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Education

Ph.D. in Mathematics August 1998, University of North Carolina at Chapel Hill

THESIS TITLE: *Relative Critical Sets in \mathbb{R}^n and their Application to Image Analysis.*

THESIS ADVISOR: James N. Damon, Ph.D.

B.A. in Mathematics May 1993, *magna cum laude*, with departmental distinction. Saint Olaf College. Northfield, Minnesota.

Budapest Semester of Mathematics (Fall 1992).

Professional Interests Scholarship of Teaching & Undergraduate Research, Differentiable Topology and Singularity Theory, Image Analysis and Scale-Space Theory, Mathematical and Quantitative Biology

Technology Expertise Mathematica, L^AT_EX2e, HTML, Macintosh OS X and GNU/Linux, Plone, and Matlab.

Professional Memberships Mathematical Association of America (incl. BIO SIGMAA)

American Mathematical Society

The Society for Mathematical Biology (incl. Education Committee)

Council on Undergraduate Research (Councilor)

Sigma Xi, The Scientific Research Society

Kappa Mu Epsilon

Professional Positions

Associate Professor of Mathematics, Truman State University, 2003–present.

Assistant Professor of Mathematics, Truman State University, 1998–2003.

Undergraduate Research

Senior Integrating Capstone Experiences Supervised thirteen Senior Capstone Integrating Experience projects in mathematics and computer science on topics including History of the Calculus, Planar tilings, Markov Chains, Game Theory, Modeling Vasculogenesis, Image Analysis, Classification Trees, Curve Singularities, and Classification Trees. The Capstone is an independent study requirement for the mathematics and computer science majors (Fall 1998–present).

Image Analysis and Modeling (2004–present) Began collaborating with two faculty of A. T. Still University of Health Sciences, Dr. Robert Baer (Physiology) and Dr. James Rhodes (Anatomy), on understanding how image analytic and mathematical modeling can contribute understanding cell–cycle kinetics and vasculogenesis. Undergraduates and faculty were supported in this effort with support from NSF UBM Supplement #0337769 and Truman State University. The work continues with support from various sources.

Quantitative Identification of Missouri Bat via Acoustic Surveys (2001–present) Co-mentoring an interdisciplinary research project on *Characterization of Bat Species via Analysis of their Echolocation Call* with Prof. M. Scott Burt (Biology) and thirteen undergraduates in mathematics, computer science, or biology. Support for this work comes from the NSF, the Missouri Department of Conservation, and Truman. This work occurs as part of Truman’s Mathematical Biology program.

Geometric Image Analysis An independent research experience supported by a Truman Undergraduate Research grant on *Geometric Properties of Functions*, Michelle Hannon (Summer 2001).

Synergistic Activities

Interdisciplinary Impact With colleagues Jon Beck, Michael Kelrick, and Jeff Osborn, established Truman's *Mathematical Biology program*, a cross-cutting activity that brings faculty and undergraduates from the mathematical and life sciences to carry-out research at the interface of the disciplines. We use the learning–communities model to incubate long–term collaborative interdisciplinary research projects and to give students long–term research experiences that start with a proposal and end with peer–review.

Course Development *Conflict, Cooperation, & Choice*, an Interdisciplinary course for liberal arts core; Introduction to Scientific Programming; Capstone Seminar in Mathematics. Also organized the development of courses in bioinformatics, modeling in biology, and biostatistics (in development).

Faculty Research Grant from Truman State University: *Ridges of Functions and Image Geometry*.

Research Groups *Bat Echolocation Group* and *BioImage Group*, described above (2003–present)

University of North Carolina Medical Image Display and Analysis Group member (1995–1998).

University of North Carolina Geometry and Computer Vision Group member (1994–1998).

Honors and Awards

Doris and Walker Allen Fellowship for Faculty Excellence, 2007.

Sigma Xi Researcher of the Year, 2006. Kirksville Chapter.

Principle Investigator and director for the National Science Foundation supported *Research–focused Learning Communities in Mathematical Biology*, (NSF UBM #0436348). Budget \$900,000 for 9/1/2004–8/31/2009. J. Beck (Computer Science), J. Osborn (Biology), and M. Kelrick (Biology) co-PIs. (9/2004–9/2009).

Principle Investigator and Director for the National Science Foundation supported *The Next STEP: Integrating STEM Learning Communities*, (NSF UBM #0431664). Budget \$2.2m for 9/2004–8/2009.

Principle Investigator and co-director for the National Science Foundation supported *Mathematical Biology Initiative*, (NSF UBM #0337769). Budget \$99,998 for 8/15/2003–8/15/2005. J. Beck (Comp Sci), J. Osborn (Biology), and M. Kelrick (Biology) co-PIs. (2004–2006).

Principle Investigator for the National Science Foundation, Division of Undergraduate Education CSEMS *Undergraduates Scholars in Mathematics and Computer Science* (NSF DUE #0123094). Budget \$394,200 for 1/1/2002–12/31/2005. C. Hoferkamp, A. Garvey, P. Reich, and D. Vazzana co-PIs, J. Beck Senior Personnel.

Visiting Member of the Fields Institute, Toronto, Ontario, Canada (Spring 1997).

J. Burton Linker Award for Teaching Excellence, Math Department, UNC Chapel Hill, 1996–97 (nominee) and 1997–98.

Presentations & Posters (* indicated undergraduate co-author)

“Towards Bio2010: Educating Mathematicians, Biologists, and Computer Scientists collaborating to redesign education: Content & Pedagogy.” Keynote Address. Howard Hughes Medical Institute Quantitative Biology Curriculum Planning Workshop. Eastern Tennessee State University. Johnson City, TN. 18–20 July, 2007.

“Charting a Course Toward Interdisciplinary Collaborations.” Invited keynote address at Tuskegee University's *Models for Interdisciplinary Research and Curriculum Development at the Undergraduate Level* workshop. Tuskegee University. Tuskegee, Alabama. February 15, 2007.

“Using Electronic Journals to Assess Student Growth from Undergraduate Research Experiences” with Jennifer Thompson and Sue Pieper. Truman State University Assessment Colloquium. December 5, 2006.

“Connectedness As a Measure of Robustness.” Sigma Xi, Kirksville Chapter. November 17. 2006.

“Crossing Disciplinary Boundaries through Undergraduate Research.” (Poster with Jon Beck, Jeffrey Osborn, and Michael Kelrick.) Joint SMB-SIAM Conference on the Life Sciences, N.C. State. Raleigh, NC. (July 31–August 4, 2006).

“Integrating Science and Mathematics Learning Communities: Developing Interdisciplinary Research and Curricular Programs.” (Poster with Jeffrey Osborn, Maria Nagan, and Jennifer Thompson.) Botany 2006. Chico, CA. (July 28–August 2, 2006).

“Integrating Science and Mathematics Learning Communities: Developing Interdisciplinary Research and Curricular Programs.” (With Jeffrey Osborn.) Council on Undergraduate Research National Conference, DePauw University. Greencastle, IN. (June 24–27, 2006).

- “Quantitative Approaches to Recognizing Bat Species via Acoustic Data.” (With Scott Burt.) Preliminary meeting to Missouri Natural Resources Conference. Lake of the Ozarks, MO. 1 February, 2006.
- “A research-focused learning community in Mathematical Biology.” (With Jon Beck, Jeffrey Osborn, and Michael Kelrick.) European Conference on Mathematical and Theoretical Biology. Dresden, Germany. (July 18–22, 2005)
- “An Open Source Tool to Aid in the Characterization of the Structure of 2D Vascular Networks.” (With M. Miller*) 16th Annual Argonne Symposium For Undergraduates In Science, Engineering And Mathematics, Argonne National Laboratory (November 4–5, 2005).
- “Quantitative identification of northeastern Missouri bats: survey results.” (With Rachel O. Van Amburg*, Scott Burt, John Hainline*, and Joshua B. Kelly*) Annual meeting of the Central Plains Society of Mammalogists. Truman State University, Kirksville, MO. 15 October, 2005.
- “Quantitative identification of northeastern Missouri bats via acoustic and standard surveys.” (With Joshua B. Kelly*, Scott Burt, John Hainline*, and Rachel O. Van Amburg*.) Annual meeting of the Central Plains Society of Mammalogists. Truman State University, Kirksville, MO. 15 October, 2005.
- “A known call library for the quantitative identification of northeast Missouri bats.” (with John Hainline*, Scott Burt, Joshua B. Kelly*, and Rachel O. VanAmburg*.) Annual meeting of the Central Plains Society of Mammalogists. Truman State University, Kirksville, MO. 15 October, 2005.
- “Mathematical Biology at Truman.” Invited presentation at the 2005 Annual Meeting of the Society for Mathematical Biology, University of Michigan (July 25–28, 2004).
- “Grant writing and project design: A panel discussion.” Southeast Missouri State University. Cape Girardeau, (April 6-7, 2004).
- “Mathematical Biology at Truman State University.” Society of Mathematical Biology’s Annual Meeting, Ann Arbor, MI. 25–28 July 2004. With J. Osborn, J. Beck, and M. Kelrick.
- “Truman State University’s Mathematical Biology Initiative.” Poster at 10th National Meeting of the Council for Undergraduate Research. University of Wisconsin, La Crosse. 24 June, 2004. With J. Osborn, J. Beck, and M. Kelrick.
- “Crossing Disciplinary Boundaries: Truman’s Mathematical Biology Initiative.” Invited presentation, Basic Sciences Seminar, Kirksville College of Osteopathic Medicine, A. T. Still University of Health Sciences. 17 Oct 2003.
- “Structures in the Space of Real Symmetric Matrices.” Annual meeting of the Missouri section of the MAA. April 12, 2002.
- “Relative Critical Sets and Ridge Sets of Functions.” Contributed talk at the Institute for Mathematics and its Applications’s workshop on Image Analysis and High Level Vision. Part of the program on Vision, Speech, and Language. November 15, 2000.
- “The Maximal Scale Ridge: Incorporating scale into the ridge definition.” (with J.Furst). Invited talk at Scale-Space Theory in Computer Vision: Proceedings of the Second International Conference, Scale-Space 1999.
- “What is the shape of an ameoba?” Invited Mathematics Colloquium talk. Saint Olaf College. Northfield, MN. Fall 1998.

Publications

- “Mathematics In Multi-disciplinary Research-focused Learning Communities.” Proceedings of the Conference on Promoting Undergraduate Research in Mathematics. American Mathematical Society. May, 2007.
- “The Maximal Scale Ridge: Incorporating scale into the ridge definition.” with J.Furst. *Scale-Space Theory in Computer Vision: Proceedings of the Second International Conference, Space-Space '99*. Springer-Verlag. Lecture Notes in Computer Science 1682: 93-104. 1999.
- “Image Loci are Ridges in Geometric Spaces” with J. Furst, R.Keller, and S. Pizer. *Scale-Space Theory in Computer Vision: Proceedings of First International Conference, Scale-Space '97*. Springer-Verlag. Lecture Notes in Computer Science 1252: 176-187. 1997.
- “Shape Based Mathematical Modeling of the Human Nasal Passages” Len Brin, Jackie Huband, Jason Miller, Laura Kay Potter, and Monica Price. In *1996 Industrial Mathematics Modeling Workshop for Graduate Students*. Center for Research in Scientific Computation, North Carolina State University, Technical Report CRSC-TR97-8. 1996.

Leadership and Service

- Truman State University's *Strategic Planning and Advisory Committee*. Resource member for faculty technology. (Fall 2005–present).
- Education Committee, Society for Mathematical Biology. (2005–present)
- Truman State University Committee on Large Section Courses (Fall 2005).
- Service on NSF review panel for the UBM program. (March 2005)
- Science, Technology, Engineering, and Mathematics Talent Expansion Program, Director and PI (Fall 2004–present). See <http://step.truman.edu/> for more information.
- Program reviewer for Truman State University's Department of Chemistry (Spring 2005).
- Project Leader for Truman's NSF supported Mathematical Biology Initiative (Fall 2003–present). See <http://mathbio.truman.edu/> for more information.
- Council on Undergraduate Research, Mathematics, Computer Science and Statistics Councilor and divisional editor of the *CUR Quarterly* (Summer 2004–present).
- Howard Hughes Medical Institute proposal preparation committee, representative for Mathematics and Computer Science division. Fall 2003.
- Computer Issues Committee (Fall 1998 –present, Chair 1999–2001).
- Mathematics Undergraduate Curriculum Committee (Fall 1999–Spring 2002, Chair 2005–present).
- Faculty co-sponsor for Truman State University's chapter of Kappa Mu Epsilon (Fall 1999–present)
- Technology Champion, Truman State University (Spring 2002–present).
- Project Leader (Principle Investigator) for the Math and Computer Science *Undergraduate Scholars in Mathematics and Computer Science* scholarship and support program (Spring 2000–Spring 2006).
- Undergraduate Research Committee, Truman State University (Fall 2002–Fall 2005, Fall 2006–present).
- Writing Assessment and Evaluation Committee, Truman State University (2002).
- Masters Committee for several M.A. students.
- Calculus Textbook and Syllabus Review Committee (Spring 1999, Fall 2002).
- Faculty Consultant, Advanced Placement Calculus, Educational Testing Service and the College Board. Fort Collins, CO (June 10–16, 2001).
- Five Year Program Review Committee, Division of Mathematics and Computer Science, Truman State University (Summer & Fall, 2001).
- Elementary Functions textbook review and selection committee (Spring 2001).
- Consultant regarding proposed junior interdisciplinary (JINS) courses for Dr. David Christiansen, Director of Interdisciplinary Studies, Truman State University (Fall 2000–present).
- Truman Institute for Interdisciplinary Teaching (Summer 2000).
- Truman State University graduation Portfolio Reader (Summer 2000).
- Truman State University's Junior Interdisciplinary Seminar Committee (Spring 1999–Spring 2000).
- Mathematics Faculty Search Committee (Summer 1999).

Conferences & Workshops

- Models for Interdisciplinary Research and Curriculum Development at the Undergraduate level workshop*. Tuskegee University, Tuskegee, Alabama. February 15, 2007.
- The MAA–AMS Joint Mathematics Meetings: New Orleans, Louisiana. January 2007.
- CUR National Conference 2006, *Learning Through Research: Dynamic Faculty, Students, and Institutions*. DePauw University, Greencastle, Indiana. (June 24–27, 2006).
- The AMS–NSA Conference on Promoting Undergraduate Research in Mathematics. Westin O'Hare Hotel, Rosemont, IL. (September 28–30, 2006).

- CUR National Conference. DePauw University, Greencastle, IN. (June 24–27, 2006)
- CUR/SPS Workshop on Undergraduate Research. DePauw University, Greencastle, IN. (June 27–28, 2006).
- “Building Communities.” National Science Foundation, PI Meeting for *STEM Talent Expansion Program (STEP)* program. Arlingington, VA. (April 20–21, 2006).
- BioMathematics Workshop. West Point Military Academy, West Point, NY. (April 4–7, 2006)
- National Science Foundation, PI Meeting for *Interdisciplinary Training for Undergraduates in Biology and Mathematics* program. Arlingington, VA. (March 22–24, 2006).
- Missouri Caves & Bats Round-table*. Osage Beach, MO. (February 1, 2006).
- Central Plains Society of Mammalogists. Truman State University (October 14–16, 2005).
- The MAA–AMS Joint Mathematics Meetings: San Antonio, TX (January 12–15, 2006).
- Sixteenth (16th) Annual Argonne Symposium For Undergraduates In Science, Engineering And Mathematics*. Argonne National Laboratory. Argonne, IL. (November 4–5, 2005)
- ECMTB05: European Conference for Mathematical and Theoretical Biology*. Dresden, Germany (July 18–22, 2005).
- Investigating Interdisciplinary Interactions*. BioQuest Summer Workshop, Beloit College, Beloit, WI (June 11–19, 2005).
- 2004 Annual Meeting of the Society of Mathematical Biology*. University of Michigan. (July 25–28, 2004).
- The 10th National Council on Undergraduate Research Conference. LaCrosse, WI. June 23-26, 2004.
- MAA Regional Meeting, Missouri Section. Southeast Missouri State University. Cape Girardeau, (April 6-7, 2004).
- AMS Midwest Regional Meeting. University of Wisconsin, Madison (Oct. 12-13, 2002).
- MAA Regional Meeting, Missouri Section. Truman State University (April 12-13, 2002).
- Third International Conference on Scale Space Theory in Computer Vision*, Vancouver, British Columbia (July 7-8, 2001).
- MAA Regional Meeting, Missouri Section. University of Missouri, Rolla (April 6-7, 2001).
- Image Analysis and High Level Vision*, a workshop in the Institute for Mathematics and its Application’s program in Vision, Speech, & Language. University of Minnesota (Nov. 13-15, 2000).
- Second International Conference on Scale Space Theory in Computer Vision*, Corfu, Greece. Invited Speaker with Jacob Furst (Sept. 1999).
- Joint Mathematics Meetings. Baltimore, Maryland (Jan. 7–10, 1998).
- Short Course on Mathematical Imaging*. Baltimore, Maryland (Jan. 5–7, 1998).
- Festival in Honour of V.I. Arnol’d*. Fields Institute, Toronto, Ontario, Canada (June 1997).
- 12th Annual Geometry Festival*. Durham, North Carolina (March 1997).
- Workshop on the Topology of Real algebraic Varieties*, Fields Institute. Toronto, Ontario, Canada (Jan. 1997).
- SIAM Southeastern Section meeting. Clemson, South Carolina (Spring 1996).
- MAA Southeastern Section’s Annual Spring Meeting. University of North Carolina, Asheville (Spring 1995).
- Effective College Teaching in Technical Fields: A Workshop for TAs & Graduate Students. Professor Richard Felder (NCSU), presenter (3 March & 4 April, 1995).
- Third Annual International Conference on Technology in Collegiate Mathematics. Orlando, Florida (November 1994).