Illustrator and InDesign, along with some others, such as Inkscape and Gimp which I mainly use to produce figures for my papers. I also know some fundamentals of video editing.

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## Hobbies and interests

Activities	cross-country skiing, freediving, hiking, rowing, running, yoga,...
Books	<i>Zen in der Kunst des Bogenschießens</i> , Мастер и Маргарита, 1984, Ossi di Seppia, <i>The Waste Land</i> ,...
Films	8 $\frac{1}{2}$ , <i>Underground</i> , <i>The Cook, the Thief, His Wife and Her Lover</i> , <i>Nosferatu</i> , 수취인불명,...
Music	J. S. Bach, L. Cohen, M. Davis,...
Places	Piazza Fontanesi, Val di Rabbi, Piazza Mattei, Fatih, Grignano Marina, 稻荷山,...