

Katharine A. Ott

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Education

University of Virginia, Charlottesville, Virginia (September 2003 - present)
Ph.D. candidate in Mathematics, expected graduation May 2008. Ph.D. advisor Irina Mitrea.
M.S. in Mathematics received May 2005.

Middlebury College, Middlebury, Vermont (September 1999 - May 2003)
Mathematics major and economics minor. B.A. received May 2003. Graduated Summa Cum Laude with High Honors from the Department of Mathematics. Elected Phi Beta Kappa in May 2003. Undergraduate advisor Steve Abbott.

University of York, York, UK (September 2001 - June 2002)
Visiting student for the 2002 - 2003 academic year. Coursework in mathematics and economics under the supervision of Ed Corrigan.

Research Fields

Real, Complex and Harmonic Analysis, Functional Analysis and Partial Differential Equations.

Publications

- Electromagnetic scattering from perturbed surfaces, with I. Mitrea, **Mathematical Methods in the Applied Sciences** 30 (2007), 861-876.
- Counterexamples to the well-posedness of L_p transmission boundary value problems for the Laplacian, with I. Mitrea, **Proceedings of the American Mathematical Society** 135 (2007), 2037-2043.
- Spectral theory and iterative methods for the Maxwell system in nonsmooth domains, with I. Mitrea, in preparation.
- Global optimization techniques for singular integrals, with I. Mitrea and W. Tucker, in preparation.
- Spectral properties of the radiosity operator on onoccluded curves, with D. Isaacs and I. Mitrea, in preparation.
- Boundary problems for the biharmonic equation with L^p data in two dimensions, with I. Mitrea, in preparation.

Fellowships and Awards

University of Virginia Faculty Senate Dissertation-Year Fellowship (2007 - 2008)

I received one of the six Faculty Senate Dissertation-Year Fellowships awarded across the university for the academic year 2007 - 2008. This award recognizes excellence in scholarly achievement as well as outstanding performance in teaching. My award is sponsored by the Alumni Association of UVA and provides a \$25,000 stipend to release me from teaching duties during my last year of dissertation work.

Huskey Graduate Research Exhibition (April 26, 2007)

I was awarded \$300 and Second Place in Oral Presentations for Physical Sciences and Mathematics for my presentation entitled *Boundary Integral Equations on Non-Smooth Domains*. I competed against 10 pre-selected graduate students from mathematics and other science departments.

Virginia Space Grant Consortium Aerospace Graduate Research Fellowship (2005 - 2006, 2006 - 2007, 2007 - 2008)

For three consecutive academic years I have been awarded an Aerospace Graduate Research Fellowship from the Virginia Space Grant Consortium. This \$5,000 award has helped support my research projects during the summer. Each spring I have attended the VSGC Annual Student Research Conference and Alumni Luncheon to present my research for an audience of graduate and undergraduate fellows, faculty members and representatives from NASA Langley. In addition, I prepared a technical report to submit to each of the conference proceedings:

- *Transmission boundary value problems in elasticity*, with I. Mitrea, technical report for the 2006 Virginia Space Grant Consortium Student Research Exhibition.
<http://www.vsgc.odu.edu/conf06/papers/Paper-Survey-Ott.pdf>
- *Electromagnetic scattering from perturbed surfaces*, with I. Mitrea, technical report for the 2007 VSGC Student Research Exhibition.

AAAS Mass Media Science and Engineering Fellowship (Summer 2006)

I was awarded one of the fourteen Mass Media Science and Engineering Fellowships offered nationwide by the American Association for the Advancement of Science. My fellowship, sponsored by SIAM, placed me at the *Milwaukee Journal-Sentinel*, a daily newspaper in Milwaukee, WI, to report on science stories. The purpose of the program is to place Ph.D. candidates in mathematics and the sciences into media outlets to learn how to effectively communicate science to the general public. I was responsible for finding stories, pitching story ideas to my editor, researching and reporting stories, and writing and editing. I wrote 9 science stories over the course of the 9-week internship, including two that appeared on the front page of the newspaper. I learned how to translate complex scientific ideas and processes into language that the average newspaper reader could understand. In addition, I wrote a reflective piece on my experience for the November issue of *SIAM News* to recruit future applicants.

- "Zeroing in on an Ancient World." *Milwaukee Journal-Sentinel* 24 June 2006, metro ed.: 1A+
<http://www.jsonline.com/story/index.aspx?id=440843>

- “Study of Fish Food Holds Key to Stable Population.” Milwaukee Journal-Sentinel 26 June 2006, metro ed.: 1G+
<http://www.jsonline.com/story/index.aspx?id=440134>
- “Zoo on Forefront of Avian Flu Fight.” Milwaukee Journal-Sentinel 27 June 2006, metro ed.: B1+
<http://www.jsonline.com/story/index.aspx?id=442572>
- “Will Fruit be the New Oil?” Milwaukee Journal-Sentinel 30 June 2006, metro ed.: A1+
<http://www.jsonline.com/story/index.aspx?id=445132>
- “Lead Poisoning in Paradise: Loons Threatened.” Milwaukee Journal Sentinel 2 July 2006, metro ed.: B1+
<http://www.jsonline.com/story/index.aspx?id=450760>
- “Scientists Fight Friction Down to the Last Atom.” Milwaukee Journal-Sentinel 24 July 2006, metro ed.: G1+
<http://www.jsonline.com/story/index.aspx?id=474776>
- “At Dissection, They Pick Through Brain’s Terrain.” Milwaukee Journal-Sentinel 31 July 2006, metro ed.: G1+
<http://www.jsonline.com/story/index.aspx?id=477529>
- “Zebrafish May Unlock Secrets to Repairing Nerves.” Milwaukee Journal-Sentinel 14 Aug. 2006, metro ed.: G1+
<http://www.jsonline.com/story/index.aspx?id=482412>
- “A Stretch Toward Science: Advances in Biology Pulling Math in a New Direction.” Milwaukee Journal-Sentinel 4 Sept. 2006, metro ed.: G1+
<http://www.jsonline.com/story/index.aspx?id=489917>
- “Show, Don’t Teach.” SIAM News November 2006: 1+
<http://www.siam.org/news/news.php?id=1036>

Double Hoo Research Award (2006 - 2007)

This award, from the Center for Undergraduate Excellence at the University of Virginia, supports collaboration between graduate and undergraduate students. David Isaacs, a senior Echols Scholar at UVa, and I were awarded \$4,000 for our research project to study the spectral properties of the radiosity operator on polygonal domains. This is an important issue arising in the Global Illumination Problem in computer graphics and it also has applications to thermal heat transfer in mechanical engineering. I mentored David on a weekly basis to work on this project. David presented our results at the National Conference on Undergraduate Research, hosted by Dominican University of California, April 12-14, 2007. In addition, he was selected as one of the 12 presenters (and the only one from mathematics) at the Undergraduate Research Symposium, Friday, April 27, 2007, sponsored by the Undergraduate Research Network at UVa.

Vincent J. Mastracco Fellowship (Spring 2006)

Mrs. Charles Bryant Endowment Fund Graduate Fellowship (Spring 2006)

Pratt Bequest Fellowship (Summer 2004)

This fellowship supported me while I prepared for the General Exams in Algebra and Analysis. It allowed me to participate in preparatory courses offered by the department.

Edwin E. Floyd Fellowship (Fall 2003)

Travel Awards

59th Midwest Partial Differential Equations Seminar, University of Kentucky (March 2007)

Awarded \$500 to attend the Midwest Partial Differential Equations Seminar at the University of Kentucky, Lexington, KY, March 24-25, 2007.

Association for Women in Mathematics (September 2006)

Selected by the Association for Women in Mathematics as one of the twelve female graduate students to present a poster at the Joint Mathematics Meetings in New Orleans, LA in January 2007. I presented a poster entitled *Transmission boundary value problems in non-smooth domains* and participated in talks and round-table discussions during the two-day workshop.

Conference on Applied Analysis on the Occasion of the 65th Birthday of David Kinderlehrer, Carnegie Mellon University (September 2006)

Awarded \$500 to attend the Conference on Applied Analysis on the Occasion of the 65th Birthday of David Kinderlehrer at Carnegie Mellon University, Pittsburgh, PA, October 19-21, 2006. I presented a talk entitled *Electromagnetic scattering from perturbed surfaces*.

Institute for Mathematics and its Applications (March 2006)

I was selected as one of 36 graduate students to participate in the annual Mathematical Modeling in Industry Workshop at the Institute for Mathematics and its Applications in Minneapolis, MN, August 9-18, 2006. The IMA covered my travel and living expenses during the ten-day workshop. I worked with a team of six graduate students under the supervision of Brendt Wohlberg from Los Alamos National Laboratory. Our project was entitled, *Blind Image Deconvolution: Motion Blur Estimation*. We studied the problem of deblurring blurry images with no knowledge of the unblurred picture. On behalf of my team I presented our final results at the conclusion of the workshop. We also prepared a technical report summarizing our work.

- *Blind image deconvolution: motion blur estimation*, with F. Kraher, Y. Lin, B. McAdoo, J. Wang, D. Widemann, and B. Wohlberg (Mentor), technical report for the Mathematical Modeling in Industry X Workshop, Institute for Mathematics and its Applications, Minneapolis, MN.

http://www.people.virginia.edu/~kao3h/Report_Team5.pdf

Rivière-Fabes Symposium, University of Minnesota (March 2006)

Awarded \$500 to travel to the University of Minnesota, Minneapolis, MN, to attend the annual Rivière-Fabes Symposium, April 7-9, 2005.

NSF-FRG Conference on Interactions Between Harmonic Analysis and Partial Differential Equations, University of Missouri (January 2006)

Awarded \$400 to attend the NSF-FRG Conference on Interactions Between Harmonic Analysis and Partial Differential Equations at the University of Missouri, Columbia, MO, March 24-26, 2006.

MSRI Introductory Workshop in Nonlinear Dispersive Equations, Mathematical Sciences Research Institute (June 2005)

Awarded \$500 for travel plus living expenses to participate in the MSRI Introductory workshop in Nonlinear Dispersive Equations at the Mathematical Sciences Research Institute, Berkeley, CA, August 22-26, 2005.

Robert J. Huskey Travel Fellowship (June 2005)

This travel award, from the University of Virginia, supported my participation in the AMS-IS-SIAM Summer Research Conference in the Mathematical Sciences: Control Methods in PDE-Dynamical Systems in Snowbird, UT, July 3-7, 2005. At this international conference I presented a talk entitled, *The sharpness of L^p transmission boundary value problems in Lipschitz domains*.

NSF/CBMS Regional Research Conference in the Mathematical Sciences: New Perspectives for Boundary Value Problems and Their Asymptotics, University of Texas - Pan American (May 2005)

Awarded \$500 to attend the NSF/CBMS Regional Research Conference in the Mathematical Sciences: New Perspectives for Boundary Value Problems and Their Asymptotics at the University of Texas - Pan American, Edinburg, TX, May 16-20, 2005.

Other Presentations

- *Transmission boundary value problems in non-smooth domains*. AMS Southeastern Sectional Meeting; Special session on Nonlinear PDE Evolutionary Systems and Their Control; Johnson City, Tennessee; October 15, 2005.
- *Transmission problems in non-smooth domains*. Poster presentation; Graduate Research Exhibition; University of Virginia; March 29, 2006.

Seminar Presentations, University of Virginia

- *Carleson measures in Partial Differential Equations*. Differential Equations and Dynamical Systems Seminar, November 7, 2006.
- *Mathematics in the media and mathematics in industry*. Graduate Seminar, September 22, 2006.
- *Electromagnetic scattering from perturbed surfaces*. Differential Equations and Dynamical Systems Seminar, April 25, 2006.
- *Inverse scattering problems*. Department of Mathematics Graduate Seminar, March 31, 2006.
- *Transmission boundary value problems in non-smooth domains*. Department of Mathematics Graduate Seminar, October 28, 2005.
- *Transmission boundary value problems in non-smooth domains: The case of the Laplacian*. Differential Equations and Dynamical Systems Seminar; October 16, 2005.
- *The Cauchy integral on Lipschitz curves*. Differential Equations and Dynamical Systems Seminar, February 1, 2005.

- *Boundedness of singular integral operators*. Department of Mathematics Graduate Seminar, January 28, 2005.

Undergraduate Presentations

- *Solving the Dirichlet Problem with the Residue Theorem*. Department of Mathematics and Computer Science Seminar; Middlebury College; April 22, 2003.
- *Complex Analysis Techniques in Partial Differential Equations*. Hudson River Valley Undergraduate Mathematics Conference; Union College; April 12, 2003.

Teaching Experience

Nominated for Department of Mathematics Teaching Award (November 2006)

Received \$500 award from the Department of Mathematics for excellence in teaching.

Teaching Assistant, MATH 308 (Summer 2007)

I assisted I. Mitrea in the instruction of a 12 student section of MATH 308: Mathematical Modeling offered as a scholarship course during Summer 2007. This was a hands-on course where undergraduate students worked in groups to model everyday phenomena such as weather forecasting and air traffic control. I was responsible for designing and leading daily one-hour labs in which I taught Matlab programming and numerical methods. I assigned weekly programming homework, assisted with group projects and helped evaluate final presentations for the course.

Teaching Assistant, MATH 131 (Fall 2006)

I directed a 29 student section of MATH 131: Calculus I, designed primarily for natural science majors. I developed my own lectures, assigned weekly on-line homework, wrote and graded weekly quizzes, led 4th hour recitation sections, graded exams and assigned final letter grades. I contributed to the writing of the two mid-terms and the final exam.

Teaching Assistant, MATH 121 & MATH 122 (Fall 2004, 2005 and Spring 2005)

For three semesters I independently taught a section of MATH 121: Applied Calculus I for Business, Social and Life Sciences and MATH 122: Applied Calculus II for Business, Social and Life Sciences. I had 38, 42 and 25 students in each semester, respectively. I was responsible for writing and giving lectures, assigning homework, creating and grading weekly quizzes, grading exams and assigning final letter grades. I participated in exam-writing sessions along with my fellow instructors for the course. I developed several supplementary assignments, including problem sets on related rates, maximization problems and Lagrange multipliers.

Teaching Assistant, MATH 231 (Fall 2005)

I led 4th hour discussion sections for S. Krushkal's Multivariable Calculus class. I wrote and administered weekly quizzes, answered homework questions and reviewed lecture material for a class of 39 students. I also helped grade exams.

Teaching Assistant, APMA 132 & 231 (Fall 2003, Spring 2004)

I assisted in the instruction of Integral Calculus and Multivariate Calculus in the Engineering School. Both semesters I directed two 4th hour discussion sections, each consisting of over 50 students. My responsibilities included reviewing course material and homework problems, writing and grading weekly quizzes, and assisting in the grading of exams.

Teaching Activities

Tomorrow's Professor Today (Fall 2006 - present)

I was selected as one of the 26 participants from the Graduate School of Arts and Sciences and the School of Engineering and Applied Sciences to participate in the *Tomorrow's Professor Today* program offered by the Teaching Resource Center at the University of Virginia. The program is designed to better prepare graduate students for a career in academia. My activities through the program include teaching and career development workshops, observing and interviewing faculty and administrators, preparing teaching documents and presenting research. In particular, I have attended or am registered to attend the following workshops (all offered through the Teaching Resource Center unless noted):

- August Teaching Workshop, August 22-23, 2007.
 - *Teaching Math to Majors, Non-Majors, Pre-Meds, Engineers*
I assisted in leading this workshop on mathematics instruction to new Teaching Assistants and Graduate Instructors.
- January Teaching Workshop, January 16, 2007.
- Women Faculty in Science, Math and Engineering, November 15, 2006.
- Connecting your Teaching and Research, November 13, 2006.
- Negotiating for What You Need to Achieve Your Personal and Professional Goals, sponsored by the Chemistry department and Vice Provost for Faculty Advancement, September 25, 2006.
- Secrets of Successful Academics, with Mary McKinney, February 28, 2006.
- Making the Most of Diversity, January 25, 2006.

Teaching and Outreach

Seminar on Thomas Jefferson and Mathematics (Spring 2007)

In the Spring 2007 semester I assisted I. Mitrea with the design and implementation of a special seminar on Thomas Jefferson and Mathematics. This seminar consisted of a group of four female undergraduate students: Adrienne Felt, Alyssa Godesky, Meredith Jennings and Caitlin Reese. The purpose of the course was to investigate the mathematical principles in Thomas Jefferson's work and strengthen student-faculty relations. I delivered a presentation on Thomas Jefferson's Wheel Cipher, organized trips to the Monticello Library and Monticello, and helped the participants prepare presentations on their own research into Jefferson's architecture (see <http://people.virginia.edu/~im3p/JeffersonMath.html>).

Sonja Kovalevskya High School Mathematics Day (April 14, 2007)

The Sonja Kovalevskya High School Math Day is a day-long program of talks, workshops and competitions sponsored by the Association for Women in Mathematics (see <http://people.virginia.edu/~im3p/SonjaKovalevskya.html>). Its purpose is to encourage young women to continue their study of mathematics, assist secondary mathematics teachers, and encourage collaboration between the university and local high schools. I assisted in the planning and scheduling of activities and recruited participants from local high schools. I also helped prepare the undergraduate presenters and assisted with the day's activities.

Girls in Math (Summer 2006, 2007)

Girls in Math is a week-long mathematics camp for 7th and 8th grade girls organized by I. Mitrea (see http://people.virginia.edu/~kao3h/girlsandmath_2007.htm). The program allows 30 talented and enthusiastic middle school girls from the local area to explore several aspects of mathematics not covered by the traditional school curriculum and to sharpen their problem solving skills. During Spring 2006 I was involved in the recruitment of participants for the program but due to my fellowship over the summer, I was unable to participate. In 2007 I was directly involved in the workshop, leading several sessions on cryptography including games and creating a wheel cipher.

Service**Undergraduate Math Club.**

The University of Virginia Math Club is an undergraduate, student-run organization that promotes mathematics through a series of popular lectures. I have presented twice to this group. On both occasions my goal was to interest more students in mathematics and possibly recruit more mathematics majors from a pool of students who may not have otherwise considered mathematics as a major.

- *Mathematics in the Media and Mathematics in Industry*, September 29, 2006.
In this presentation, I described my two summer experiences in 2006 - my work as a science journalist at the Milwaukee Journal Sentinel and my experience at the Mathematical Modeling in Industry Workshop at the IMA. My goal was to expose undergraduate students to other applications of mathematics, such as science journalism, and give them a concrete example of how mathematics is used in industry.
- *Presentation on Careers in the Mathematical Sciences*, February 18, 2006.
I created and delivered a presentation detailing the requirements for a major in mathematics to a group of undergraduate students. The presentation also discussed possible employment opportunities for undergraduate math majors and highlighted professions and employers of previous mathematics majors from the University of Virginia.

Women in Mathematics and Science (WIMS)

This group of female Ph.D. candidates in mathematics, sciences and engineering at UVa organizes career development seminars for women and brings prominent female scientists to speak at the University. I serve on the Community Service Committee. In 2006, we helped judge a local middle-school science fair and awarded the prize for the best presentation by a female. We also organized a clothing drive for the women's center in Charlottesville, VA. In 2007 I hosted a visit by Professor Jane Hawkins of the University of North Carolina, a well-established and prominent mathematician, on behalf of WIMS and the Department of Mathematics.

Affiliations

Mathematical Society, National Association of Science Writers

Computer Skills

Microsoft Office, Java, L^AT_EX, Maple, MATLAB, HTML, Dreamweaver