

Joseph Bernhardt Geddes III

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Education Doctor of Philosophy in Engineering Science

The Pennsylvania State University, University Park, PA (2002–2006)

- Graduated: May 2006
- Thesis: Manipulation of optical pulses with chiral sculptured thin films
- Advisor: Akhlesh Lakhtakia

Master of Science in Engineering Science

The Pennsylvania State University, University Park, PA (1997–2001)

- Graduated: May 2001
- Thesis: Traversal of optical pulses through dielectric thin-film helicoidal bianisotropic mediums
- Advisor: Akhlesh Lakhtakia

Bachelor of Science in Engineering Science

The Pennsylvania State University, University Park, PA (1997–2001)

- Graduated: May 2001 with Honors and Minor in Engineering Mechanics
- Thesis: Circular Bragg phenomenon and pulse bleeding in cholesteric liquid crystals
- Advisor: Akhlesh Lakhtakia

Research Optics and Optical Materials

Postdoctoral Fellow, Beckman Institute, U. of Illinois at Urbana-Champaign (2006–2007)

- Performed calculations that resolved controversy concerning refractive index of active two-component media.
- Predicted properties of metal-dielectric metamaterials and photonic crystals exhibiting enhanced nonlinear properties (*PI: Paul Braun*).
- Developed algorithms to calculate reflection and transmission spectra of holographic photonic crystals (*PI: Pierre Wiltzius*).
- Performed calculations and built systems for development of optical coherence tomography exhibiting molecular specificity (*PI: Stephen Boppart*).
- Helped researchers model plasmonic crystal biosensors (*PI: John Rogers*).
- Modeled and designed experiment to demonstrate advantages of semiconductor detectors transferred to curved substrates (*PI: John Rogers*).
- Mentored three graduate students in conduct of research on optics of metamaterials, photonic crystals, and plasmonic crystal biosensors.

Optics of Sculptured Thin Films

Graduate/Undergraduate Research Assistant, Penn State University (1998–2006)

- Developed numerical models of optical pulsed plane wave and beam propagation through cholesteric liquid crystals and chiral sculptured thin films (*PI: Akhlesh Lakhtakia*).
- Implemented new finite-difference algorithms on supercomputers at Pittsburgh Supercomputing Center.

SPIRIT Sounding Rocket

Undergraduate Research Assistant, Penn State University (1998–2001)

- Designed and built pair of Langmuir probes for sounding rocket with two other students (*PI: Timothy Wheeler*).

- Constructed circuits for optical experiment on payload (*PI: David Meisel*).
- Helped build smaller rocket payload to test flight hardware.

Atmospheric Science

Undergraduate Research Assistant, Penn State University (1998–2000)

- Worked in Atmospheric Sensing and Lidar Lab (*PI: Timothy Kane*).
- Helped build and program a prototype photometer for attempts at optical detection of micrometeors (*PI: David Meisel*).
- Aided installation and test of experiment at Arecibo Observatory, Puerto Rico.

Greenland Lidar Studies

Undergraduate Research Assistant, Sondrestrom, Greenland (Summer 1998)

- Operated, experimented upon, and helped maintain two lidar atmospheric remote sensing instruments (*PI: Timothy Kane*).
- Experimented with optogalvanic tuning system for dye laser.

Antarctica Lidar Studies

Undergraduate Research Assistant, South Pole, Antarctica (Fall 1997)

- Worked for three weeks at South Pole Station with NSF sponsorship (*PI: George Papen*).
- Helped repair lidar atmospheric remote sensing instrument.
- Conducted outreach activities for elementary and high school students.

Honors

- SPIE Educational Scholarship (2004)
- SPIE Travel Grant (2003)
- National Science Foundation Graduate Research Fellowship (2001–2004)
- Xerox Award for research accomplishment by an MS student (2001)
- Dean’s Award for research accomplishment by a BS student (2001)
- Proctor & Gamble Summer Undergraduate Research Fellowship (2000)
- Eagle Scout (1996)

Teaching

Department of Engineering Science and Mechanics

Instructor and Teaching Assistant, Penn State University (2004–2006)

- Earned Teaching with Technology Certificate (Spring 2006).
- Instructor for introductory course in engineering dynamics (Summer 2004, 2005).
- Earned Graduate School Teaching Certificate (Spring 2005).
- Served as teaching assistant for upper level course in laboratory techniques and experimental statistics. Delivered several lectures and created optics laboratory exercises for students (Fall 2004, 2005).
- Served as teaching assistant for introductory course in engineering statics. Lead recitation sections and tutored students on homework problems (Fall 2004).
- Served as teaching assistant for introductory course in numerical methods. Delivered several lectures and helped students complete in-class programming exercises (Spring 2004).

Villanova Summer Research Institute

Teaching Assistant and Counselor, Villanova University (1999, 2001)

- Worked as counselor and teaching assistant for high school students in summer enrichment program in biology, mathematics, and computing (*PI: William Fleischman*).
- Served as research guide for group of students investigating mathematical models of HIV and language evolution.
- Taught basic programming techniques in the Maple computer language.

Chapters

- J. B. Geddes III, Towards shaping of pulsed plane waves in the time domain via chiral sculptured thin films, in *Frontiers in Optical Technology: Materials and Devices*, P. K. Choudhury and O. N. Singh, Eds., Nova Science Publishers: Hauppauge, NY, USA (2006).

- J. B. Geddes III, Prospects for thermoacoustic technology, in *Innovations and Materials for Green Engineering*, Volume III, A. Lakhtakia and C. E. Bakis, Eds., Pennsylvania State University: University Park, PA, USA (2001).

Papers Journal Articles:

- A. Lakhtakia, J. B. Geddes III, and T. G. Mackay, When does the choice of the refractive index of a linear, homogeneous, isotropic, active, dielectric medium matter?, *Opt. Express* 15 (2007) 17709–17714.
- Y. C. Chen, J. B. Geddes III, J. T. Lee, P. V. Braun, and P. Wiltzius, Holographically fabricated photonic crystals with large reflectance, *Appl. Phys. Lett.* 91 (2007) 241103.
- J. B. Geddes III, T. G. Mackay, and A. Lakhtakia, On the refractive index for a nonmagnetic two-component medium: resolution of a controversy, *Opt. Commun.* 280 (2007) 120–125.
- J. B. Geddes III and A. Lakhtakia, Swamping of circular Bragg phenomenon and shaping of videopulses, *Microwave Opt. Technol. Lett.* 49 (2007) 776–779.
- A. Lakhtakia and J. B. Geddes III, Scattering by a nihility cylinder, *AEÜ Int. J. Electron. Commun.* 61 (2007) 62–65.
- J. B. Geddes III and A. Lakhtakia, Quantification of pulsed-plane-wave-shaping by chiral sculptured thin films, *J. Mod. Opt.* 53 (2006) 2763–2783.
- J. B. Geddes III and A. Lakhtakia, Numerical investigation of reflection, refraction, and diffraction of pulsed optical beams by chiral sculptured thin films, *Opt. Commun.* 252 (2005) 307–320.
- A. Lakhtakia and J. B. Geddes III, Nanotechnology for optics is a phase-length-time sandwich, *Opt. Eng.* 43 (2004) 2410–2417.
- J. B. Geddes III and A. Lakhtakia, Effects of carrier phase on reflection of optical narrow-extent pulses from axially excited chiral sculptured thin films, *Opt. Commun.* 225 (2003) 141–150.
- J. Wang, A. Lakhtakia, and J. B. Geddes III, Multiple Bragg regimes exhibited by a chiral sculptured thin film half-space on axial excitation, *Optik* 113 (2002) 213–221.
- J. B. Geddes III and A. Lakhtakia, Videopulse bleeding in axially excited chiral sculptured thin films in the Bragg regime, *Eur. Phys. J. Appl. Phys.* 17 (2002) 21–24.
- J. B. Geddes III and A. Lakhtakia, Pulse-coded information transmission across an axially excited chiral-sculptured thin film in the Bragg regime, *Microw. Opt. Technol. Lett.* 28 (2001) 59–62.
- J. B. Geddes III and A. Lakhtakia, Time-domain simulation of the circular Bragg phenomenon exhibited by chiral sculptured thin films, *Eur. Phys. J. Appl. Phys.* 14 (2001) 97–105; Erratum: 16 (2001) 247.
- J. B. Geddes III and A. Lakhtakia, Reflection and transmission of optical narrow-extent pulses by axially excited chiral sculptured thin films, *Eur. Phys. J. Appl. Phys.* 13 (2001) 3–14; Erratum: 16 (2001) 247.
- J. B. Geddes III and A. Lakhtakia, Time-domain signature of an axially excited cholesteric liquid crystal. Part II: Rectangular wide-extent pulses, *Optik* 112 (2001) 62–66.
- J. B. Geddes III, M. W. Meredith, and A. Lakhtakia, Circular Bragg phenomenon and pulse bleeding in cholesteric liquid crystals, *Opt. Commun.* 182 (2000) 45–57.

Conference Publications—Full Papers:

- J. B. Geddes III and A. Lakhtakia, Swamping of circular Bragg phenomenon revealed by durations and average speeds of videopulses transmitted through chiral sculptured thin films, *Proc. SPIE* 6638 (2007) 66380O.
- J. B. Geddes III and A. Lakhtakia, Durations and average speeds of ultrashort pulses shaped by chiral sculptured thin films, *Proc. SPIE* 6328 (2006) 632811.

- J. B. Geddes III and A. Lakhtakia, Pulsed-beam propagation through a chiral sculptured thin film, Proc. SPIE 5509 (2004) 83–93.
- J. B. Geddes III and A. Lakhtakia, Phase effects on reflection of narrow-extent pulses from axially excited chiral sculptured thin films, Proc. SPIE 5219 (2003) 83–91.
- J. B. Geddes III, M. W. Meredith, and A. Lakhtakia, Pulse bleeding in thin-film helicoidal bianisotropic mediums, Proc. SPIE 4097 (2000) 352–355.

Conference Publications—Summaries and Abstracts:

- J. B. Geddes III, D. L. Marks, Z. Jiang, and S. A. Boppart, Analysis of pulse shaping for selective excitation of coherent anti-Stokes Raman scattering for improvement of nonlinear interferometric vibrational imaging, accepted for SPIE Photonics West, San Jose, CA, USA (19–24 Jan. 2008).
- Z. Jiang, D. L. Marks, J. B. Geddes III, and S. A. Boppart, Nonlinear interferometric vibrational imaging of biological tissue, accepted for SPIE Photonics West, San Jose, CA, USA (19–24 Jan. 2008).
- J. B. Geddes III, T. G. Mackay, and A. Lakhtakia, Determination of sign of refractive index of active media via time-domain calculation, OSA Annual Meeting, San Jose, CA, USA (16–20 Sep. 2007).
- Y.-C. Chen, J. B. Geddes III, P. V. Braun, and P. Wiltzius, Optical characterization of 3D photonic crystals fabricated by holographic lithography, APS March Meeting, Denver, CO, USA (5–9 Mar. 2007).
- J. B. Geddes III and A. Lakhtakia, Average speeds and durations of pulsed plane waves transmitted through chiral sculptured thin films, APS March Meeting, Baltimore, MD, USA (13–17 Mar. 2006).
- J. B. Geddes III and A. Lakhtakia, Shaping of electromagnetic pulsed beams by chiral sculptured thin films, Asia Pacific Microwave Conference, New Delhi, India (15–18 Dec. 2004).
- J. B. Geddes III and A. Lakhtakia, Time-domain manifestation of the circular Bragg phenomenon in an axially excited chiral sculptured thin film, OSA Annual Meeting, Long Beach, CA, USA (14–18 Oct. 2001).

Service

- First president of Engineering Science and Mechanics (ESM) Graduate Student Council; worked to improve ESM department through increased communication between faculty and graduate students (Fall 2004–Spring 2005).
- Helped organize first graduate student symposium in ESM department (Spring 2005).
- Vice president of the Penn State Student Chapter of SPIE (Fall 2004–Spring 2005).
- Served in the Graduate Student Association (Fall 2004–Spring 2005).

Reviewer

- Electromagnetics
- Journal of Nanophotonics
- Journal of Raman Spectroscopy
- Optics Letters

Member

- American Physical Society (APS)
- Institute of Electrical and Electronics Engineers (IEEE)
- International Society for Optical Engineering (SPIE)
- Optical Society of America (OSA)
- Materials Research Society (MRS)
- Society for Amateur Scientists (SAS)