

Ignacio Andrade-Silva

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SUMMARY

PhD in Physics. Postdoctoral CNRS researcher at IUSTI lab, Aix-Marseille Université, France. Interested in nonlinear phenomena in soft matter, with a current focus on slender structures for applications in soft actuation and soft robotics.

RESEARCH EXPERIENCE

Postdoc, CNRS, Aix-Marseille Université Jan 2022 - Apr 2023

CNRS postdoctoral researcher at the IUSTI laboratory of Aix-Marseille Université. Research project: Modelling heat and mass transport in artificial leaves and development of a bio-mimetic pervaporation-based morphing device. (with Dr. Geoffroy Guéna.)

Postdoc, CNRS, Aix-Marseille Université Feb 2020 - Dec 2021

CNRS postdoctoral researcher at the IUSTI laboratory of Aix-Marseille Université in the [Bio-Soft Actuation group](#) (with [Joel Marthelot](#)). Research projects:

- Conception, design and mechanical description of a novel inflatable soft robotic gripper based on fabric inextensibility (see [preprint](#), submitted to Science Robotics).
- Unusual mechanical properties of frictional fiber aggregates: (1) memory-dependent mechanics of aggregates under cyclic compression (see [conference paper](#)) and (2) packing-dependent cohesion and tensile strength. Experimental characterization, and theoretical and numerical modelling. Collaboration with [Olivier Pouliquen](#) and [ELAN](#) team at [INRIA, Grenoble](#)).
- Fluidic actuation in *Drosophila Melanogaster* first wings expansion (as mentoring of PhD candidate Simon Hadjaje).

Visiting researcher, Aarhus University, Denmark Oct 2018

Collaboration with Dr. M. A. Dias in nonrigid origami.

Visiting researcher at Université of Lille 1, France Feb 2016

Collaboration with Dr. V. Odent at the Laboratoire de Physique des Lasers, Atomes et Molécules in nonlinear dynamics in liquid crystal devices.

TEACHING EXPERIENCE

Seminars for young researchers 2021 - Present

Organizer of weekly seminars ([Coffee, Cake & Science](#)) for students, interns and postdocs of IUSTI and [IRPHE](#) labs.

Introduction to research program 2021 - 2023

Participation in the Introduction to research program (TAPIR) for engineering students from [Polytech Marseille](#).

Advanced Mechanics Lectures 2020

Lectures on elasticity theory, geometric nonlinearity and advanced topics on mechanics for the Bio-soft actuation group.

Teaching assistance in theoretical lectures, laboratory work and evaluations at U. of Chile, FCFM, at undergraduate and graduate levels. Courses: Newtonian systems (2011,2014), Mechanics (2014,2015), Vibrations and Waves (2015), Continuum Mechanics (2016).

EDUCATION

2016 - 2019 PhD in Physics, **ENS de Lyon**

Thesis: “[Wrinkling and folding induced patterns in thin elastic sheets](#)”

Advisor: Mokhtar Adda-Bedia · mokhtar.adda-bedia@ens-lyon.fr

2014 - 2016 Master in Physics, **Universidad de Chile, FCFM**

Thesis: “[Interface Dynamics in Liquid Crystals](#)” (Maximum distinction)

Advisor: Marcel Clerc · marcel@dfi.uchile.cl

2009 - 2013 Bachelor in Physics, **Universidad de Chile, FCFM**

GRANTS, SCHOLARSHIPS AND HONORS

1. **Fondecyt Posdoctorado 2023 ANID** fellowship. Project title: **Morphing 1D structures through overcurvature: how to harness in and out-of-plane motions through geometry**, at U. of Chile.
2. **Becas Chile 2016 ANID**: PhD funding .
3. Master’s degree with honors, U. of Chile, FCFM.
4. Outstanding student in bachelor, U. of Chile, FCFM.

PUBLICATIONS

Andrade-Silva, I., V. Charpentier, and J. Marthelot (2023). “Shaping plastic metamaterials”. In preparation.

Andrade-Silva, I., E. Hohnadel, J. Marthelot, T. Metivet, O. Poliquen, and F. Bertails-Descoubes (2022). “Frictional three-point bending test: disentangling the role of friction through real and numerical experiments”. In preparation.

Andrade-Silva, I. and J. Marthelot (2022). “Fabric-based star soft robotic gripper”. In: *arXiv preprint arXiv:2209.02491*. Submitted to Advanced Intelligent Systems. URL: <https://arxiv.org/abs/2209.02491>.

Yu, Tian, Ignacio Andrade-Silva, Marcelo A. Dias, and J.A. Hanna (2022). “Cutting holes in bistable folds”. In: *Mechanics Research Communications* 124, p. 103700. URL: <https://www.sciencedirect.com/science/article/pii/S0093641321000458>.

Andrade-Silva, Ignacio, Théo Godefroy, Olivier Pouliquen, and Joel Marthelot (2021). “Cohesion of bird nests”. In: *EPJ Web of Conferences*. Vol. 249. EDP Sciences, p. 06014. URL: https://www.epj-conferences.org/articles/epjconf/abs/2021/03/epjconf_pg2021_06014/epjconf_pg2021_06014.html.

Andrade-Silva, Ignacio, Marcel G. Clerc, Gregorio Gonzalez-Cortes, and Vincent Odent (2021). “Light beam induced finger instability in a photosensitive liquid crystal cell”. In: *Physical Review Research* 3.2, p. L022027. URL: <https://journals.aps.org/prresearch/abstract/10.1103/PhysRevResearch.3.L022027>.

Andrade-Silva, Ignacio (2019). “Wrinkling and folding induced pattern formation in elastic thin sheets”. PhD thesis. Université de Lyon. URL: <https://tel.archives-ouvertes.fr/tel-02476368/>.

- Andrade-Silva, I. and M. Adda-Bedia (Nov. 2019). “Pre-buckled states of a stretched sheet with an elliptic hole”. In: *EPL (Europhysics Letters)* 128.1, p. 14004. URL: <https://doi.org/10.1209/0295-5075/128/14004>.
- Andrade-Silva, I., M. Adda-Bedia, and M. A. Dias (July 2019). “Foldable cones as a framework for nonrigid origami”. In: *Phys. Rev. E* 100 (3), p. 033003. URL: <https://link.aps.org/doi/10.1103/PhysRevE.100.033003>.
- Andrade-Silva, I, Umberto Bortolozzo, Camila Castillo-Pinto, MG Clerc, Gregorio González-Cortés, Stefania Residori, and Mario Wilson (2018). “Dissipative structures induced by photoisomerization in a dye-doped nematic liquid crystal layer”. In: *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 376.2135, p. 20170382. URL: <https://royalsocietypublishing.org/doi/abs/10.1098/rsta.2017.0382>.
- Andrade-Silva, Ignacio, Umberto Bortolozzo, Marcel G Clerc, Gregorio González-Cortés, Stefania Residori, and Mario Wilson (2018). “Spontaneous light-induced Turing patterns in a dye-doped twisted nematic layer”. In: *Scientific Reports* 8.1, pp. 1–8. URL: <https://www.nature.com/articles/s41598-018-31206-x#citeas>.
- Andrade-Silva, I., V. Odent, E. Louvergneaux, and M. G. Clerc (Nov. 2016). “Optical wall dynamics induced by coexistence of monostable and bistable spatial regions”. In: *Phys. Rev. E* 94 (5), p. 052220. URL: <https://link.aps.org/doi/10.1103/PhysRevE.94.052220>.
- Andrade-Silva, I., M.G. Clerc, and V. Odent (2016). “Asymmetric counter propagation of domain walls”. In: *Communications in Nonlinear Science and Numerical Simulation* 36, pp. 192–203. URL: <https://www.sciencedirect.com/science/article/pii/S1007570415004049>.
- Andrade-Silva, I. (2016). “Interface Dynamics in liquid crystals”. In: URL: <https://repositorio.uchile.cl/handle/2250/141766>.
- Andrade-Silva, I., M. G. Clerc, and V. Odent (June 2015). “Asymmetric counterpropagating fronts without flow”. In: *Phys. Rev. E* 91 (6), p. 060501. URL: <https://link.aps.org/doi/10.1103/PhysRevE.91.060501>.
- (Aug. 2014). “Zig-zag wall lattice in a nematic liquid crystal with an in-plane switching configuration”. In: *Phys. Rev. E* 90 (2), p. 022504. URL: <https://link.aps.org/doi/10.1103/PhysRevE.90.022504>.

CURRENTLY REFEREE IN

Physical Review Letters, Physical Review Research, Physical Review E, PRE letters, and Materials & Design.

NOTABLE COLLABORATIONS

Name	Institution	Topic
J. Marthelot	CNRS, Aix-Marseille Université	Soft robotic gripper
O. Pouliquen	CNRS, Aix-Marseille Université	Frictional fiber aggregates
J. Marthelot	CNRS, Aix-Marseille Université	
Bertalis-Descoubes F.	Inria, Grenoble	
G. Guéna	Aix-Marseille Université	Mass transport in artificial leaves
T. Yu	U. of Princeton	Cutting holes in bistable folds
J. Hannah	U. of Nevada	
M. A. Dias	U. of Edinburgh	
M. Adda-Bedia	ENS Lyon	Nonrigid origami
M. A. Dias	U. of Edinburgh	
M. Clerc	U. de Chile	Interface dynamics in liquid crystals
V. Odent	U. de Lille	

SKILLS

Basic Software	Windows, MS Office, LINUX, L ^A T _E X.
Scientific Programming	C, Matlab, Python, Mathematica, AUTO, COMSOL.
Graphics	Blender, Adobe Illustrator, Autodesk Fusion 360, G-Code.
Manufacturing techniques	3D printing, 3D scan, CNC machine, Laser cutting, Silicone molding.
Experimental techniques	Universal traction machine, X-ray microtomography, optical instrumentation.
Languages	Spanish (mother tongue), English (fluent), French (fluent).

OTHERS

Appearance in the [chilean press](#) and the [french press](#).

Amateur jazz guitarist.

SEMINARS AND CONFERENCES

1. March 2023, Journée Instabilités, Marseille.
Talk: “Membrane architecture dictates membrane separation”.
2. July 2022, ESMC, Ireland.
Talk: “Fracture and tensile strength of aggregates of frictional flexible fibers”.
3. March 2022, APS March Meeting, USA.
Talk: “Fracture and tensile strength of aggregates of frictional flexible fibers”.
4. August 2021, Les Houches school, France.
Talk: “Fabric-based pneumatic grippers”.
5. July 2021, Powders & Grains 2021.
Talk: “Cohesion of birdnests”.
6. March 2021, APS March Meeting.
Talk: “Inflatable grippers”.
7. July 2019, seminar, LPTMS, Université Paris-Sud, France.
Talk: “Foldable cones and nonrigid origami”.
8. March 2019, PhD seminars, Laboratoire de Physique, ENS de Lyon, France.
Talk: “Thin sheets, origami and the pizza theorem”.
9. August 2018, Summer School, Mechanics and Physics of Stretchable Objects (MEPHISTO). Institut d’Etudes Scientifiques de Cargèse, France.
Poster: “General model for foldable-cones”.
10. June 2018, Journée des doctorants du Laboratoire de Physique, ENS de Lyon, France.

- Talk: “A general model for f-cones”.
11. December 2017, XVI International Workshop on Instabilities and Nonequilibrium Structures. PUCV, Valparaíso, Chile.
Poster: “General model for foldable-cones”.
 12. June 2017, Journée des doctorants du Laboratoire de Physique, ENS de Lyon, France.
Talk: “Wrinkling, folding and crumpling thin sheets”.
 13. December 2015, XV International Workshop on Instabilities and Nonequilibrium Structures. PUCV, Valparaíso, Chile.
Talk: “Photo-isomerization fronts in a nematic liquid crystal”.
 14. Novembre 2015, IV Encuentro de Investigación de Estudiantes de Postgrado. University of Bío-Bío, Concepción, Chile, 2015.
Talk: “Dinámica de interfases en cristales líquidos”.
 15. October 2015, Seminars at the Physics Department in FCFM, University of Chile and PUCV. Santiago and Valparaíso, Chile.
Talk: “Interface dynamics in liquid crystals”.
 16. November 2014, [XIX Simposio Chileno de Física](#). University of Concepción, Chile.
Poster: “Zig-zag wall lattice in a nematic liquid crystal with an in-plane switching configuration”.
 17. November 2014, Dynamics Days, South America. PUCV, Valparaíso, Chile.
Poster: “Photo-isomerization induces pattern instability, labyrinth and foam textures”.
Poster: “Asymmetric counter-propagative fronts without flow”.
 18. September 2014, Seminar at the Physics Department, FCFM, University of Chile. Santiago, Chile.
Talk: “Zig-zag wall lattice in a nematic liquid crystal”.
 19. April 2014, Encuentro No Lineal. PUCV, Curaura, Chile.
Talk: “Red de interfases zig-zag en un cristal líquido nemático”.
 20. March 2013, Chilean congress on optics and photonics. University of Santiago, Santiago, Chile.
Poster: “Propagación de un frente de foto-isomerización en un cristal líquido dopado sometido a un haz gaussiano”.