

# John C. Loftin

## Title and Address :

Assistant Professor  
 Department of Mathematical & Computer Science  
 Faculty of Arts & Sciences - Newark - Mathematics &  
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## Education

### Highest Earned Degree

**Harvard University, Cambridge, MA.**  
 Ph.D. in Mathematics June, 1999.

### Dissertation

Dissertation under the supervision of Prof. S.T. Yau: *Applications of Affine Differential Geometry to Manifolds with Convex  $\mathbb{R}P^2$  Structure.*

### Other Earned Degrees, Graduate and Undergraduate

**Harvard University, Cambridge, MA.**  
 A.M. in Mathematics, March, 1993.

**Stanford University, Stanford, CA.**  
 B.S. with distinction in Mathematics, June, 1991. A.B. in English, June, 1991.

## Honors and Awards

### Fellowships

**NSF Graduate Fellowship (1991-94)** Department of Mathematics, Harvard University.

### Professional Awards and Honors

1991 | **Φ BK (1990-1991)** Stanford University.

## Employment History

### Positions Held

2003-ongoing | **Assistant Professor**  
 Department of Mathematics and Computer Science, Rutgers University-  
 Newark.

1999-2003 | **Ritt Assistant Professor** Columbia University.

### Funded Visiting Appointments

02/2008 | BIRS (Banff, Canada), Workshop on Special Structures in Riemannian  
 Geometry, February 17-22, 2008.

- 03/2007 | AIM (Palo Alto, California), Workshop on Representations of Surface Groups, discussion section co-leader, March 19-23, 2007.
- 08/2005 | MFO (Oberwolfach, Germany), Workshop on Global Differential Geometry, August 7-13, 2005.
- 06/2005 | CMS (Zhejiang University, Hangzhou, China), Conference on the Calculus of Variations and PDEs, as well as Conference in Honor of Leon Simon's 60th Birthday, June 19-27, 2005.
- 12/2003 | MSRI (Berkeley, California) Workshop on Geometric Analysis, December 1-5, 2003.
- 08/2003 | CRM (Montréal) Short programme on analysis and resolution of singularities, August 17-30, 2003.
- 09/2002 | University of Minnesota, Yamabe Memorial Symposium, September 20-22, 2002.

### Other Work Experience

- 08/1997 | **Journal of Differential Geometry**  
Interim journal secretary.
- 1989-1990 | **Microsoft Corporation (Summers 1989, 1990)**  
Computer programming internship.

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### Publications

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#### Articles in Refereed Journals

- 2008 | J. Loftin and M.P. Tsui. *Ancient Solutions of the Affine Normal Flow*, J. Diff. Geom., 78(1):113-162, 2008.
- 2007 | J. Loftin. *Affine Hermitian-Einstein Metrics*, arXiv:0711.0977, 37 pp., 2007.
- 2007 | J. Loftin and M.P. Tsui. *Limits of Solutions to a Parabolic Monge-Ampère Equation*, arXiv:0802.0208, 26 pp., 2007.
- 2007 | J. Loftin. *Flat Metrics, Cubic Differentials and Limits of Projective Holonomies*, Geom. Dedicata 128: 97-106, 2007.
- 2005 | J. Loftin. *Singular Semi-Flat Calabi-Yau Metrics on  $S^2$* , Comm. Anal. Geom., 13(2):333-361, 2005.
- 2005 | J. Loftin, S.T. Yau and E. Zaslow. *Affine Manifolds, SYZ Geometry and the "Y" Vertex*, J. Diff. Geom., 71(1):129-158, 2005.
- 2004 | J. Loftin. *The Compactification of the Moduli Space of Convex  $RP^2$  Surfaces, I*, J. Diff. Geom., 68(2):223-276, 2004.
- 2002 | J. Loftin. *Riemannian Metrics on Locally Projectively Flat Manifolds*, Amer. Jour. Math., 124(3):595-609, 2002.
- 2002 | J. Loftin. *Affine Spheres and Kähler-Einstein Metrics*, Math. Res. Lett., 9(4):425-432, 2002.
- 2001 | J. Loftin. *Affine Spheres and Convex  $RP^n$ -Manifolds*, Amer. Jour. Math., 123(2):255-275, 2001.

#### Works in Progress

- 2008 | W. Goldman, J. Loftin and A. Wienhard. *Geometry of Hitchin Representations into  $\mathbf{SP}(4, \mathbf{R})$* .
- 2008 | J. Loftin and M.P. Tsui. *Noncompact Limits of the Affine Normal Flow*.
- 2008 | J. Loftin, E. Lutwak, D. Yang, S.T. Yau and G. Zhang. *Affine Geometry and Convex Optimization*.
- 2008 | J. Loftin. *Limits of Convex  $\mathbf{RP}^2$  Structures*.
- 2008 | J. Loftin. *Applications of Affine Hermitian-Einstein Metrics*.
- 2008 | J. Loftin. *Survey of Affine Spheres*.
- 2008 | J. Loftin. *Cone Structure of Affine Kähler Manifolds*.

## Teaching Activities

### Courses Taught

#### Undergraduate Mathematics Courses, Rutgers Newark

- Precalculus
- Discrete Structures

#### Undergraduate Computer Science Courses, Rutgers Newark

- Computers and Programming I
- Computers and Programming II
- Principles of Operating Systems
- Data Structures and Algorithm Design
- Advanced Data Structures and Algorithm Design

#### Graduate Courses, Rutgers Newark

- Differentiable Manifolds
- Real Analysis II: developed 164-page course notes available online at <http://andromeda.rutgers.edu/Nloftin/>

#### Invited Lecture Series, largely for Graduate Students

- Affine Differential Geometry and the Strominger-Yau-Zaslow Conjecture, National Central University, Jhongli, Taiwan, June, 2007
- The Support Function and the Affine Normal Flow, Institute of Mathematical Sciences, Chinese University of Hong Kong, June, 2006
- The Geometry of Affine Manifolds, Institute of Mathematical Sciences, Chinese University of Hong Kong, June, 2005
- Affine Differential Geometry, Institute of Mathematical Sciences, Chinese University of Hong Kong, November, 2004

#### Columbia University (1999-2003)

- Calculus IA
- Calculus IIA

- Calculus IIIA
- Ordinary Differential Equations
- Groups and Symmetry (introductory course for non-technical majors)
- Surfaces and Knots (introductory course for non-technical majors)
- Analysis and Optimization (mathematics for economists)
- Analysis II (graduate course in elliptic PDEs)

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## Conference Presentations, Lectures, Demonstrations

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### Other Invited Addresses

- 2008 | Workshop Lecture, *Real Projective Surfaces and Holomorphic Cubic Differentials*, May, 2008.
- 2008 | Department Colloquium, *Affine Hermitian-Einstein Metrics*, Lehigh University, March 2008.
- 2008 | Differential Geometry Seminar, *Affine Hermitian-Einstein Metrics*, Harvard University, March, 2008.
- 2008 | Workshop Lecture, *Affine Hermitian-Einstein Metrics*, Workshop on Special Structures in Riemannian Geometry, BIRS (Banff, Canada), February, 2008.
- 2007 | Geometry Seminar, *Affine Differential Geometry and the SYZ Conjecture*, National Taiwan University, June, 2007.
- 2007 | Conference Speaker, *Affine Normal Flow of Noncompact Hypersurfaces*, International Conference on Geometric Analysis, NCTS (Taipei, Taiwan), June, 2007.
- 2007 | Lecture Series, *Affine Differential Geometry and the Strominger-Yau-Zaslow Conjecture*, National Central University, Jhongli, Taiwan, June, 2007.
- 2007 | Department Colloquium, *The Affine Normal Flow*, Yeshiva University, New York, March, 2007.
- 2007 | Geometry/Topology Seminar, *Real Projective Surfaces and Holomorphic Cubic Differentials*, Rutgers University (New Brunswick), February, 2007.
- 2007 | Special Session Lecture, *Ancient Solutions of the Affine Normal Flow*, Joint Special Session on Nonlinear Analysis and Nonlinear Geometric PDEs, AMS Fall Eastern Section Meeting (Storrs, CT), October, 2006.
- 2007 | Summer Geometry and Topology Seminar, *Affine Geometry and Singular  $RP^2$  Surfaces*, University of Maryland, July, 2006.
- 2006 | Seminar/ Colloquium, *Support Function and the Affine Normal Flow*, I.M.S., Chinese University of Hong Kong, June, 2006.
- 2006 | Nonlinear Analysis Seminar, *Ancient Solutions of the Affine Normal Flow*, Rutgers University (New Brunswick), April, 2006.
- 2006 | Department Colloquium, *Projective Invariants of Convex Domains*, University of Toledo (Toledo, Ohio), November, 2005.

- 2006 | Workshop Lecture, *Singular Semi-Flat Calabi-Yau Metrics on  $S^n$* , Workshop on Global Differential Geometry, MFO (Oberwolfach, Germany), August, 2005.
- 2005 | Lecture Series, *Geometry of Affine Manifolds*, I.M.S., Chinese University of Hong Kong, June, 2005.
- 2005 | Speaker, *Singular Semi-Flat Calabi-Yau Metrics on  $S^n$* , International Conference on Complex Analysis, Differential Geometry, and Partial Differential Equations, in honor of Masatake Kuranishi's 80th birthday, Columbia University, May, 2005.
- 2005 | Speaker, *Singular Semi-Flat Calabi-Yau Metrics on  $S^n$* , Workshop on Geometry and Topology, University of Minnesota, March, 2005.
- 2005 | Nonlinear Analysis Seminar, *Singular Semi-Flat Calabi-Yau Metrics on  $S^n$* , Rutgers University (New Brunswick), February, 2005.
- 2005 | Geometry Seminar, *Singular Semi-Flat Calabi-Yau Metrics on  $S^n$* , McMaster University (Hamilton, Ontario), January, 2005.
- 2005 | Lecture Series, *Affine Differential Geometry*, I.M.S., Chinese University of Hong Kong, November, 2004.
- 2005 | Geometry and Analysis Seminar, *Singular Semi-Flat Calabi-Yau Metrics on  $S^n$* , Columbia University, September, 2004.
- 2005 | Speaker, *Singular Semi-Flat Calabi-Yau Metrics on  $S^2$* , Mirror Symmetry Conference, NCTS (Hsinchu, Taiwan), July, 2004.
- 2004 | Differential Geometry and Analysis Seminar, *Singular Semi-Flat Calabi-Yau Metrics on  $S^2$* , CUNY Graduate Center, March, 2004.
- 2004 | Nonlinear Analysis Seminar, *Singular Semi-Flat Calabi-Yau Metrics on  $S^2$* , Rutgers (New Brunswick), February, 2004.
- 2004 | Geometric Analysis Seminar, *Singular Semi-Flat Calabi-Yau Metrics on  $S^2$* , University of Wisconsin, February, 2004.
- 2004 | Speaker, *Singular Semi-Flat Calabi-Yau Metrics on  $S^2$* , Workshop on Geometric Analysis, MSRI (Berkeley, California), December, 2003.
- 2004 | Geometry Seminar, *Singular Semi-Flat Calabi-Yau Metrics on  $S^2$* , Northwestern University (Evanston, Illinois), November, 2003.
- 2004 | Speaker, *Singular Semi-Flat Calabi-Yau Metrics on  $S^2$* , Short Programme on Analysis and Resolution of Singularities, CRM (Montreal), August, 2003.

### Papers, Abstracts, and Lectures

- 2003 | Nonlinear Analysis Seminar, *Monge-Ampère Equations and Projective Quotients of Convex Domains*, Rutgers (New Brunswick), April, 2003.
- 2003 | Geometry and Analysis Seminar, *Families of Degenerating Real Projective Surfaces*, Columbia University, October, 2002.
- 2003 | Contributed Talk, *PDEs on Projectively Flat Manifolds*, EDGE Summer School and Conference (Edinburgh, Scotland), July, 2002.

- 2002 | Special Session Lecture, *Toward a Compactification of the Moduli Space of Convex  $\mathbf{RP}^2$  Surfaces*, AMS Sectional Meeting, Special Session on Flat Structures, Moduli Spaces, and Minimal Surfaces: Portland, Oregon, June, 2002.
- 2002 | Department Colloquium, *Differential Geometric Invariants of Convex Cones*, Polytechnic University (Brooklyn, New York), February, 2002.
- 2002 | Geometry and Analysis Seminar, *Toward a Compactification of the Moduli Space of Convex  $\mathbf{RP}^2$  Surfaces*, Columbia University, October, 2001.
- 2001 | Geometry Seminar, *Affine Spheres and Kalder-Einstein Metrics*, UC Irvine, April, 2001.
- 2001 | Special Session Lecture, *Affine Spheres and Kähler-Einstein Metrics*, AMS Sectional Meeting, Special Session on Ricci Curvature and Related Topics: Hoboken, New Jersey, April, 2001.
- 2001 | Differential Geometry Seminar, *Riemannian Metrics on Projectively Flat Manifolds*, CUNY Graduate Center, February, 2001.
- 2000 | Six-hour Lecture Series, *Affine Differential Geometry and  $\mathbf{RP}^n$ -Manifolds*, Seoul National University, March, 2000.
- 2000 | Geometry and Analysis Seminar, *Riemannian Metrics on Locally Projectively Flat Manifolds*, Columbia University, February, 2000.
- 2000 | Valley Geometry Seminar, *Affine Spheres and Convex  $\mathbf{RP}^n$ -Manifolds*, Amherst, Massachusetts, November, 1999.
- 1999 | Geometry and Analysis Seminar, *Applications of Affine Differential Geometry to  $\mathbf{RP}^2$  Surfaces*, Columbia University, March, 1999.
- 1999 | Geometry and Topology Seminar, *Applications of Affine Differential Geometry to  $\mathbf{RP}^2$  Surfaces*, University of Maryland, March, 1999.

### Abstracts (Published Papers)

J. Loftin. *Riemannian Metrics on Locally Projectively Flat Manifolds*.

Abstract: The expression  $-u^{-1}u_{,ij}$  transforms as a symmetric  $(0, 2)$  tensor under projective coordinate changes of a domain in  $\mathbf{R}^n$  as long as  $u$  transforms as a section of a certain line bundle. On a locally projectively flat manifold, the section  $u$  can be regarded as a metric potential analogous to the local potential in Kähler geometry. Let  $M$  be a compact locally projectively flat manifold. We prove that if  $u$  is a negative section of the dual of the tautological bundle so that  $-u^{-1}u_{,ij}$  is a Riemannian metric, then  $M$  is projectively equivalent to a quotient of a bounded convex domain in  $\mathbf{R}^n$ . The same is true for such manifolds  $M$  with boundary if  $u = 0$  on the boundary. This theorem is an analog of a result of Schoen and Yau in locally conformally flat geometry. The proof involves affine differential geometry techniques developed by Cheng and Yau.

J. Loftin. *Affine Spheres and Convex  $\mathbf{RP}^n$ -Manifolds*.

Abstract: We outline consequences of a theorem of Cheng-Yau in affine differential geometry for manifolds locally modeled on  $\mathbf{RP}^n$ . In particular, on each properly convex  $\mathbf{RP}^n$ -manifold, there are two canonical projectively flat connections and a canonical Riemannian metric. One connection represents the given  $\mathbf{RP}^n$  structure and the other the  $\mathbf{RP}^n$ -structure of the projective dual manifold. When  $n$  is 2, we use this approach, together with a result of C.-P. Wang, to show that a compact oriented convex  $\mathbf{RP}^2$ -surface of genus at least two is equivalent to a conformal structure on the surface together with a holomorphic cubic differential. This recovers a theorem of Goldman on the deformation space of such surfaces, and yields a description of the moduli space.

J. Loftin. *Affine Spheres and Kähler-Einstein Metrics*.

Abstract: To every convex cone  $C$  in  $\mathbf{R}^{n+1}$  which contains no lines, there is a natural complete affine Kähler metric due to Cheng-Yau which is the restriction of the unique complete Kähler-Einstein metric with negative Ricci curvature on the tube domain  $C + i\mathbf{R}^{n+1} \square \mathbf{C}^{n+1}$ . We show that the level sets of a natural affine Kähler potential for this Cheng-Yau metric are hyperbolic affine spheres. We also relate all metrics of the form  $-u^{-1}u_{ij}$  on projectively flat manifolds to affine Kähler metrics, and extend our earlier work to show that any projectively flat manifold which admits a complete Riemannian metric of the form  $-u^{-1}u_{ij}$ , where  $u$  is a negative convex section of the dual of the tautological bundle, is a projective quotient of a bounded convex domain in  $\mathbf{R}^n$ .

J. Loftin. *The Compactification of the Moduli Space of Convex  $\mathbf{RP}^2$  Surfaces, I*.

Abstract: There is a canonical identification, due independently to the author and to F. Labourie, of a convex real projective structure on an orientable surface of genus  $g$  and a pair consisting of a conformal structure together with a holomorphic cubic differential on the surface. The Deligne-Mumford compactification of the moduli space of curves then suggests a partial compactification of the moduli space of convex real projective structures: Allow the Riemann surface to degenerate to a stable nodal curve on which there is a regular cubic differential. We construct convex real projective structures on open surfaces corresponding to this singular data and relate their holonomy to earlier work of Goldman. We also have results for families degenerating toward the boundary of the moduli space. The techniques involve affine differential geometry results of Cheng-Yau and C.P. Wang and a result of Dunkel on the asymptotics of systems of ODEs.

J. Loftin. *Singular Semi-Flat Calabi-Yau Metrics on  $S^2$* .

Abstract: This paper is motivated by recent work of Gross and Wilson, in which they construct degenerate limits of families of K3 surfaces equipped with Calabi-Yau metrics (Ricci-flat Kähler metrics). Upon proper rescaling, the metric limit of such a family is a two-dimensional sphere equipped with a Riemannian metric with prescribed singularities at 24 points. Away from singularities, this limit metric is an affine Kähler metric. In other words, there are natural affine flat coordinates and a local potential function with specified metric. In this case, the metric is naturally a real slice of a Calabi-Yau metric. We refer to such a metric as a semi-flat Calabi-Yau metric. Such singular semi-flat Calabi-Yau metrics on surfaces were first constructed by Greene-Shapere-Vafa-Yau. We construct many examples of such metrics.

J. Loftin. *Flat Metrics, Cubic Differentials and Limits of Projective Holonomies*.

Abstract: Labourie and the author independently showed that a convex real projective structure on an oriented surface of genus at least 2 is equivalent to a conformal structure plus a holomorphic cubic differential  $U$ . We analyze the behavior of the real-projective structure as the conformal structure is fixed and the cubic differential is scaled to infinity. In particular, we find the asymptotic eigenvalues of the holonomies around smooth geodesic loops with respect to the flat metric given by  $|U|^{2/3}$ . If the asymptotic holonomies of all loops could be computed, then that would describe a boundary point in the deformation space of convex real-projective structures, as constructed by In Kang Kim. The proof involves an affine differential geometry of hyperbolic affine 2-spheres due to C.P. Wang, and an analysis of a PDE similar to Mike Wolf's analysis of the harmonic map equation and Thurston's boundary of Teichmüller space.

J. Loftin, S.T. Yau and E. Zaslow. *Affine Manifolds, SYZ Geometry and the "Y" Vertex*.

Abstract: We prove the existence of a solution to the Monge-Ampère equation  $\det \text{Hess}(\varphi) = 1$  on a cone over a thrice-punctured two-sphere. The total space of the tangent bundle is thereby a Calabi-Yau manifold with flat special Lagrangian fibers. (Each fiber can be quotiented to three-torus if the the affine monodromy can be shown to lie in  $\text{SL}(3, \mathbf{Z}) \square \mathbf{R}^3$ .) Our method is through Baues and Cortés's result that a metric cone over an elliptic affine sphere has a parabolic affine sphere structure (i.e., has a Monge-Ampère solution). The elliptic affine sphere structure is determined by a semilinear PDE on  $\mathbf{CP}^1$  minus three points, and we prove existence of a solution using the direct method in the calculus of variations.

J. Loftin and M.P. Tsui. *Ancient Solutions of the Affine Normal Flow*.

Abstract: We construct noncompact solutions to the affine normal flow of hypersurfaces, and show that all ancient solutions must be either ellipsoids (shrinking solitons) or paraboloids (translating solitons). A corollary is the classical theorem, due to Jorgens, Calabi, Pogorelov, and Cheng-Yau, that any entire convex solution to  $\det u_{ij} = 1$  is a quadratic function. We also provide a new proof of the existence of a hyperbolic affine sphere asymptotic to the boundary of a convex cone containing no lines, which is originally due to Cheng-Yau. The main techniques are local second-derivative estimates for a parabolic Monge-Ampère equation modeled on those of Ben Andrews and Gutiérrez-Huang, a decay estimate for the cubic form under the affine normal flow due to Ben Andrews, and a hypersurface barrier due to Calabi.

## Abstracts (Preprints)

J. Loftin and M.P. Tsui. *Limits of Solutions to a Parabolic Monge-Ampère Equation*.

Abstract: We present the results from our earlier paper on the affine normal flow on noncompact convex hypersurfaces in affine space from a more PDE point of view, emphasizing the estimates involved. Our results concern the limits of solutions to a parabolic Monge-Ampère equation on  $S^n$ , where a sequence of smooth strictly convex initial value functions increase monotonically to a limiting initial value function which is infinite on at least a hemisphere of  $S^n$ . We prove long-time existence and instantaneous smoothing for quite general initial data, and we characterize ancient solutions as ellipsoids or paraboloids. We make essential use of estimates of Andrews and Gutiérrez-Huang, and barriers due to Calabi.

J. Loftin. *Affine Hermitian-Einstein Metrics*.

Abstract: We develop a theory of stable bundles and affine Hermitian-Einstein metrics for flat vector bundles over a special affine manifold (a manifold admitting an atlas whose gluing maps are all locally constant volume-preserving affine maps). Our paper presents a parallel to Donaldson-Uhlenbeck-Yau's proof of the existence of Hermitian-Einstein metrics on Kähler manifolds, and the extension of this theorem by Li-Yau to the non-Kähler complex case of Gauduchon metrics. Our definition of stability involves only flat vector subbundles (and not singular subsheaves), and so is simpler than the complex case in some places.

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## Organizing and chairing activities

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### Participation in Organizing or Chairing Conferences, Workshops, and Organizations

- 05/2008 | **Ahlfors-Bers Colloquium**  
Member of local organizing committee, organizer of Workshop on Geometric and Algebraic Structures, and of Workshop on Conformal, Quasiconformal Geometry and Dynamics.
- 04/2003 | **AMS Sectional Meeting, Courant Institute**  
Co-organized Special Session on Nonlinear PDEs in Differential Geometry.

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## Funding

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**Single Discipline, Externally-Funded Research and/or Training Grants**

2004-2007 | (Grant Amount: \$107,973) **NSF Grant DMS0405873** *Monge-Ampère Equations and Geometric Structures on Manifolds.*

**Single Discipline, Internally-Funded Research and/or Training Grants**

2008-2009 | (Grant Amount: \$880) **Rutgers University Research Council**  
*Noncompact Affine Normal Flow.*

**Service****Contributions to the Advancement of the Academic Profession**

- 2003-ongoing | **Referee**  
6 papers for *Geometriae Dedicata*, 1 paper for *American Journal of Mathematics*, 1 paper for *Asian Journal of Mathematics*, 2 papers for *Journal of Differential Geometry*, 1 paper for *Math Annalen*, and 1 book for *World Scientific*; 1 paper for *Differential Geometry and its Applications*.
- 2003-2008 | **Math Reviews**  
10 article reviews, 1 book review written.
- 1999-2003 | **Referee**  
4 papers for *Journal of Differential Geometry* and 2 papers for *Transactions of the AMS*.

**Service to Other Public Bodies**

2000-2003 | **Columbia Geometry & Analysis Seminar**  
Organizer.

**Service to Rutgers University**

- 04/2008 | **Grants Facilitator Interview**  
Member of informal committee of junior faculty to interview grants facilitator candidates for FASN.
- 2006-2007 | **Rutgers Newark Student Colloquium**  
Organizer.
- 2005-ongoing | **RU Out Alliance**  
A founding member of an alliance of faculty and staff at Rutgers-Newark who want to help make the campus a more welcoming environment for LCBTIQ students, staff and faculty.
- 05/2004 | **Rutgers New Faculty Traveling Seminar**  
A member of the first annual traveling seminar of new Rutgers faculty, led by Rutgers President McCormick, the purpose of which was to tour New Jersey for five days in order to learn more about the land, the people, and the economy of New Jersey.
- 2004-2006 | **New Faculty Traveling Seminar Advisory Committee (university-wide)**
- 2003-ongoing | **Internal Committees, Department of Mathematics and Computer Science**

- Computer Science Committee (2003-)
- Instructional Technology Committee (2005-2006)

2003-2008 | **Rutgers Newark Mathematics Colloquium**  
Organizer (except on leave Spring, 2008).

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## **Students Supervised**

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### **Students Supervised for Independent Studies**

- 2007 | Timothy Foo, Differential Manifolds, Fall, 2006
- 2005 | Joshua Isralowitz, Differential Manifolds, Spring, 2005
- 2005 | Louis Thrall, Topics in Measure Theory and Algebraic Geometry, Summer, 2005

### **Master's or Doctoral Students by Type of Supervision**

- 2007 | C.N. Tsai (Columbia), 2007.
- 2004 | Jian Song (Columbia), 2004.
- 2004 | Ben Weinkove (Columbia), 2004.
- 2003 | Hanjin Lee (Columbia), 2003.
- 2001 | Albert Chan (Columbia), 2001.