Brian Seguin

Mathematics and Statistics
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Positions

- **Assistant Professor**, August 2015 to present
  Department of Mathematics and Statistics, Loyola University Chicago
- **Postdoctoral Research Assistant**, January 2014 to May 2015
  Division of Mathematics, University of Dundee
- **Postdoctoral Fellow**, July 2010 to September 2013
  Department of Mathematics and Statistics, McGill University

Education

- **Ph.D. in Mathematical Sciences**, 2010
  Carnegie Mellon University, Pittsburgh PA
- **M.S. in Mathematical Sciences**, 2009
  Carnegie Mellon University, Pittsburgh PA
- **B.S. in Engineering Mechanics**, 2005
  Minor in Mathematics (honors program), 2005
  University of Illinois, Urbana–Champaign IL

Research Interests

- applied mathematics
- multiscale problems
- differential geometry
- mechanics

Publications

- Seguin, B., Chen, Y.C., Fried, E.: Closed unstretchable knotless ribbons and the Wunderlich functional. *submitted*
- Zambom, A.Z., Seguin, B.: Fastest route planning for an unmanned vehicle in the presence of accelerating obstacles. *submitted*
- Seguin, B., Walkington N.J.: Multi-component multiphase flow. accepted at *Archive for Rational Mechanics and Analysis*

- Seguin, B.: A fractional notion of length and an associated nonlocal curvature. *The Journal of Geometric Analysis* https://doi.org/10.1007/s12220-018-00140-9

- Seguin, B.: A transport theorem for nonconvecting open sets on an embedded manifold. *Continuum Mechanics and Thermodynamics* https://doi.org/10.1007/s00161-019-00777-z

- Seguin, B., Walkington N.J.: Multi-component multiphase flow through a poroelastic medium. *Journal of Elasticity* **135**, 485–507 (2019)

- Zambom, A.Z., Seguin, B., Zhao, F.: Robot path planning in a dynamic environment with stochastic measurements. *Journal of Global Optimization* **73**, 389–410 (2019)

- Paroni, R., Podio-Guidugli, P., Seguin, B.: On the nonlocal curvatures of open surfaces. *Communications of Pure and Applied Analysis* **17**, 709–727 (2018)

- Seguin, B.: On the homogenization of a new class of locally periodic microstructures in linear elasticity with residual stress. *Mathematics and Mechanics of Solids* **23**, 1025–1039 (2017)

- Ptashnyk, M., Seguin, B.: Homogenization of a viscoelastic model for plant cell wall biomechanics. *ESIAM: Control, Optimisation and Calculus of Variations* **23**, 1447–1471 (2017)

- Ptashnyk, M., Seguin, B.: The impact of microfibril orientations on the biomechanics of plant cell walls and tissues: modelling and simulations. *Bulletin of Mathematical Biology* **78**, 2135–2164 (2016)

- Ptashnyk, M., Seguin, B.: Periodic homogenization and material symmetry in linear elasticity. *Journal of Elasticity* **124**, 225-241 (2016)

- Ptashnyk, M., Seguin, B.: Homogenization of a system of elastic and reaction-diffusion equations modelling plant cell wall biomechanics. *ESIAM Mathematical Modelling and Numerical Analysis* **50**, 593–631 (2016)

- Seguin, B., Fried, E.: Stable and unstable helices: Soap films in cylindrical tubes. *Calculus of Variations and Partial Differential Equations* **54**, 969–988 (2015)

- Seguin, B., Fried, E.: Calculating the bending moduli of the Canham–Helfrich free-energy density from a particular potential. ICMS Workshop: *Differential Geometry and Continuum Mechanics*. Proceedings in Mathematics and Statistics. Springer (2015)

- Seguin, B., Hinz, D. F., Fried, E.: Extending the transport theorem to rough domains of integration. *Applied Mechanics Reviews* **66**, 050802 (2014)

- Seguin, B., Fried, E.: Roughening it — Evolving irregular domains and transport theorems. *Mathematical Models and Methods in Applied Sciences* **24**, 1729 (2014)

- Seguin, B., Fried, E.: Microphysical derivation of the Canham–Helfrich free-energy density. *Journal of Mathematical Biology* **68**, 647–665 (2014)

- Maleki, M., Seguin, B., Fried, E.: Kinematics, material symmetry, and energy densities for lipid bilayers with spontaneous curvature. *Biomechanics and Modeling in Mechanobiology* **12**, 997–1017 (2013)

- Seguin, B., Fried, E.: Statistical foundations of liquid-crystal Theory II. Continuum-level balances. *Archive for Rational Mechanics and Analysis* **207**, 1–37 (2013)

- Seguin, B., Fried, E.: Statistical foundations of liquid-crystal theory I. Discrete systems of rod-like molecules. *Archive for Rational Mechanics and Analysis* **206**, 1039–1072 (2012)
- Capriz, G., Fried, E., Seguin, B.: Constrained ephemeral continua. *Rendiconti Lincei–Matematica e Applicazioni* **23**, 157–195 (2012)
- Seguin, B.: Simple thermomechanical materials with memory. *Journal of Elasticity* **105**, 207–252 (2011)
- Seguin, B.: Thermoelasto-viscous materials. *Journal of Elasticity* **101**, 153–177 (2010)
- Noll, W., Seguin, B.: Basic concepts in thermomechanics. *Journal of Elasticity* **101**, 121–151 (2010)
- Noll, W., Seguin, B.: Plugs in viscometric flows of simple semi-liquids. *Journal of the Society of Rheology Japan* **37**, 1–10 (2009)
- Noll, W., Seguin, B.: Monoids, boolean algebras, and materially ordered sets. *International Journal of Pure and Applied Mathematics* **37**, 187–202 (2007)

Talks

- *Isometric deformations: closed ribbons and beyond*, Recent Advances in Mechanics and Mathematics of Materials, Sapienza University of Rome, Italy, November 2019
- *Modeling Lipid Bilayers: a combination of mechanics and geometry*, Rataj Lecture, Loyola University Chicago, October 2019
- *On the nonlocal curvature of surfaces and curves*, Geometry, Topology and Dynamics Seminar, OIST, Japan, February 2019
- *Homogenization and material isomorphisms involving periodic and locally periodic microstructures*, joint meeting of SNP and ISIMM, University of Oxford, Oxford, June 2018
- *On the nonlocal curvature of surfaces and curves*, CoMFoS17: Mathematical Analysis of Continuum Mechanics, OIST, Japan, September 2017
- *On the nonlocal curvature of surfaces and curves*, Midwest PDE Seminar, University of Illinois, Chicago, September 2017
- *Some interplay between homogenization and material isomorphisms*, Università Degli Studi de Udine, Udine Italy, March 2017
- *Homogenization of locally periodic microstructures with anisotropy and residual stress*, AMS Sectional Meeting, Brunswick ME, October 2016
- *The benefits of symmetry in the homogenization of linearly elastic materials*, Loyola University Chicago, Chicago IL, March 2016
- *Material symmetry and periodic homogenization in linear elasticity*, Okinawa Institute of Science and Technology, Okinawa Japan, December 2015

- *Homogenization of a system of elastic and reaction-diffusion equations modelling plant cell wall biomechanics*, University of Illinois at Chicago, Chicago IL, November 2015
- *A Transport Theorem for Irregularly Evolving Domains*, Society for Natural Philosophy meeting, University of Calgary, Calgary ON, August 2015
- *Modeling a Plant Cell Wall: model and multiscale analysis*, Weierstrass Institute for Applied Analysis and Stochastics, Berlin Germany, June 2015
- *Modeling a Plant Cell Wall: model and multiscale analysis*, Applied Mathematics Seminar, University of Glasgow, Glasgow UK, February 2015
- *Stability of a Helical Soap Film in a Tube and other interesting topics*, Job Talk, Loyola University Chicago, January 2015
- *Modeling a Plant Cell Wall: interactions between mechanics and biochemistry*, European Conference on Mathematical and Theoretical Biology, Gothenburg Sweden, June 2014
- *Stability of a Helical Soap Film in a Cylindrical Tube*, Scottish PDE Colloquium, University of Edinburgh, Edinburgh UK, May 2014
- *Stability of a Helical Soap Film in a Cylindrical Tube*, Society for Natural Philosophy meeting, University of Minnesota, Minneapolis MN, November 2013
- *Microphysical Derivation of the Canham–Helfrich Free-Energy Density*, Society for Engineering Sciences, Brown University, Providence RI, July 2013
- *Statistical Foundations of Liquid Crystal Theory*, Society for Industrial and Applied Mathematics, Philadelphia PA, June 2013
- *A Microphysical Derivation of the Canham–Helfrich Energy*, Pan American Congress of Applied Mechanics XIII, University of Houston, Houston TX, May 2013
- *Evolving Irregular Domains and a Generalized Transport Theorem*, Pan American Congress of Applied Mechanics XIII, University of Houston, Houston TX, May 2013
- *Derivation of the Balance Laws for Liquid Crystals using Statistical Mechanics*, Nonlinear Analysis of Continuum Theories: Statics and Dynamics, Oxford University, Oxford UK, April 2013
- *Deriving the Canham–Helfrich Energy Using Statistical Mechanics*, Department of Mechanical Engineering and Materials Science Colloquium, Washington University, St. Louis MO, October 2012
- *A Statistical Mechanical Derivation of the Canham–Helfrich Energy for a Lipid Bilayer*, Biomath Seminar, IUPUI, Indianapolis IN, October 2012
- *Evolving Irregular Domains and a Generalized Transport Theorem*, Analysis Seminar, McGill University, Montreal QC, September 2012
- *A Transport Theorem for Irregular Evolving Domains*, Focus Program on Geometry, Mechanics and Dynamics: the Legacy of Jerry Marsden, University of Toronto, Toronto ON, July 2012

- *Statistical Foundations of Liquid-Crystals*, Applied Math Days, Rensselaer Polytechnic Institute, Troy NY, March 2012
- *Statistical Foundations of Liquid-Crystals*, Applied Mathematics Seminar, McGill University, Montreal QC, March 2012
- *An Introduction to Frame-Free Continuum Thermomechanics*, American Mathematical Society Conference, University of Kentucky, Lexington KY, March 2010
- *An Introduction to Frame-Free Continuum Thermomechanics*, Job talk, McGill University, Montreal QC, November 2009
- *How Should We Think About Space? A motivation for the principle of material frame-indifference*, Undergraduate Colloquium, Carnegie Mellon University, Pittsburgh PA, October 2009
- *Frame-Free Continuum Thermomechanics*, 8th International Congress on Thermal Stresses, University of Illinois, Urbana-Champaign IL, May 2009
- *Frame-Free Continuum Thermomechanics*, Center for Nonlinear Analysis, Carnegie Mellon University, Pittsburgh PA, May 2009
- *A Step Towards Frame-free Thermomechanics*, Society for Industrial and Applied Mathematics conference, Philadelphia PA, May 2008
- *Plugs in Viscometric Flows of Simple Semi-Liquids*, Society for Engineering Science conference, Texas A&M, College Station TX, October 2007
- *Plugs in Viscometric Flows of Simple Semi-Liquids*, Society for Natural Philosophy meeting, Purdue University, West Lafayette IN, November 2006

Teaching

Loyola University Chicago, Chicago IL

- **Instructor**
  - Math 108 Real World Modeling — Fall 2018
  - Math 161 Calculus I — Fall 2015, Spring 2017, Fall 2019
  - Math 162 Calculus II — Spring 2016, Fall 2017
  - Math 212 Linear Algebra — Fall 2019
  - Math 263 Multivariable Calculus — Fall 2015, Spring 2018, Fall 2018
  - Math 264 Ordinary Differential Equations — Fall 2017
  - Math 313 Abstract Algebra — Spring 2017
  - Math 351 Introduction to Real Analysis I — Fall 2015
  - Math 352 Introduction to Real Analysis II — Spring 2016
  - Math 353 Introductory Complex Analysis — Fall 2015

McGill University, Montreal QC

- **Instructor**
  - Math 262 Intermediate Calculus — Fall 2011
  - Math 666 Seminar course: Differential Geometry with Applications — Fall 2010

Carnegie Mellon University, Pittsburgh PA

- **Instructor**
  - 21-105 Pre-Calculus — Summer 2008
  - 21-260 Differential Equations — Summer 2007
  - 21-127 Concepts of Mathematics — Summer 2006
- **Teaching Assistant**
  - 21-235 Mathematical Studies (honors program) — Fall 2009, Spring 2010
  - 21-470 Calculus of Variations — Summer 2009
  - 21-126 Introduction to Mathematical Software — Spring 2009, 2008
  - 21-122 Integration, Differential Equations and Approximation — Fall 2008
  - 21-120 Differential and Integral Calculus — Fall 2007, Fall 2006
  - 21-257 Models and Methods of Optimization — Fall 2006
  - 21-259 Calculus in Three Dimensions — Fall 2005

Service

- Co-Organizer of the 55th meeting of the Society for Natural Philosophy on Microstructure, Defects, and Growth in Mechanics, Loyola University Chicago, Fall 2019. Supported by **NSF Grant** #1931144 on which I am a PI
- Co-Organizer, Quantum Mechanics Seminar, Loyola University Chicago, Fall 2019
- Leadership Team for Chicago Math Teachers' Circle at Loyola, Fall 2017 to present
- Treasurer for the Society for Natural Philosophy, March 2017 to present
- Co-Organizer, 78th Midwest PDE Seminar, Loyola University Chicago, Fall 2016
- Organizer, Mathematical Biology Working Group, University of Dundee, Spring 2014
- Co-Organizer, Geometric Measure Theory Reading Group, McGill University, Spring 2012
- Co-Organizer, Operator Theory Reading Group, McGill University, Montreal QC, Fall 2011