Proposal for Mellon 23 Faculty Workshop: Workshop on global Riemannian geometry, orbifolds, and related topics Fall 2009

Workshop Organizers:

Emily Proctor (designated workshop liaison)
Middlebury College

Ralph Gomez
Swarthmore College

Megan Kerr
Wellesley College

Christopher Seaton
Rhodes College

December 23, 2008

Supplemental Introduction to the Workshop Topic

This supplemental section introduces the non-mathematician to the areas of research that will be the focus of this workshop.

Geometry is the study of the shapes of *manifolds*, which are generalized surfaces, along with distance functions, called *metrics*. For example, the surface of a sphere is a manifold. The shape of a manifold is uniquely determined by its metric. Shape is measured in terms of curvature and how curvature varies as one moves along the manifold. There are several notions of curvature, and each gives different information about a space. A manifold can carry infinitely many metrics, since there are infinitely many ways to bend or stretch a manifold without making holes or creases. Applications of geometry range from the very large (the shape of the universe) to the very small (the shape of red blood cells).

One of the dominant themes in Riemannian geometry, a subfield of differential geometry, is understanding the extent to which qualities of the metric of a manifold restrict the manifold's "topological structure," the structure of the manifold that doesn't change when it is bent or stretched. For instance, the (scalar) curvature of a surface tells how many holes it has, distinguishing, for example, between the surface of a sphere (no holes) and a doughnut (one hole). There are many open questions about these kinds of restrictions; most notably, the **Hopf conjecture** hypothesizes

that the Euler characteristic, which is a measurement based on the topological structure of the manifold, must be positive when the (sectional) curvature is positive.

One way to gain insight into difficult problems is to consider them in special cases with nice features. Much work in global Riemannian geometry involves not generic manifolds, but rather a special class of manifolds with a high degree of symmetry: homogeneous or low-cohomogeneity spaces. In these spaces, the curvature is the same at every point (in the case of cohomogeneity-one spaces, curvature varies in only a one-parameter direction). As an example, the Hopf conjecture is still unresolved in general, but is known to be true if one restricts to manifolds with these kinds of symmetries. The study of homogeneous and low-cohomogeneity manifolds combines the geometric notion of curvature with the algebraic structure of Lie groups.

Classical Riemannian geometry is the study of "smooth" manifolds. More recently, Riemannian geometers have begun to extend their study of smooth manifolds to the broader class of *orbifolds*, which are generalizations of manifolds. Orbifolds are "mostly smooth", but are allowed to have singularities such as cone-like points or edges. These singularities occur through "gluing" based on symmetries. For instance, by rolling up and gluing a piece of paper (i.e. choosing a finite number of rotations as symmetries), one forms a "dunce hat" shape that has a single cone point at the top. It is known that many orbifolds, if not all, can be constructed from manifolds using Lie group symmetries.

The study of orbifolds has led to a better understanding of smooth manifolds. They played a major role in resolving the 100-year old **Poincaré Conjecture**, finally proven in 2003, about the shape of 3-dimensional manifolds. In addition, orbifolds have become an important topic themselves. For example, it has long been known that every manifold has an associated *Laplace spectrum*, which can roughly be thought of as the "sound" of the manifold. For many years, geometers have tried to determine which information about a manifold we can "hear". In other words, if two manifolds have the same Laplace spectrum, what topological and geometric information must they share? Recently, it has been proven that every orbifold also has a Laplace spectrum, so a similar question can be posed for orbifolds. The question becomes broader in the orbifold setting because the orbifold structure gives rise to additional, more complex topological and geometric information that does not exist in the manifold setting.

Orbifolds have, surprisingly, also played a major role in string theory, an area of theoretical physics. For example, certain orbifolds give rise to geometrically rich manifolds called Sasakian manifolds. Physicists have used some of these manifolds to test the **AdS/CFT conjecture**, a very general conjecture in string theory. Many physicists regard this conjecture as the most important conceptual development in string theory.

These questions and many others in Riemannian geometry involve the interplay between manifolds, Lie groups, and orbifolds. The answers to these questions must involve a synthesis of algebra, analysis, geometry, and topology, and they will have important consequences in mathematics and physics. This workshop will bring together scholars working with these and related questions, who share a strong interest in introducing undergraduate students to the ideas and techniques involved in their study.

Workshop Description

Every liberal arts faculty member is challenged to balance an active scholarly program with excellent teaching. For many mathematicians, this challenge is enhanced by the fact that the definitions fundamental to their research are beyond the scope of the undergraduate curriculum.

Mathematics research is most successful when done in collaboration with others, as we pool our separate expertise to tackle a problem. Establishing collaborations with mathematicians at other liberal arts colleges has a two-fold benefit: first, these colleagues have similar expectations and obligations, allowing more symbiotic and successful partnerships. The second benefit is curricular: differential geometry has a long tradition as a successful course for undergraduates. Some of the participants of this workshop have also taught upper-level courses on matrix groups, a large class of Lie groups. This workshop will bring together colleagues with a shared interest in bridging the gap between our scholarship and the undergraduate classroom.

The goal of this workshop is to create community among the many active Riemannian geometers at Mellon 23 and other liberal arts institutions, working together as scholars and teachers. Providing a forum for colleagues to share their research, initiate new collaborations, and discuss ways to introduce undergraduates to Riemannian geometry, the specific aims of the workshop are to:

1. brainstorm and catalyze scholarly collaborations among Mellon 23 and other liberal arts faculty working in Riemannian geometry;
2. share ideas about handling the challenges of pursuing our scholarship at liberal arts colleges; and
3. share and brainstorm methods of introducing Riemannian geometry to undergraduate students at liberal arts colleges both through our courses and by involving them in our research.

Workshop Impact

The Mellon 23 colleges have a strong tradition of educating scientists within the liberal arts context. In mathematics, where much of the material of the standard undergraduate curriculum is over 100 years old, it is important to raise the visibility of research, especially in geometry and topology. Discussions among these faculty regarding undergraduate education will result in more opportunities for undergraduates to learn about and take part in scholarly research in Riemannian geometry.

The impact to the scientific community will be scholarly collaborations between faculty members at Mellon 23 and other liberal arts colleges. The research has the potential to generate results that can be published in high quality research journals and presented at mathematics conferences.

Workshop Format

This workshop, to be held at Middlebury College in the fall of 2009, will consist of morning sessions where participants present their research, and afternoon sessions devoted to brainstorming sessions. Participants will be invited to give 25-30 minute talks on their work, including a discussion of open questions that they are interested in pursuing collaboratively with other participants. Afternoon discussions will focus on topics from the research talks and potential projects as well as sharing techniques for successfully getting undergraduate students involved in research in Riemannian geometry.

Evaluation of Workshop

In the short term, we plan to evaluate the workshop by means of a questionnaire that will be filled out by all participants at the end of the workshop. We will follow up on this evaluation one year later by polling, via email, all participants. We will specifically focus on whether pairs or groups participants have formed collaborative relationships with each other, and on how participants have used, or plan to use, ideas from the conference to involve more undergraduates in the study of Riemannian geometry. In the longer term, we will judge the success of the conference by papers submitted by groups of participants to peer-edited mathematical research journals.

Tentative Schedule (Fall 2009)

Saturday:

Time	**Activity**
8am – 9am	Coffee/breakfast and introductions
9am – 12noon	Presentations by participants (4-5 presentations)
12noon – 1:30pm	Lunch
1:30pm – 2pm	Presentation (1 presentation)
2pm – 3:30pm	Discussion: Open questions and connections raised by today's talks
3:30pm – 4pm	Break
4pm – 5pm	Discussion: Involving undergraduates in scholarship in Riemannian geometry
evening	Dinner/social activity

Sunday:

Time	**Activity**
8am – 9am	Coffee/breakfast
9am – 11am	Presentations by participants (3-4 presentations)
11am – 12noon	Discussion: Teaching differential geometry at the undergraduate level
12noon – 2pm	Lunch
2pm – 4pm	Discussion: Open questions and connections raised by today's talks

Organizers and Participants

Designated Workshop Liaison

Emily Proctor,
Middlebury College
eproctor@middlebury.edu

Other Organizers:

1. Ralph Gomez, Swarthmore College
2. Megan Kerr, Wellesley College
3. Christopher Seaton, Rhodes College

Potential Participants at Mellon 23 Institutions:

1. Linda Chen, Swarthmore College
2. Joshua Davis, Carleton College
3. Weiqing Gu, Harvey Mudd College
4. Martin Magid, Wellesley College
5. Janet Talvacchia, Swarthmore College
6. Lisa Traynor, Bryn Mawr College

Potential Participants at Other Institutions:

1. Joe Borzellino, California Polytechnic State University
2. Tom Cecil, College of the Holy Cross
3. Rachelle DeCoste, Wheaton College
4. Emily Dryden, Bucknell University
5. Sarah Greenwald, Appalachian State University
6. Elizabeth Stanhope, Lewis & Clark College

Proposed Preliminary Budget

Item	**Cost**
Stipends for workshop organizers	$4 \times \$500 = \$2{,}000$
Travel for non-Middlebury Mellon 23 participants (assuming 9)	$9 \times \$600 = \$5{,}400$
Accommodations for non-Middlebury Mellon 23 participants (assuming 9)	$9 \times \$400 = \$3{,}600$
Travel for non-Middlebury non-Mellon 23 participants (assuming 4)	$4 \times \$600 = \$2{,}400$
Accommodations for non-Middlebury non-Mellon 23 participants (assuming 4)	$4 \times \$400 = \$1{,}600$
Coffee and refreshments for discussion sessions	\$250
Lunches for workshop participants	$2 \times \$180 = \$360$
Saturday dinner for participants	\$360
Staff support	\$1,000
Administrative expenses	\$500
TOTAL:	**\$17,470**

Ralph Rudolph Gomez
Curriculum Vitae

Department of Mathematics and Statistics
Swarthmore College
500 College Avenue
Swarthmore, PA 19081
e-mail: rgomez1@swarthmore.edu

United States Citizen
Office Phone: (610) 690-6857
Office Fax: (610) 690-6854
Home Phone: (610) 604-3331

EDUCATION

- Ph.D., Mathematics, University of New Mexico, May 2008.
  - Thesis Title: *On Lorentzian Sasaki-Einstein Geometry*
  - Thesis Advisor: Charles P. Boyer
- M.A., Mathematics, University of California at Santa Cruz, December 2001.
- B.A., Mathematics, University of California at Santa Cruz, June 1998

POSITIONS

- Visiting Assistant Professor, Swarthmore College, September 2008 - Present

RESEARCH INTERESTS

My primary area of research is in differential geometry. In particular, I am currently interested in Sasakian geometry and applications of algebraic geometry to Sasakian geometry problems.

HONORS AND FUNDING

- Spring, 2008: Ph.D. Distinction
- 2005, 2007: Efroymson Award Outstanding Ph.D student
- 2005 -2006: Outstanding Teaching Assistant of the Year
- 2004: Research Assistantship under Professor Charles P. Boyer
- 2003-2005: New Mexico Alliance for Graduate Education and the Professoriate(NMAGEP)Fellow
- Summer 1997: CAMP (California Alliance for Minority Participation) Fellow

PUBLICATIONS

- *Lorentzian Sasaki-Einstein Geometry in Dimension Five*, To be submitted.

SELECTED AND UPCOMING PRESENTATIONS

- Spring 2009 PACT (Philadelphia Area Contact Topology) Seminar
- February 6, 2009 Tetrahedral Geometry/Topology Seminar(TGTS)
- March 7, 2008 *Shocking Secrets of Sasakian Geometry Revealed*, Swarthmore College
- February 13, 2008: *Sasakian eta-Einstein Metrics on Certain Five-Manifolds*, UNM
- October 4,18, 2006 *Sasakian eta- Einstein Geometry I-II* , UNM

Megan Kerr, Curriculum Vitae

Department of Mathematics
Wellesley College
Wellesley, MA 02481

email: mkerr@wellesley.edu
phone: (781) 283-3144
fax: (781) 283-3642

EDUCATION

Ph.D. (1995) in Mathematics, The University of Pennsylvania.

Dissertation: *Homogeneous Einstein Metrics.*

Advisor: Wolfgang Ziller.

B.A. (1989) with honors, Magna cum laude, Wellesley College.

ACADEMIC EMPLOYMENT

2003–pres: **Associate Professor**, Wellesley College.

1998–2003: **Assistant Professor**, Wellesley College.

2001–2002: **Visiting Scholar**, Brown University.

Spring 1998: **Visiting Assistant Professor**, University of Arizona.

Fall 1997: **Assistant Professor**, Wellesley College.

1995–1997: **John Wesley Young Research Instructor**, Dartmouth College.

1991–1995: **Summer Instructor**, The University of Pennsylvania.

1992–1994: **T.A.-Training Instructor**, The University of Pennsylvania.

1989–1994: **Graduate Teaching Assistant**, The University of Pennsylvania.

RESEARCH INTERESTS

Riemannian geometry, in particular the global geometry of Lie groups and homogeneous spaces. Invariant metrics with prescribed curvature constraints such as Einstein metrics, on homogeneous and low-cohomogeneity manifolds.

RESEARCH PUBLICATIONS AND PREPRINTS

- *Some New Homogeneous Einstein Metrics on Symmetric Spaces*, Transactions of the AMS, **348** (1996), no. 1, 153–171.
- *Homogeneous Einstein–Weyl Structures on Symmetric Spaces*, Annals of Global Analysis and Geometry, **15** (1997), no. 5, 437–445.
- *New Examples of Homogeneous Einstein Metrics*, Michigan Mathematical Journal, **45** (1998), 115–134.
- *New Homogeneous Einstein Metrics of Negative Ricci Curvature*, Annals of Global Analysis and Geometry, **19** (2001), no. 1, 75–101. *Joint with Carolyn S. Gordon.*
- *A Deformation of Quaternionic Hyperbolic Space*, Proceedings of the AMS, **134** (2006), no. 2, 559–569.

- *Low-dimensional homogeneous Einstein manifolds*, Transactions of the AMS, **358** (2006), no. 4, 1455–1468. *Joint with Christoph Böhm.*
- *The geometry of compact homogeneous spaces with two isotropy summands*, Annals of Global Analysis and Geometry, **34** (2008). 329–350. *Joint with William Dickinson.*
- *The geometry of filiform nilpotent Lie groups*, Rocky Mountain Journal of Mathematics, to appear. *Joint with Tracy L. Payne*

OTHER PUBLICATIONS

- *Alumnae Profile: Wellesley College*, Math Horizons, February 2005. *Joint with Alan Shuchat and Ann N. Trenk.*

HONORS AND AWARDS

- 2008–2010: Brachman Hoffman Fellowship, Wellesley College.
- May 2008: Invitation to the Workshop in Differential Geometry, Mathematics Institute of the UNAM, Cuernavaca, Morelos, Mexico.
- 1998–2004: Clare Boothe Luce Chair, Wellesley College.
- Mar. 2004: AWM travel award to the AWM Leadership Workshop.
- 2001-2002: Bunting Fellowship, Radcliffe Institute for Advanced Study.
- Jul. 1999: AWM travel award to present at AWM Olga Taussky Todd Celebration of Careers in Mathematics for Women, at Mathematical Sciences Research Institute.
- Jun. 1999 Invitation to attend Workshop on Global Differential Geometry, Mathematisches Forschungsinstitut Oberwolfach.
- Jul. 1996: AWM travel award to present at AWM Julia Robinson Celebration of Women in Mathematics, at Mathematical Sciences Research Institute.
- Jan. 1996 AWM travel award to speak at AWM Workshop, Joint AMS/MAA Meetings, Orlando (one of eight post-doctoral speakers, selected nationally).
- 1995–1997: John Wesley Young Research Instructorship, Dartmouth College.
- 1990–1995: Graduate Fellowships, University of Pennsylvania and U.S. Department of Education.
- 1992: Dean's Award for Excellence in Teaching, University of Pennsylvania.
- 1989: Lewis Atterbury Stimson Prize for Excellence in Mathematics, Wellesley College.

PROFESSIONAL MEMBERSHIPS

American Mathematical Society, Mathematical Association of America, Association for Women in Mathematics.

Emily Proctor

Department of Mathematics
Middlebury College
Middlebury, VT 05753
http://www.middlebury.edu/~eproctor

Work: (802) 443-5954
Fax: (802) 443-2080
eproctor@middlebury.edu

EDUCATION

Ph.D. in Mathematics, Dartmouth College, Hanover, NH — June 2003
Title: *Isospectral metrics on classical compact simple Lie groups*
Advisor: Carolyn Gordon

A.B. in Mathematics, *Summa Cum Laude,* Bowdoin College, Brunswick, ME — May 1996

ACADEMIC EXPERIENCE

Assistant Professor, Middlebury College — 2005-present

Visiting Assistant Professor, Swarthmore College — 2003-2005

Lecturer, Dartmouth College — 1999-2003

Teaching and Learning Mathematics Seminar, Dartmouth College — Summer 1999
Participated in an intensive ten week seminar which considered educational issues, instruction techniques, and presentation skills.

Teaching Assistant, Dartmouth College — 1997-1999

RESEARCH INTERESTS

My general research interests are Riemannian geometry and Lie groups. In particular, I have proven results about isospectral manifolds and orbifolds. Currently, I am studying comparison geometry on orbifolds.

PUBLICATIONS AND WORK IN PROGRESS

"Isospectral metrics and potentials on classical compact simple Lie groups", *Michigan Mathematical Journal*, **53** (2005), no. 2, 305–318.

"An isospectral deformation on an orbifold quotient of a nilmanifold", with Elizabeth Stanhope, (submitted).

"Spectral and geometric bounds on 2-orbifold diffeomorphism type", with Elizabeth Stanhope, (submitted).

"Orbifold homotopy finiteness based on geometric constraints", with Elizabeth Stanhope, (in preparation).

"Examples in spectral geometry", manuscript with Carolyn Gordon, (in preparation).

HONORS AND AWARDS

Invitation to the Workshop in Differential Geometry,
Mathematics Institute of the UNAM, Cuernavaca, Morelos, Mexico — May 2008

Nominated for Marjorie Lamberti Faculty Appreciation Award
Middlebury College — May 2007

Faculty Research Grant, Swarthmore College	2003 and 2004
Funded participant, AWM Workshop, Baltimore, MD	January 2003
Funded participant, MSRI Introductory Workshop on Quantum Computation	August 2002
Nominated participant, MSRI Summer Graduate Program	July 1999
Dartmouth Graduate Student Fellowship	2000-2003
NSF Graduate Student Fellowship	1997-2000
Phi Beta Kappa	May 1996
Honors in Mathematics, Bowdoin College	May 1996
Edward Sanford Hammond Mathematics Prize, Bowdoin College	May 1996
Smyth Mathematical Prize, Bowdoin College	May 1994

SELECTED PRESENTATIONS

Mathematics Department Seminar, Middlebury College — November 2007
"What is an Orbifold?"

Analysis on Homogeneous Spaces Conference, University of Arizona — March 2007
"An Isospectral Deformation on an Orbifold Quotient of a Nilmanifold"

Special session on Spectral Theory, Orbifolds, Symplectic Reduction, and Quantization, AMS Spring Sectional Meeting, Miami University — March 2007
"An Isospectral Deformation on an Orbifold Quotient of a Nilmanifold"

Geometry and Topology Seminar, Binghamton University — March 2005
"Isospectral Metrics and Potentials on Lie Groups"

Special session on Spectral Geometry, Joint Mathematics Meeting, Atlanta — January 2005
"Isospectral Metrics and Potentials on Classical Compact Simple Lie Groups"

Mathematics and Statistics Colloquium, Williams College — March 2004
"You Can't Hear the Shape of a Lie Group"

Geometry and Topology Seminar, University of Pennsylvania — March 2003
"Isospectral Metrics on Classical Compact Simple Lie Groups"

Inverse Spectral Problems Conference, University of Kentucky — June 2002
"Isospectral Deformations of $SU(n) \times T^2$"

Journal of Differential Geometry Conference, Harvard University — May 2002
"Multiparameter Families of Isospectral Metrics" [Poster]

Geometry Seminar, Dartmouth College — April 2002
"Multiparameter Families of Isospectral Metrics"

Workshop on Inverse Spectral Problems, Dartmouth College — June 2001
"Laplace and Length Spectra of Compact Hyperbolic Manifolds"

Symmetric Spaces Seminar, organizer and speaker, Dartmouth College — Winter 2001

Christopher Wayne Seaton
Curriculum Vitae

Department of Mathematics and Computer Science
Rhodes College
2000 N. Parkway
Memphis, TN 38112-1690
e-mail: seatonc@rhodes.edu

United States Citizen
Office Phone (901) 843-3721
Office Fax (901) 843-3050
Home Phone (901) 355-5481

EDUCATION

- Ph.D., Mathematics, University of Colorado at Boulder, May 2004.
  - Thesis Title: *Two Gauss-Bonnet and Poincaré-Hopf Theorems for Orbifolds with Boundary*
  - Thesis Advisor: Carla Farsi
- B.A., Mathematics, Kalamazoo College, May 1999.
  - Departmental honors, cum laude, biology minor.

POSITIONS

- Visiting Assistant Professor, Rhodes College, 2004–6.
- Assistant Professor, Rhodes College, 2006 to present.

RESEARCH INTERESTS

Differential geometry and topology of orbifolds, including cohomological obstruction theory for orbifolds, Chen-Ruan orbifold cohomology, characteristic classes of orbifold vector bundles, and orbifold index theory.

HONORS AND FUNDING

- Summer, 2008: Co-recipient (with Professor Rachel Dunwell) of a Curriculum Development Grant from the Associated Colleges of the South Environmental Initiative. Proposal Title: **Adding a Major Environmental Modeling Component to the Applied Calculus Class at Rhodes College**.
- Summer, 2007: Recipient of a Faculty Development Grant from Rhodes College to support summer research. Proposal Title: **Higher Orbifold Characteristic Classes and Applications**.
- Summer, 2006: Co-recipient (with Professor Rachel Dunwell) of a Hill Grant from Rhodes College to support summer curriculum development. Proposal Title: **Integrating a Significant Mathematical Modeling Component into the Mathematics Curriculum Available to all Rhodes College Students**.
- Summer, 2005: Recipient of a Faculty Development Grant from Rhodes College to support summer research. Proposal Title: **Obstructions to Nonvanishing Sections of Bad Orbifold Vector Bundles**.

PUBLICATIONS AND PREPRINTS

- *K-Theory of crepant resolutions of complex orbifolds with $SU(2)$ singularities*, Rocky Mountain J. Math. **37** (2007), no. 5, 1705–1712. `arXiv:math/0311067v3 [math.AT]`

- *Characteristic classes of bad orbifold vector bundles*, J. Geom. Phys. **57** (2007), no. 11, 2365–2371. `arXiv:math/0606665v2 [math.DG]`
- *Two Gauss-Bonnet and Poincaré-Hopf theorems for orbifolds with boundary.* Differential Geom. Appl. **26** (2008), no. 1, 42–51. `arXiv:math/0311075v2 [math.DG]`
- *Nonvanishing vector fields on orbifolds* with Carla Farsi, (to appear in the Transactions of the American Mathematical Society). Preprint: `arXiv:0807.2738v2 [math.DG]`
- *The index of a vector field on an orbifold with boundary* with Elliot Paquette (submitted). Preprint: `arXiv:0806.2113v1 [math.DG]`
- *A Complete obstruction to the existence of nonvanishing vector fields on almost-complex, closed, cyclic orbifolds* (unpublished). Preprint: `arXiv:math/0408187v3 [math.DG]`

SELECTED PRESENTATIONS

- October 24th, 2008: *Generalized Orbifold Euler Characteristics and Cohomology*, joint work with Carla Farsi, 2008 AMS Fall Southeastern Sectional Meeting, Special Session on Homotopy Theory and Algebraic Topology, University of Alabama, Huntsville, AL.
- October 4th, 2008: Γ-*Sectors of an Orbifold, Euler Characteristics, and Vector Fields*, joint work with Carla Farsi, 2008 AMS Fall Western Sectional Meeting, Special Session on Moduli Spaces and Singularity Theory, University of British Columbia, Vancouver, Canada.
- October 12, 2007: *Higher Orbifold Euler Classes for General Orbifolds*, 2007 Lehigh University Geometry and Topology Conference, Lehigh University, Bethlehem, PA.
- March 14, 2007: *Generalized orbifold characteristic classes for orbifolds*, Conference on Analysis on Homogeneous Spaces, University of Arizona, Tucson, AZ.
- March 17, 2007: *Euler Classes for Orbifolds,* 2007 AMS Spring Central Sectional Meeting Special Session on Spectral Theory, Orbifolds, Symplectic Reduction, and Quantization, University of Miami at Ohio, Oxford, OH.
- June 10, 2006: *The Euler Class of a Bad Orbifold Vector Bundle*, 2006 Lehigh University Geometry and Topology Conference, Lehigh University, Bethlehem, PA.
- Apr. 9, 2006: *Characteristic Classes of Bad Orbifold Vector Bundles*, 2006 Spring Central Sectional Meeting of the AMS, Special Session on Developments and Applications in Differential Geometry, The University of Notre Dame, Notre Dame, IN.
- Oct. 23, 2004: *Orbifold K-Theory and Resolutions of Orbifolds with $SU(2)$ Singularities*, West Coast Operator Algebras Seminar, Seattle University, Seattle, WA.
- Oct. 17, 2004: *A Complete Obstruction to the Existence of Nonvanishing Vector Fields on Almost-Complex, Closed Orbifolds*, 2004 Fall Southeastern Section Meeting of the AMS, Special Session on Index Theory and the Topology of Manifolds, Vanderbilt University, Nashville, TN.
- Sept. 18th, 2004: *The Orbifold Euler Class,* Wabash Modern Analysis Miniconference, Indiana University–Purdue Univ at Indianapolis, Indianapolis, IN.
- Oct. 3, 2003: *Gauss-Bonnet and Poincaré-Hopf Theorems for Orbifolds with Boundary,* 2003 Joint Central and Western Section Meeting of the AMS, Special Session on Noncommutative Geometry and Geometric Analysis, University of Colorado at Boulder, Boulder, CO.