Oscar E. Fernandez

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NOTE: blue text is hyperlinked

Employment

2011–Present **Wellesley College**, *Wellesley, MA*.
- Faculty Director, Pforzheimer Learning and Teaching Center (July 2018–Present)
  - Charged with supporting faculty to develop and maintain excellence in their teaching; planning and coordinating New Faculty Orientation; designing and coordinating programming that promotes the uptake of innovative instructional strategies, inclusive pedagogy, and their assessment; supporting the adoption of evidence-based teaching strategies; supporting projects seeking to contribute to the Scholarship on Teaching and Learning; and overseeing teaching mentor programs
- Associate Professor of Mathematics (Fall 2017–Present)
- Assistant Professor of Mathematics (Fall 2011–Fall 2017)

2010–2011 **Institute for Mathematics and its Applications**, *Minneapolis, MN*.
Postdoctoral Fellow

2009–2010 **University of Michigan**, *Ann Arbor, MI*.
Michigan NSF AGEP Postdoctoral Fellow

Education

2004–2009 **University of Michigan**, *Ann Arbor, MI*.
- Ph.D. in Applied and Interdisciplinary Mathematics
- Thesis title: *The Hamiltonization of Nonholonomic Systems and its Applications*
- Thesis Advisor: Anthony M. Bloch

2000–2004 **University of Chicago**, *Chicago, IL*.
B.S. in Applied Mathematics; B.A. in Physics with Honors

Research Interests

Dynamics and dynamical systems (especially geometric and nonholonomic mechanics), global analysis, integrability and quantization of constrained systems, mathematical physics, applied mathematics.

Publications

Research Articles

2018 **14.** Fernandez, O.E. and Radhakrishnan, M.L. The Quantum Mechanics of a Molecular "Nanocar." *Scientific Reports*, 8 (2018), Article number: 14878. [pdf]

2015 **13.** Fernandez, O.E. and Beltrán-Sánchez, H. The Entropy of the Life Table: A Reappraisal. *Theor. Pop. Biology*, 104 (2015), 26–45. [doi]

12. Balseiro, P. and Fernandez, O.E. Reduction of nonholonomic systems in two stages. *Nonlinearity*, 28(8) (2015), 2873–2912. [pdf] [doi]

11. Fernandez, O.E. Poincaré Transformations in Nonholonomic Mechanics. *Appl. Math. Lett.*, 43 (2015), 96–100. [pdf] [doi]

2014 **10.** Fernandez, O.E., Bloch, A.M. and Zenkov, D.V. The Geometry and Integrability of the Suslov Problem. *J. Math. Phys.*, 55 (2014), 112704. [pdf] [doi]

9. Fernandez, O.E. Quantizing Conditionally Variational Nonholonomic Systems. *J. Phys. A: Math. Theor.*, 47(30) (2014), 305206. [pdf][doi]

2012 **8.** Fernandez, O.E., Bloch, A.M. and Olver, P.J. Variational Integrators for Hamiltonizable Nonholonomic Systems. *J. Geometric Mechanics*, 4(2) (2012), 137–163. [pdf][doi]

2011 **7.** Ohsawa, T., Fernandez, O.E., Bloch, A.M. and Zenkov, D.V. Nonholonomic Hamilton-Jacobi Theory via Chaplygin Hamiltonization. *J. Geometry and Physics*, 61(8) (2011), 1263–1291. [pdf][doi]

6. Fernandez, O.E. and Bloch, A.M. The Weitzenböck Connection and Time Reparameterization in Nonholonomic Mechanics. *J. Math. Physics*, 52 (2011), 012901. [pdf] [doi]

2009 **5.** Fernandez, O.E., Mestdag, T. and Bloch, A.M. A Generalization of Chaplygin's Reducibility Theorem. *Reg. and Chaotic Dyn.*, 14(6) (2009), 635–655. [pdf][doi]

4. Mestdag, T., Bloch, A.M. and Fernandez, O.E. Hamiltonization and Geometric Integration of Nonholonomic Systems. *Proc., 8th Nat. Congress on Theor. and Appl. Mechanics*, Brussels, Belgium (2009). [pdf]

3. Bloch, A.M., Fernandez, O.E. and Mestdag, T. Hamiltonization of Nonholonomic Systems and the Inverse Problem of the Calculus of Variations. *Rep. Math. Phy.*, 63 (2009), 225–249. [pdf][doi]

2008 **2.** Fernandez, O.E., Bloch, A.M. and Mestdag, T. The Pontryagin Maximum Principle applied to Nonholonomic Mechanics. *Proc., IEEE 47th Control Decision Conf.,* (2008), 4306–4311. [pdf][doi]

1. Fernandez, O.E. and Bloch, A.M. Equivalence of the Dynamics of Nonholonomic and Variational Nonholonomic Systems for certain Initial Data. *J. Phys. A: Math. Theor.*, 41(34) (2008) 344005. [pdf][doi]

Books and Book Chapters

2019 **5.** (Book) Fernandez, O.E. *Calculus Simplified*. Princeton, NJ: Princeton University Press. *Forthcoming, Summer 2019.*

2018 **4.** (Book Chapter) Fernandez, O.E. *How Constructivism Can Boost Success in STEM Fields for Women and Students of Color.* In D. Kritt (Eds.), *Constructivist Education in an Age of Accountability*. Cham, Switzerland: Palgrave Macmillan (January 2018).

2017 **3.** (Book) Fernandez, O.E. *The Calculus of Happiness: How a Mathematical Approach to Life Adds Up to Health, Wealth, and Love.* Princeton, NJ: Princeton University Press (April 2017). Translations published in: Chinese, Japanese, Korean, and Portuguese.

2. (Book Chapter) Fernandez, O.E. Help Save the Planet: Take the $\frac{1}{2}$ CO_2e Challenge! In B. Kateman (Eds.), *The Reducetarian Solution: How the Surprisingly Simple Act of Cutting 10% of Meat from Your Diet Can Transform Your Health and The Planet.* Harmondsworth, UK: Penguin Books (April 2017).

2014 **1.** (Book) Fernandez, O.E. *Everyday Calculus: Discovering the Hidden Math All Around You.* Princeton, NJ: Princeton University Press (April 2014). Translations have been published in Japanese, Korean, and Portuguese.

Articles Related to Teaching

2018 **1.** Fernandez, O.E. Second Chance Grading: An Equitable, Meaningful, and Easy-to-Implement System that Synergizes the Research on Testing for Learning, Mastery Grading, and Growth Mindsets. *Submitted to PRIMUS' special issue on Mastery-Based Grading.*

Other Writing

I blog regularly about math on The Huffington Post (here is the link to my author page), and on my site, surroundedbymath.com. I have also written blog posts for Princeton University Press' blog and the AMS Teaching and Learning Blog.

Grants, Fellowships, and Honors

2015 *Wellesley Emerging Scholars Initiative* named a "Bright Spot in Hispanic Education" by the White House Initiative for Educational Excellence for Hispanics

2013–2015 *Wellesley Emerging Scholars Initiative*, MAA-Tensor Foundation Strengthening Underrepresented Minority Mathematics Achievement Grant

2014 *Career Enhancement Fellowship for Junior Faculty*, Woodrow Wilson National Foundation

2014 *Everyday Calculus* selected as one of American Association for the Advancement of Science's Books for General Audiences and Young Adults 2014

2012 *Mathematics in Context*, Three Colleges Presidential Innovation Fund Grant

2012 Wellesley College Brachman-Hoffman Small Grant

2011 *Applicable Mathematics Across the Three College Consortium*, Three Colleges Presidential Innovation Fund Grant

2011 *A Research-Based Hybrid IBL Approach to Calculus I*, Academy of Inquiry-Based Learning Small Grant

2009 Michigan NSF AGEP Postdoctoral Fellowship

2002–2009 Mellon Mays Undergraduate Fellowship

2005–2008 Social Sciences Council Summer Research Grants

2009 University of Michigan AGEP Outstanding Leadership Award

Press

8/16/2017 Fox News Radio interview about *The Calculus of Happiness*

8/11/2017 Live video interview with CNBC regarding *The Calculus of Happiness*

8/10/2017 *New Scientist* publishes review of *The Calculus of Happiness*

7/27/2017 Wellesley College publishes "daily shot" story (appears on the College's homepage) about TIME Magazine collaboration (referenced below)

7/7/2017 Wellesley College Wellesley College publishes "daily shot" story about NPR interview (referenced below)

6/29/2017 Radio interview with Cape Cod NPR's Living Lab Radio about *The Calculus of Happiness*

6/24/2017 TIME Magazine publishes interactive applet based on *The Calculus of Happiness*

Winter 2016 Featured in *Wellesley Magazine* article

10/9/2015 Wellesley College Wellesley College publishes "daily shot" story about WESI White House honor

Talks and Presentations

Invited Research Talks

Oct. 2018 "The Quantum Mechanics of a Molecular 'Nanocar'," *Turfe Lecture*, University of Michigan, Dearborn, MI.

Oct. 2018 "The Quantum Mechanics of a Molecular 'Nanocar'," *AMS Sectional Meeting*, University of Michigan, Ann Arbor, MI.

Jun. 2015 "The Poincaré–Hopf Theorem in Nonholonomic Mechanics," *ICERM Workshop on Integrability in Mechanics*, Providence, RI

May 2015 "The Poincaré–Hopf Theorem in Nonholonomic Mechanics," *SIAM Conference on Applications of Dynamical Systems*, Snowbird, UT

Aug. 2014 "The Quantum Mechanics of Nanocars," *Alán Aspuru-Guzik chemistry group, Harvard University*, Cambridge, MA

Jun. 2014 "The Quantum Mechanics of Nanocars," *Woodrow Wilson Foundation Career Enhancement Retreat*, Atlanta, GA

Aug. 2013 "A New Approach to the Integrability of the Suslov Problem," *AMMCS 2013 Conference*, Waterloo, Canada

May 2013 "A New Approach to the Integrability of the Suslov Problem," *SIAM Conference on Applications of Dynamical Systems*, Snowbird, UT

Nov. 2012 "Nonholonomic Systems: Dynamics and Simulations via Time Transformations," *Univ. Mass. Amherst Applied Math Seminar*, Amherst, MA

Sep. 2012 "An Improved Integrability Theorem for Hamiltonizable Nonholonomic Systems," *Third Iberoamerican Meeting On Geometry, Mechanics and Control*, Salamanca, Spain

Jul. 2012 "Variational Integrators for Hamiltonizable Nonholonomic Systems," *Ninth AIMS Conference*, Orlando, FL

Mar. 2012 "Variational Integrators for Hamiltonizable Nonholonomic Systems," *IMPA Seminar*, Rio de Janeiro, Brazil

Apr. 2011 "Variational Integrators for Hamiltonizable Nonholonomic Systems," *Mathematical Physics Seminar*, Univ. of Minnesota, Minneapolis, MN

Nov. 2010 "Applications of the Hamiltonization of Nonholonomic Systems," *Mathematical Physics Seminar*, Univ. of Minnesota, Minneapolis, MN

Sep. 2010 "Developing Variational Integrators for Hamiltonizable Nonholonomic Systems," *Modern Math Workshop*, Anaheim, CA

Feb. 2010 "The Hamiltonization of Nonholonomic Systems and its Applications," *Applied Math Seminar*, Univ. of Michigan, Ann Arbor, MI

Jan. 2010 "Dynamical Systems and Nonholonomic Mechanics," *Univ. of Ill. at Chicago*, Chicago, IL

Jan. 2010 "Nonholonomic Systems and their Hamiltonization," *Fourth Intl. Young Researchers Workshop on Geometry, Mechanics and Control,* Ghent, Belgium

Oct. 2009 "Explicitly Solvable Nonholonomic Systems," *AMS Sectional Meeting*, University Park, PA

Contributed Research Talks and Posters

Oct. 2014 "Quantizing Nonholonomic Systems," *Annual Meeting of Mid-Atlantic APS*, University Park, PA

Aug. 2011 "Applications of the Hamiltonization of Nonholonomic Systems," Poster, *Appl. Dynamics and Geometric Mechanics Conf.*, Olberwolfach, Germany

Oct. 2010 "Simulating Nonholonomic Mechanics using Variational Integrators through Hamiltonization," *Postdoctoral Seminar*, Institute for Mathematics and its Applications, Minneapolis, MN

Mar. 2010 "Developing Geometric Integrators for Hamiltonizable Nonholonomic Systems," *Institute for Mathematics and its Applications*, Minneapolis, MN

Dec. 2008 "The Pontryagin Maximum Principle applied to Nonholonomic Mechanics," *IEEE* 47^{th} *Conference on Decision and Control*, Cancun, Mexico

Talks Related to Teaching

Mar. 2018 "Mastery Grading," joint talk with Stanley Chang and Alex Diesl (Wellesley College Mathematics Department), *Wellesley College*, Wellesley, MA

Nov. 2017 "8 Research-Based Guiding Principles for Maximizing Learning for Women and Students of Color in STEM," *ATMNE Fall Conference*, Marlborough, MA

Feb. 2017 "8 Research-Based Guiding Principles for Maximizing Learning for Women and Students of Color," *Pforzheimer Learning and Teaching Center*, Wellesley College, Wellesley, MA

Jun. 2016 "The Calculus of Music," *MIT MathROOTS Program*, MIT, Cambridge, MA

Jun. 2016 "Research-Based Strategies for Improving Women and Minority Students' STEM Experience." *2016 Massachusetts PKAL Regional Meeting: Best Practices in STEM Education*, Westfield State Univ., Westfield, MA

Jun. 2016 "A Few Easy Ways to Boost Student Success in Math," *Alumni Reunion 2016*, Wellesley College, Wellesley, MA

Oct. 2015 "Closing the Achievement Gap in STEM," *Wellesley College Science Center Faculty Seminar Series*, Wellesley College, Wellesley, MA

Talks for General Audiences

Oct. 2018 "The Mathematics of Happiness," *Turfe Lecture*, University of Michigan, Dearborn, MI

Jun. 2017 "Mathematical Models: A Short Tour of Great Successes and Great Failures," *MIT MathROOTS Program*, MIT, Cambridge, MA

Jun. 2015 "A Short Introduction to the Hidden Math All Around You," *Alumni Reunion 2015*, Wellesley College, Wellesley, MA

Apr. 2015 "A Short Introduction to the Hidden Math All Around You," *Junior Open Campus event for students and parents*, Wellesley College, Wellesley, MA

Apr. 2013 "Visualizing Mathematics," *Junior Open Campus event for students and parents*, Wellesley College, Wellesley, MA

Nov. 2010 "Falling Cats, Spinning Disks and Snakeboarding: A Tour Through the Mathematics of Mechanics," *Undergraduate Math Club*, Univ. of Minnesota, Minneapolis, MN.

Teaching

I teach my courses using a combination of interactive lectures and inquiry-based learning (IBL), and infuse evidence-based teaching strategies (e.g., mastery learning) to help all students succeed. I also regularly use technology—such as online Java applets and SMART boards—to help students interact with the math we are learning. **NOTE:** I was on sabbatical during the 2014–2015 academic year.

Associate Professor, Wellesley College, Dept. of Mathematics

- Intro. to Fourier Analysis and PDEs — Spring (2018, 2016, 2014)
- Complex Analysis — Fall 2013
- Real Analysis — Spring (2017, 2013), Fall 2015
- Mathematical Methods for the Physical Sciences — Summer 2017, Fall (2012–2018)
- Ordinary Differential Equations — Spring (2017–2018, 2012–2014)
- Calculus II — Fall 2017, Spring 2012
- Calculus I — Summer (2017–2018), Spring 2016, Fall 2011

Math Instructor — Summer 2017
Noonan Scholars Summer Academy

- Taught pre-calculus and introductory calculus to 25 first-generation students of color from the greater Boston area; supervised two teaching assistants

Student Research Supervised

Project title: *Global Pricing Models for Medical Devices.* — Spring 2013

- Work done in collaboration with Boston Scientific. Students supervised: Ana Plascencia Casillas '14, Shuyu Gao '13, Karan Kanodia '13 (Babson College), Laura Liu '14, and Farheen Rahimtoola '13

Project title: *Assessing Risk in the Quality Control Process.* Spring 2013

- Work done in collaboration with Boston Scientific. Students supervised: Sookyo Jeong '14, Gerta Malaj '13, Sophie Sun '14, and Elsa Wong '15 (Babson College)

Project title: *The Quantum Mechanics of a Nanocar.* Summer 2012–Fall 2012

- Work done with Ana Plascencia Casillas '14

Student-Oriented Outreach Activities

Co-Director: Wellesley Emerging Scholars Initiative Fall 2012–Present

- Created a learning community for first year students of color and first-generation students enrolled in calculus courses. We meet twice weekly for 1 hour to work on challenging calculus problems in small groups. The program was funded by an MAA-Tensor SUMMA grant from 2013–2015.

Organizer: Applicable Mathematics Lecture Series Fall 2012–Spring 2016

- Lectures' location rotated between Babson, Olin, and Wellesley Colleges and focused on the real-world applications of mathematics. Lecturers included representatives from: Mathworks Inc., Wolfram Inc., The Chubb Corporation, and Bank of America.

Co-organizer: "Epic Pi Day 2015" Spring 2015

- Set up pi-related activities and provided food for the over 130 science students and faculty that attended; event began at 9:26:53 a.m. on 3/14/15.

Mentor to Latina students in *Mezcla* Fall 2012–Fall 2016

Wellesley College *Math Games* judge Fall 2014

Head Mathematics Coach Fall 2006–Spring 2010
University of Michigan, Ross School of Business *Preparation Initiative*

- Trained incoming mathematics coaches (and served as one myself) to tutor, advise, and mentor students of color applying to the business B.A. program and enrolled in first-year calculus courses.

College and Departmental Service

College-wide:

- Advisor to first year students Fall 2018–Present
- Educational Research & Development Committee Fall 2018–Present
- Career Education Advisory Committee Fall 2017–Present
- Inclusive Excellence Working Group Spring 2018–Present
- Inclusive Excellence Faculty Retreat Planning Committee Spring 2018
- Associate Dean of Academic Integration Search Committee Spring 2018
- Dean of Students Search Committee Fall 2015–Fall 2016
- Agenda Committee (sets agenda for academic council meetings) Fall 2015–Spring 2017

- Sherman Fairchild Foundation grant steering committee — Spring 2015–Fall 2016
- Honor Code Council — Fall 2012–Spring 2014

Departmental:

- One of three representatives at our "Meet the Departments" biannual events — Fall 2012–Present
- Applied math curriculum subcommittee — Spring 2015–Present
- Mathematics tenure-track hiring committee — Fall 2015–Spring 2016
- Mathematics "virtual career panel" coordinator — Fall 2015–Spring 2016

Professional Development Activities

- Assoc. of Teachers of Mathematics in New England (ATMNE) Fall Conference, Marlboro, MA — Fall 2017
- AACU Massachusetts Project Kaleidoscope (PKAL) Conference, Framingham State University, Framingham, MA — Fall 2015
- Transforming Postsecondary Education (TPSE) meeting, University of Maryland, Baltimore County, MD — Fall 2015
- Legacy of R.L. Moore Inquiry-Based Learning Conference, Austin, TX — Summer 2010
- Society for the Advancement of Chicanos and Native Americans in the Sciences (SACNAS) Conference, Dallas, TX — Fall 2009
- SREB Compact for Faculty Diversity Institute on Teaching and Mentoring Conference — Fall (2006, 2007, 2008)
- Referee: J. Mathematical Physics, J. Applied Mechanics, J. Geometric Mechanics, Physica D, SIGMA
- Book reviewer for Princeton University Press