# Andres Zuniga

Institute of Engineering Sciences University of O'Higgins (UOH) Av. Libertador Bernardo O'Higgins 611, Rancagua, Chile ⊠ andres.zuniga@uoh.cl Date of birth: Feb 3rd, 1988. Citizenship: Chilean.

# **Research Interests**

Partial Differential Equations, Calculus of Variations, Nonlinear Analysis.

Topics: Liquid drop models, functional inequalities and nonlinear diffusions, phase transition models, connecting orbits in ODE systems, least gradient problems, anisotropic Ginzburg-Landau models.

## Academic Experience

- 2019 today Assistant Professor. Institute of Engineering Sciences, University of O'Higgins (UOH), Chile.
- 2019 2020 **Postdoctoral fellow.** Department of Mathematics and Statistics, McMaster University, Canada. Supervisors: Stan Alama, Lia Bronsard.
- 2018 2019 **FSMP-PSL Postdoctoral fellow.** CEREMADE (CNRS), Université Paris IX Dauphine, France. Supervisor: Jean Dolbeault.

# Education

- 2014 2018 Ph.D. in Mathematics. Indiana University, Department of Mathematics, IN, USA. Dissertation title: Geometric Problems in the Calculus of Variations. Defended in May 2018. Advisor: Peter Sternberg.
- 2012 2014 M.A. in Mathematics. Indiana University, Department of Mathematics, IN, USA.
- 2006 2012 **Mathematical Engineering**, University of Chile, Department of Mathematical Engineering, Santiago, Chile.

Thesis title: Construction of two-end solutions to the inhomogeneous Allen-Cahn equation in the plane. Defended in July 2012. Advisor: Manuel del Pino.

2006 - 2011 B.S. in Engineering. University of Chile, Department of Mathematical Engineering, Santiago, Chile.

#### Publications

- 2020 A nonlinear isoperimetric problem with density perimeter, with Stan Alama, Lia Bronsard and Ihsan Topaloglu. Submitted for publication. **Preprint** arXiv:2006.16278 [math.AP]
- 2019 Prescribed energy connecting orbits for gradient systems, with Francesca Alessio and Piero Montecchiari. Discrete Contin. Dyn. Syst. Series A, vol. 39, no. 8, pp. 4895–4928.
- 2019 *Continuity of minimizers to weighted least gradient problems*. **Nonlinear Analysis**, vol. 178, pp. 86–109.
- 2016 On the heteroclinic connection problem for multi-well gradient systems, with Peter Sternberg. J. Differential Equations, vol. 261, no. 7, pp. 3987–4007.
- 2014 A two-end family of solutions for the inhomegeneous Allen-Cahn equation in  $\mathbb{R}^2$ , with Oscar Agudelo. J. Differential Equations, vol. 256, no. 1, pp. 157–205.

# Awards and Honors

2019 - 2020 Becas-Chile Postdoctoral fellowship for research abroad. CONICYT, Government of Chile.

- 2019 Recipient of Financial Support Program for young researchers to attend the *9th International Congress* of Industrial and Applied Math. in Valencia. Academic Committee of ICIAM.
- 2018 2019 FMSP-PSL postdoctoral fellowship. Fondation de Sciences Mathématiques de Paris, France.
  - 2017 Hazel King Thompson thesis-support fellowship. Department of Mathematics, Indiana University.
  - 2017 Glenn Schöber research-abroad fellowship. Department of Mathematics, Indiana University.
  - 2016 Student Travel Award. College of Arts and Sciences, Indiana University.

- 2016 David Rothrock teaching award. Department of Mathematics, Indiana University.
- 2012 Recruitment award international graduate student, Department of Mathematics, Indiana University
- 2012 2016 Becas-Chile doctoral scholarship for study abroad. CONICYT, Government of Chile.
- 2010,2011 Outstanding Student Award in Mathematics. Department of Mathematical Engineering, University of Chile.
  - 2010 Best Undergraduate Teaching Assistant Award. Department of Mathematical Engineering, University of Chile.
- 2006 to 2008 Outstanding Student Award in Engineering. School of Engineering, University of Chile.

# Talks in International Conferences (past & future)

- July 2020 Special Session on Variational Problems and Nonlinear PDE, 6th Latin American Congress of Mathematicians (CLAM 2020). Montevideo, Uruguay.
- July 2020 *Minisymposium: Ordered Structures in Variational Problems and PDEs and their applications*, 2nd Joint Society for Industrial and Applied Mathematics (SIAM) and the Canadian Applied and Industrial Mathematics Society (CAIMS) Annual Meeting (AN20). Toronto, ON, Canada.
- July 2019 Minisymposium: Least Gradient Problems and Optimal Transport, 9th International Congress on Industrial and Applied Mathematics (ICIAM). Valencia, Spain.
- June 2019 Workshop on New Trends in Variational Models: From Superconductors to Liquid Crystals. Fields Institute, Toronto, ON, Canada.
- Feb 2019 Winter School in Calculus of Variations and Probability. Institute of Mathematics (CIMI), University of Toulouse III Paul Sabatier, Toulouse, France.
- Nov 2017 Special Session on Geometric Analysis, AMS Fall Western Sectional Meeting. University of California, Riverside, CA, USA.
- July 2016 *Poster Session in LMS-CMI Research School:* Modern topics in Nonlinear PDEs and Geometric Analysis. University of Reading, Reading, UK.

# Talks in Local Meetings

- Feb 2020 Analysis and PDE Seminar, McMaster University, Hamilton, ON, Canada.
- Oct 2019 PDE Seminar, Indiana University, Bloomington, IN, USA.
- July 2019 Analysis and PDE working group's Seminar of Felix Otto, Max Planck Institute for Mathematics, Leipzig, Germany.
- Apr 2019 Analysis and Probability Seminar, Université Paris IX Dauphine, France.
- Oct 2017 PDE Seminar, Indiana University, Bloomington, IN, USA.
- Sept 2017 Applied Math. Seminar, Michigan State University, East Lansing, MI, USA.
- Oct 2016 PDE Seminar, Indiana University, Bloomington, IN, USA.
- Jul 2016 PDE Seminar, DIM University of Chile, Santiago, Chile.

## Expository Talks

A least gradient problem in  $\mathbb{R}^n$  with  $L^{\infty}$ -constraint. Graduate-Student PDE Seminar. Indiana University, Bloomington, IN. (2 sessions: Feb.-March, 2017).

Reduced boundary and regularity theory of Minimal Surfaces. Graduate-Student PDE Seminar. Indiana University, Bloomington, IN. (3 sessions: Oct.-Dec., 2016).

#### Selected Schools, Seminars and Events attended

- May 2019 Workshop on Variational Problems in Physics, Université Toulouse III Paul Sabatier, France.
- March 2019 Meeting of working group in Shape Optimization (ANR SHAPO), Univeristé Paris VII Diderot, France.
  - Feb 2019 Winter School in Calculus of Variations and Probability, Centre International de Mathématiques et Informatique (CIMI), Université Paul Sabatier Toulouse III, France.

- Dec 2018 PDEs at Valparaiso: a conference in honor of Patricio Felmer 60th birthday, Universidad Técnica Federico Santa María (UTFSM). Valparaíso, Chile.
- Fall 2018 Seminar of Paris Work-group in Calculus of Variations (GT CalVa), Paris, France. Seminar in Analysis and Probability, Université Paris IX - Dauphine, France.
- Oct-Nov 2018 Course in Entropy Methods for PDEs (by Prof. Christian Schmeiser). Institute of Mathematics Henri Poincaré (IHP), Sorbonne Université, Paris, France.
  - Nov 2018 Conference in PDEs and Geometric Measure Theory. ETH, Zurich, Switzerland.
  - Jan 2018 Workshop on Liquid Crystals, Soft-matter packing, and active systems. IMA, Minneapolis, MN, USA.
  - May 2017 Summer School in Calculus of Variations and Nonlinear PDEs. University of California, Berkeley, CA, USA.
  - 20th Rivière-Fabes symposium: Topics in elliptic and parabolic PDEs. University of Minnesota, Apr 2017 Minneapolis, MN, USA.
  - Jul 2016 Summer School in Modern topics in nonlinear analysis and PDEs. University of Reading, Reading, UK

# Teaching experience

#### • Department of Mathematics and Statistics, McMaster University.

During my Postdoctoral Fellowship (2019-2020) I served as Instructor of the following courses aimed at students of the Faculty of Science:

- Linear Algebra I (MATH 1B03)
- Introd. Calculus for Social Sciences (MATH 1K03)

#### • Department of Mathematics, Indiana University.

As part of my doctoral studies (2012-2018), I served as Instructor for the following courses aimed at students in the College of Arts and Sciences:

0	Ordinary Differential Equations I (M343)	0	Pre-Algebra (M014)
0	Finite Mathematics (M118)	0	Pre-Calculus (M025)
0	Intro. to Finite Math II (D117)	0	Mathematical Reasoning (J110)
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as well as serving as *Teaching Assistant* for the introductory courses:

- Finite Mathematics (M118) • Calculus I (M211)
- Applied Calculus for Biology and Finance (M119) Calculus II (M212)

Additionally, I served as *Teaching Assistant* for the following courses of the graduate program in Mathematics:

- Partial Differential Equations I (M540)
- Ordinary Differential Equations I (M544) • Analysis I (M511)
- Introd. Real Analysis I (M/S 413)
- Department of Mathematical Engineering, University of Chile. (DIM)

During my studies of mathematical engineering (2008–2012), I served as Teaching Assistant for the introductory courses of the School of Engineering:

- Calculus I (MA1001) • Ordinary Differential Equations (MA2601) • Calculus II (MA1002)
- Calculus III (MA2001)

• Abstract Algebra (MA1101)

• Introd. Real Analysis II (M/S 414)

• Theory of Probability II (M564)

• Engineering Mathematics II-B (MATH 1ZC3)

- Linear Algebra (MA1102)
- Vector Calculus Calculus IV (MA2002)

I also worked as *Teaching Assistant* for the following courses of the mathematical engineering program:

- Differential Calculus in Banach Spaces (MA4002) Functional Analysis (MA4801)
- PDE in Math. Physics (MA4601) • ODE in Banach Spaces (MA4802)

• Department of Physics, School of Physical and Mathematical Sciences, University of Chile. (DFI) Before obtaining my bachelor's degree (2008), I worked as *Teaching Assistant* in the course:

• Thermodynamics (FI 2004)

## Service

Reviewing I have participated as referee for the journals: • Indiana University Mathematics Journal (IUMJ)

- Gammuniantians in Dure and Applied Applied (CD
- Communications in Pure and Applied Analysis (CPAA)
- Nonlinear Analysis (NA).

Chair Session Contributed papers session II, AMS sectional meeting at Indiana University (Apr 2016).

- Co-Organizer PDE Analysis Seminar for graduate students at Indiana University (Fa 2016 Spr 2017).
  - Outreach Volunteer for Indiana University Science Fest (Oct 2014, Oct 2015), Volunteer for University of Chile Summer School Program: PreCalculus courses aim towards high-school students (Jan 2008 - Jan 2012).

# Languages

Programming LATEX, MATLAB, JAVA. Some experience with FORTRAN 90 and C++.

Spanish: Native, English: Fluent, French: Beginner (Conversational).