

## Robert P. Viator Jr.

*Visiting Assistant Professor – Swarthmore College*

### CONTACT INFORMATION

*Address:* 318 N. Chester Rd., Floor 1  
Swarthmore, PA 19081  
*Phone:* (225) 978-0649  
*Email:* rviator1@swarthmore.edu

### PROFESSIONAL EXPERIENCE

<i>Teaching Assistant</i>	Louisiana State University	2009-2016
<i>Postdoctoral Researcher</i>	IMA	2016-2017
<i>Visiting Assistant Professor</i>	Southern Methodist University	2017-2020
<i>Visiting Assistant Professor</i>	Swarthmore College	2020-Present

### EDUCATION

<i>B.S. in Mathematics</i>	Louisiana State University	2009
<i>M.S. in Mathematics</i>	Louisiana State University	2012
<i>Ph.D in Mathematics</i>	Louisiana State University	2016

### RESEARCH HISTORY

*Postdoctoral Research* IMA, SMU, Swarthmore 2016-present  
-Mathematics of Electromagnetism & Optics  
-Mathematics of Composite Materials  
-Perturbative & Asymptotic methods  
-Shape deformation and Isoperimetric inequalities

*Doctoral Research* Louisiana State University 2012-2016  
-Spectral Properties of Photonic Crystals  
-Mathematics of Electromagnetic Metamaterials  
-Integral Transforms and Divergence-Form PDE

### RESEARCH INTERESTS

Partial Differential Equations  
Spectral Theory  
Perturbation Theory  
Optics, Photonics, and Electromagnetism  
Materials Science

### COMPUTATIONAL SOFTWARE

MATLAB  
COMSOL

## TEACHING EXPERIENCE

### - LSU

- *Calculus I*
- *Differential Equations and Linear Algebra*
- *Number Sense and Problem Solving*
- *Geometry, Reasoning, and Measurement*

### - SMU

- *Calculus I – III (Fall 2017 – Spring 2020)*
- *Introduction to Proofs and Analysis (Spring 2020)*

### - Swarthmore College

- *Real Analysis (Fall 2020, Fall 2021, Fall 2022)*
- *Theory of Differential Equations (Spring 2021)*
- *Linear Algebra (Spring 2022)*

## AWARDS

<i>Certificate of Teaching Excellence</i>	Louisiana State University	Spring 2013
<i>Certificate of Teaching Excellence</i>	Louisiana State University	Fall 2013
<i>David Oxley Teaching Award</i>	Louisiana State University	Fall 2014
<i>Betty M. Spears Teaching Excellence Award</i>	Southern Methodist University	Spring 2018
<i>HOPE Professor of the Year Award (Nomination)</i>	Southern Methodist University	Fall 2020

## STUDENT-FOCUSED TRAINING SESSIONS

- “Mathematical Proofs: Practice and Prep”, Swarthmore College, Fall 2021. Co-organized with Nsoki Mavinga
- “Mathematical Proofs: Practice and Prep”, Swarthmore College, Fall 2022. Co-organized with Nsoki Mavinga

## LECTURES AND PRESENTATIONS

- “Metamaterials and Non-coercive Equations,” Graduate Student Seminar, LSU, Baton Rouge, LA, November 2012.
- “Asymptotic Analysis of High-Contrast Photonic Crystals” AMS Session on Mathematics Applied to the Physical Sciences, AMS Joint Mathematics Meetings, San Antonio, TX, January 2015
- “Perturbation Theory of High-Contrast Photonic Crystals,” Applied Analysis Seminar, LSU, Baton Rouge, LA, March 2015
- “Radii of Convergence for Power Series Expansions of Eigenfrequencies of High-Contrast Photonic Crystals,” MAA General Contributed Paper Session on Applied Mathematics, III, AMS Joint Mathematics Meetings, Seattle, WA, January 2016
- “Prescribing a Finite Contrast Ratio for Opening Band Gaps in 2-dimensional Periodic Media” IMA Postdoc Seminar, IMA, Minneapolis, MN, September 2016
- “Analysis of Maxwell’s Equations in Passive Layered Media” IMA Postdoc Seminar, IMA, Minneapolis, MN, September 2016
- “Criteria for opening band gaps in periodic media” Session 11C: Contributed Talks, WAVES 2017, MN, May 2017

- “Opening Band Gaps in Two-dimensional Photonic Crystals” University of Utah Applied Mathematics Seminar, University of Utah, UT, July 2017
- “Steklov eigenvalues of reflection-symmetric nearly-circular planar domains” AMS Contributed Paper Session on Partial Differential Equations I, Joint Mathematics Meetings, Baltimore, MD January 2019
- “Steklov eigenvalues of reflection-symmetric nearly-circular planar domains” University of Utah Applied Mathematics Seminar, University of Utah, UT, June 2019
- “Opening band gaps in photonic and acoustic crystals” ICIAM 2019, Minisymposium on Multiscale and Asymptotic Analysis, Modeling, and Simulation for Materials Science, Valencia, Spain, July 2019
- “Shape Perturbation of Steklov Eigenvalues in Nearly-Circular and Nearly-Spherical Domains” SIAM Conference on Analysis of Partial Differential Equations, Minisymposium on Recent Developments on Steklov Eigenproblems, La Quinta, CA, December 2019
- “Bloch Waves in 3D Photonic Crystals” SIAM TX/LA Sectional Meeting, Minisymposium on Analytic and Computational Approaches for Metamaterial and Nanoscale Optics, College Station, TX, October 2020
- “Nonreciprocal optical behavior in high-loss magnetic-dielectric photonic crystals” SIAM Conference on Mathematical Aspects of materials Science, Minisymposium on Frontiers in nonreciprocity, metamaterials, and non-symmetric effective tensors, May 2021
- “Bloch Waves in 3-dimensional high-contrast photonic crystals” Mathematical Congress of the Americas, Workshop: Diverse Aspects of Elliptic PDEs and Related Problems, July 2021
- “Bloch Waves in 3D Photonic Crystals” SIAM TX/LA Sectional Meeting, Minisymposium on Advances in Theory and Applications of Composite Materials, College Station, TX, November 2021
- “Periodic PDE and Composite Materials: Band Gaps, Spectral Methods, and Effective Properties” Mathematical Sciences Department Colloquium, Florida Institute of Technology, June 2022
- “Shape-Perturbation of Steklov Eigenvalues in Nearly-Spherical Domains” MAA Mathfest, Invited Paper Session: Recent Advances in Harmonic Analysis and Partial Differential Equations, August 2022
- “Shape-Perturbation of Steklov Eigenvalues in Nearly-circular and Nearly-Spherical Domains” Analysis & Applied Mathematics Seminar, Wake Forest University, October 2022

## **SYMPOSIA & SPECIAL SESSIONS**

- Minisymposium: *Frontiers in nonreciprocity, metamaterials, and non-symmetric effective tensors*. SIAM Conference on Mathematical Aspects of Materials Science, May 2021. Co-organized with Christian Kern, Ornella Mattei, and Aaron Welters.
- Minisymposium: *Advances in Theory and Applications of Composite Materials*. Fourth Annual Meeting of the SIAM Texas-Louisiana Section, November 2021. Co-organized with Aaron Welters and Anthony Stefan.

## **PAPERS AND PUBLICATIONS**

- Lipton, R. and Viator, R., “Bloch Waves in crystals and periodic high contrast media” (ESAIM: M2AN Volume 51, Number 3, pg 889-918, April 2017)

- Lipton, R. and Viator, R., "Creating Band Gaps in Periodic Media" (Multiscale Model. Simul., Volume 15, Issue 4, pg 1612-1650, June 2017)
- Viator, R. and Osting, B., "Steklov eigenvalues of reflection-symmetric nearly-circular planar domains" (The Royal Society (Proceedings A), Volume 474, Issue 2220, December 2018)
- Viator, R. and Osting, B., "Analyticity of Steklov eigenvalues in nearly-circular and nearly-spherical domains" (Research in the Mathematical Sciences, Volume 7, Number 4, January 2020)
- Lipton, R., Viator, R., Jimenez, S., and Adili, A., "Bloch Waves in high contrast electromagnetic crystals" (ESAIM: M2AN Volume 56, Number 5, pg 1483-1519, October 2022)
- Viator, R., Osting, B., "Steklov eigenvalues of nearly-spherical domains" (Journal on Control and Optimization, Volume 30, Issue 3, 2022)
- Beard, K., Stefan, A., Viator, R., and Welters, A., "On effective operators and their variational principles for discrete electrical network problems" (Under review)