

# Nathan Louis Gibson

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## Education:

**Doctor of Philosophy**, Applied Mathematics August, 2004  
with Concentration in Computational Mathematics  
North Carolina State University, Raleigh, NC  
Committee: Professors H. T. Banks (adviser), H. T. Tran, K. Ito, and N. G. Medhin  
Thesis: *Terahertz-Based Electromagnetic Interrogation Techniques for Damage Detection*

**Master of Science**, Applied Mathematics August, 2001  
with Concentrations in Numerical Analysis and Mathematical Modeling  
University of Tennessee, Knoxville, TN  
Committee: Professors X. Feng (adviser), S. Lenhart, and O. Karakashian  
Thesis: *Solving a Fluid-Plate Interaction Problem Using Finite Element Methods with Domain Decomposition Strategies*

**Bachelor of Science**, Mathematics May, 1998  
with Concentration in Computational and Applied Analysis  
and Minor in Computer Science  
Worcester Polytechnic Institute, Worcester, MA  
Thesis adviser: Prof. B. Servatius  
Thesis: *Molecular Computing*

## Professional Experience:

**Assistant Professor:** September 2006 - Present  
Department of Mathematics  
Oregon State University, Corvallis, OR

**NIA Postdoctoral Fellow:** August 2004 - September 2006  
Center for Research in Scientific Computation  
North Carolina State University, Raleigh, NC  
Supervised by Prof. H. T. Banks of NCSU and Dr. William Winfree of NASA Langley

**NASA Graduate Student Research Fellow:** August 2002 - July 2004  
Center for Research in Scientific Computation  
North Carolina State University, Raleigh, NC  
Advised by Prof. H. T. Banks of NCSU and Dr. William Winfree of NASA Langley

**Science Tutor:** January 2003 - May 2004  
 Individualized Learning Center  
 Wake Technical Community College, Raleigh, NC  
 Supervised by Mrs. Sharon McMillian

**Research Assistant:** August 2001 - July 2002  
 Department of Mathematics  
 North Carolina State University, Raleigh, NC  
 Advised by Prof. H. T. Banks

**Graduate Teaching Associate:** August 1999 - July 2001  
 Department of Mathematics  
 University of Tennessee, Knoxville, TN

**Summer Research:** June 2000 - August 2000  
 Department of Ecology  
 University of Tennessee, Knoxville, TN  
 Advised by Prof. S. Gavrillets

**Graduate Teaching Assistant / Maple Tutor:** August 1998 - July 1999  
 Department of Mathematics  
 University of Tennessee, Knoxville, TN  
 Supervised by Professors V. Alexiades and O. Karakashian

### Peer-Reviewed Journal Publications:

- H. T. Banks, V. A. Bokil and N. L. Gibson, “Analysis of stability and dispersion in a finite element method for Debye and Lorentz dispersive media”, accepted into *Numerical Methods for Partial Differential Equations*. Expanded version: Tech. Rep. CRSC-TR06-21, Center for Research in Scientific Computation, North Carolina State University, August 2006.
- H. T. Banks, V. A. Bokil and N. L. Gibson, “Parameter Estimation Versus Homogenization Techniques in Time-Domain Characterization of Composite Dielectrics”, *JIIP* (Special Issue on IPMS-2006 Conf. Proc.), vol. 15, no. 2, 117–135, May 2007. Expanded version: Tech. Rep. CRSC-TR06-20, Center for Research in Scientific Computation, North Carolina State University, August 2006.
- H. T. Banks, N. L. Gibson and W. P. Winfree, “2D Modeling of Pulsed THz Interrogation of SOFI with Knit Lines”, *Review of Progress in Quantitative Nondestructive Evaluation* (AIP Conf. Proc.), vol. 894, 408–414, 2007. Expanded version: Tech. Rep. CRSC-TR06-22, Center for Research in Scientific Computation, North Carolina State University, September 2006.
- H. T. Banks and N. L. Gibson, “Inverse Problems Involving Maxwell’s Equations with a Distribution of Dielectric Parameters”, *Quarterly of Applied Mathematics*, **64**, 749–795, December 2006. Expanded version: Tech. Rep. CRSC-TR05-29, Center for Research in Scientific Computation, North Carolina State University, July 2005.

- H. T. Banks and N. L. Gibson, “Void Detection in Foam with Knit Lines Using THz Pulse Interrogation”, *Mathematical and Computer Modelling*, vol. 44, nos. 9-10, 807–815, November 2006. Expanded version: Tech. Rep. CRSC-TR06-05, Center for Research in Scientific Computation, North Carolina State University, February 2006.
- H. T. Banks, V. A. Bokil, D. Cioranescu, N. L. Gibson, G. Griso, and B. Miara, “Homogenization of Periodically Varying Coefficients in Electromagnetic Materials”, *Journal of Scientific Computing*, vol. 28, no. 2, 191–221, September 2006. Expanded version: Tech. Rep. CRSC-TR05-05, Center for Research in Scientific Computation, North Carolina State University, January 2005.
- H. T. Banks and N. L. Gibson, “Well-posedness of solutions with a distribution of dielectric parameters”, *Applied Mathematics Letters* **18**, 423–430, 2005. Expanded version: Tech. Rep. CRSC-TR04-01, Center for Research in Scientific Computation, North Carolina State University, January 2004.
- H. T. Banks, N. L. Gibson and W. P. Winfree, “Gap detection with electromagnetic terahertz signals”, *Nonlinear Analysis: Real World Applications* **6**, 381–416, 2005. Expanded version: Tech. Rep. CRSC-TR03-40, Center for Research in Scientific Computation, North Carolina State University, September 2003.
- S. Gavrilets and N. L. Gibson, “Fixation Probabilities in a Spatially Heterogeneous Environment”, *Population Ecology* **44**, 51–58, 2002.

### Other Publications:

- Nathan Gibson, Jason Kurtz, Ahmed Naga, Zoi Rapti, Yoon Song, Yan Yu, and Stanislav Žabić, “Ring Structure against Rolling Circular Drum” in 2001 Industrial Mathematics Modeling Workshop for Graduate Students, P. A. Gremaud, Z. Li, R. C. Smith, and H. T. Tran, editors, Tech. Rep. CRSC-TR01-27, Center for Research in Scientific Computation, North Carolina State University, November 2001.

### Invited Presentations:

- Applied Mathematics and Computation Seminar, Oregon State University, Corvallis, OR. “Gradient-based Methods for Optimization. Parts I and II.”, November, 2007.
- Conference on Applied Inverse Problems 2007: Theoretical and Computational Aspects, University of British Columbia, Minisymposium: Identification of defects and cracks, “Electromagnetic Characterization of Damage in Complex Dielectrics”, June 2007.
- Mathematics Colloquium, Oregon State University, Corvallis, OR. “Electromagnetic characterization of damage in Space Shuttle foam”, March, 2007.
- Applied Mathematics and Computation Seminar, Oregon State University, Corvallis, OR. “Inverse Problem for Distributions of Dielectric Parameters”, November, 2006.

- The Third International Conference on Inverse Problems: Modeling and Simulation, Oludeniz, Turkey. “Parameter Identification using Electromagnetic Interrogation of Heterogeneous Dielectrics”, *Inverse Problems Related to Scattering in Complex Structures Session*, organized by J. A. Burns and H. T. Banks, May 2006.
- Applied Mathematics Colloquium, Sandia National Laboratories, Albuquerque, NM. “On Various Inverse Problems in Electromagnetics Involving Distributions of Dielectric Parameters”, February, 2006.
- Sixth SIAM Conference on Control and its Applications, New Orleans, LA. “An Electromagnetic Inverse Problem Involving Distributions of Dielectric Parameters”, *Inverse Problems in Electromagnetics and Biology Minisymposium*, organized by H. T. Banks and A. S. Ackleh, July 2005.
- 29th Annual SIAM Southeast Atlantic Section Meeting, Charleston, SC. “Gap Detection with Electromagnetic Terahertz Signals”, *Inverse Problems in Electromagnetics and Biology Minisymposium*, organized by H. T. Banks and N. L. Gibson, March 2005.
- SAMSI Multiscale Working Group Closing Workshop, RTP, NC. “Multiscale and Polarization in Dielectric Materials: A Probabilistic Approach”, invited by R. C. Smith, September 2004.
- “Journées Jeunes” at Laboratoire J.-L. Lions/Paris VI, Paris, France. “Pulsed Terahertz Electromagnetic Inverse Problems”, invited by D. Cioranescu, March 2004.
- Applied Math Graduate Student Seminar, North Carolina State University. “Electromagnetic Crack Detection Inverse Problems Using Terahertz Interrogating Signals”, October 2003, invited by M. Haider.

### Other Presentations:

- 2007 REU Program at Oregon State University, Corvallis, OR. “Finding damage in Space Shuttle foam”, July 2007.
- 2007 DOE Summer School in Multiscale Mathematics and High Performance Computing, Corvallis, OR. “Introduction to Finite Difference, Finite Element and Finite Volume Methods for the Numerical Solution of Partial Differential Equations”, June 2007.
- 33rd Annual Review of Progress in Quantitative Nondestructive Evaluation, Portland, OR. “2D Modeling of Pulsed THz Interrogation of SOFI with Knit Lines”, *Terahertz Imaging Session*, chaired by H. Ringermacher, August 2006.
- Industrial Mathematical and Statistical Modeling Workshop for Graduate Students, NCSU, Raleigh, NC. “Ring Structure against Rolling Circular Drum”, chaired by Ralph Smith, August 2001.
- MathFest '98, Toronto, Canada. “DNA Computing”, IIME Student Paper Session, chaired by Robert Smith, July 1998. (IIME presentation award winner.)

## Other Conference/Workshop Participation:

- American Institute of Mathematics Research Conference Center workshop “High-order methods for computational wave propagation and scattering”, September 2007.
- Southeast Conference on Applied Mathematics, Raleigh, NC, November 2001.
- Fifth Mississippi State Conference on Differential Equations & Computational Simulations, Starkville, MS, May 2001.
- SIAM Southwestern Regional Mathematics in Industry Workshop, Houston, TX, April 2001. (Participated in panel discussion.)
- SIAM Northeast Regional Mathematics in Industry Workshop, Worcester, MA, May 1998. (Assisted with organization.)

## Professional Activities:

**Review and Referee Service:** Refereed articles for the following scholarly journals:

1. *Journal of Inverse and Ill-Posed Problems*
2. The journal *Mathematical and Computer Modelling*

## Professional Service:

1. Organized an invited session on “Inverse Problems in Biology” at the *Third International Conference on Inverse Problems: Modeling and Simulation*, Oludeniz, Turkey, May 2006.
2. Organized a special session on “Inverse Problems in Electromagnetics and Biology” at the *SIAM Southeast Atlantic Section Meeting*, College of Charleston, SC, March 2005.

## OSU Service:

1. Member, Computer/Web Committee, Fall 2007–present.
2. Member, Math Club/Competitions, Fall 2007–present:
  - Chapter Advisor, Pi Mu Epsilon Mathematics Honor Society, Fall 2007–present.
  - Organized OSU’s participation in the 2007 VTR Mathematics Competition, October 2007.
  - Organized OSU’s participation in the 2006 Putnam Competition, December 2006.
  - Organized OSU’s first ever participation in the 2007 COMAP Math Modeling Competition, February 2007. Our team of three, consisting of one student each from Mathematics, Electrical Engineering, and Computer Science, achieved “Meritorious Winner”.

## Professional Development:

- Participant in “Building Future Faculty Program”, Faculty Center for Teaching and Learning, North Carolina State University, Raleigh, NC, Mar 2006.
- Participant in Mentoring Workshop: “Right Attention, Right Balance and Right Empowerment”, how to mentor graduate students, especially from underrepresented groups, NCSU, Raleigh, NC, March 2006.
- Participant in “Teaching Workshop”, for graduate teaching associates, NCSU, Raleigh, NC, August 2001.
- Participant in “Introduction to CourseInfo” and “Advanced CourseInfo”, training course for Blackboard’s CourseInfo program, UTK, Knoxville, TN, June and July 2000.

### **Teaching Experience:**

- Numerical Linear Algebra (MTH 451): Fall 2007
- Linear Algebra I (MTH 341): Fall 2007, Spring 2008
- Introduction to Numerical Analysis (MTH 351): 2 Sections, Fall 2006 and 2 Sections, Spring 2007
- Applied Differential Equations (MTH 256): Winter 2007 & 2008, Spring 2008
- Calculus I (MA 141): Fall 2005

### **Awards/Funding:**

- NIA/NASA grant NIA/NCSU-03-01-2536-NC, June 2007 – August 2007.
- NIA Post-doctoral Fellowship, July 2004 – June 2006.
- NASA Fellowship, July 2002 – June 2004.
- Nominated Mathematics Graduate Teaching Assistant of the Year at University of Tennessee, Knoxville, 1999.

### **Computer Experience:**

- Languages/Software: C/C++, Fortran 77, MPI, HTML, Matlab, FEMLAB/Comsol, Maple, Blackboard, WebCT
- Operating Systems: Linux, Unix, Windows, MacOS

### **Professional and Honorary Societies:**

- Pi Mu Epsilon – Mathematics Honor Society
- Society for Industrial and Applied Mathematics
- Mathematics Association of America