

Weiqing Gu

DEPARTMENT OF MATHEMATICS
HARVEY MUDD COLLEGE
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EDUCATION AND CAREER:

1978 - 1980 Shanghai Teachers College of Technology
1980 - 1982 Teacher of Mathematics at Shanghai Teachers College of Technology
1982 - 1984 **Bachelor's Degree** Shanghai Teachers University
1984 - 1987 Continued teaching Mathematics at Shanghai Teachers University
1988 - 1989 Began graduate work in Mathematics at the University of Oklahoma
1989 - 1995 **Ph.D.** in Mathematics, University of Pennsylvania (**M.S.** 1993)
1995 - 1996 **Master's Degree** in Computer Science, University of Pennsylvania
1996 - 2002 Assistant Professor of Mathematics at Harvey Mudd College
1999 (Fall) Assistant Researcher at the University of California at Irvine
2002 - present Associate Professor of Mathematics at Harvey Mudd

RESEARCH INTERESTS:

- Differential Geometry and Topology
- Geometric Modeling and Design
- Industry Mathematics
- Applications in Math-Biology

DOCTORAL DISSERTATION IN MATHEMATICS:

- The stable 4-dimensional geometry of the real Grassmann manifolds.
(Adviser: *Herman Gluck*)

FELLOWSHIPS:

- University of Pennsylvania: Spring 1991, Spring 1993, Fall 1994 and Spring 1995,
Research Fellow at UC Irvine, Fall 1999.

RESEARCH PAPERS:

PAPERS ARE ORGANIZED INTO FOLLOWING 4 CATEGORIES (PLEASE SEE MY RESEARCH STATEMENT FOR MORE DETAILS):

1. Differential Geometry and Topology

- Weiqing Gu (1997), *The Stable 4-dimensional Geometry of the Real Grassmann Manifolds*. **Duke Mathematical Journal**, Vol. **93**, No. **1**, 155-178.
- Weiqing Gu and Zhongmin Shen (1998), *Lévy Concentration of Metric Measure Manifolds*. **Finslerian Geometries**, **Kluwer Academic Publishers**, 169-177.
- Weiqing Gu and Shenjun Jiang (1998), *Knotty Matrices in Knots*. **The Journal of Knot Theory and its Ramifications**, Vol. **8**, No. **6**, 701-707.
- Daniel Grossman and Weiqing Gu (2001), *Uniqueness of Volume-Minimizing Submanifolds Calibrated by the First Pontryagin Form*, **the Transactions of the American Mathematics Society**, Vol. **353**, No. **11**, Pages 4319-4332. (Article also electronically published on June 14, 2001.)
- Daniel Grossman and Weiqing Gu, *The 4-Dimensional Calibrated Geometry of Complex Grassmannians*. **In preparation**.
- Herman Gluck and Weiqing Gu (2001), *Volume-Preserving Great Circle Flows on the 3-Sphere*, **Geometriae Dedicata**, Vol. **88**, **2001**, Pages 259-282.
- Weiqing Gu and Christopher Pries, *Examples of Cayley Manifolds in R^8* . **Houston Journal of Mathematics**. Electronic Edition Vol. **30**, No. **1**, **2004**, pages 55-87. **This is a publication with an undergraduate at HMC**.
- Weiqing Gu and Ian Weiner, *Associative Manifolds Invariant Under 1-Parameter Subgroups of G_2* . Accepted by **International Journal of Pure and Applied Mathematics**.
- Weiqing Gu and Christopher Pries, *Classification of Symmetric Cayley Manifolds*. Submitted to **Houston Journal of Mathematics**.
- Weiqing Gu and Matt Holden, *Volume Minimizing Cycles in $R^6 \times S^1 \cong R^7/Z$* . **In preparation for submission**.
- Weiqing Gu and Jeff L. Jauregui, *Solving for Volume-Minimizing Cycles in G_2 -Manifolds*. **In preparation for submission**.
- Weiqing Gu and Ruben Arenas, *A New Basis for Lie Algebra of G_2* . **In preparation for submission**.

2. Geometric Modeling and Design

- Rida T. Farouki, Weiqing Gu, and Hwan Pyo Moon (2000), *Geometry of Minkowski Roots*. **Geometric Modeling and Processing 2000**, **IEEE Computer Society Press**, 287-300(2000).
- Doug DeCarlo, Jean Gallier and Weiqing Gu, *Fast and Simple Methods for Computing Control Points*, **Scientific Literature Digital Library**, <http://citeseer.ist.psu.edu/316748.html>.

- Philip D. Cha and Weiqing Gu (1999), *Comparing the Perturbed Eigensolutions of a Generalized and a Standard Eigenvalue Problem*. **The Journal of Sound and Vibration**, Vol. **227(5)**, 11 Nov, **99**, 1122-1132.
- Philip D. Cha and Weiqing Gu (1999), *Model Updating Using an Incomplete set of Experimental Modes*. **The Journal of Sound and Vibration**, Vol. **233(4)**, 2 Dec, **99**, 587-600.
- Philip D. Cha and Weiqing Gu, *Perturbation Method for a Symmetrized Standard Eigenvalue Problem*. **International Journal of Computational and Numerical Analysis and Applications**. Vol. **2**, No. **3**, **2002**, 337-350.
- Weiqing Gu and Ian Weiner, *Minkowski Geometric Algebra of Quaternion Sets*. **International Journal of Pure and Applied Mathematics**. Vol. **3**, No. **4**, **2002**, 385-411. **This is a publication with an undergraduate at HMC.**
- Weiqing Gu, *Geometric Methods in Finding Complete Intersections of Quadratic Equations*. **In preparation for submission.**
- Weiqing Gu and Ronald N. Goldman, *A New and Simple Scheme for Symmetrizing Multiaffine Polynomials*. **In preparation for submission.**
- Micah Smukler and Weiqing Gu, *Minimal Symmetrizing Sets of Multiaffine Polynomials*. **In preparation.**

3. Industrial Mathematics

- Weiqing Gu, *Using Elliptic Curves Over Finite Fields in Cryptography and More*, currently VIASAT INC. **CONFIDENTIAL**: will be published after waiting a certain period since it is an extension of the math Clinic project with ViaSat Inc. supervised by myself on *Using Elliptic Curve Cryptography for Secure Communication*, which has been **patented through ViaSat**.
- Weiqing Gu, *Geometric Methods in Finding Intersections of Nonlinear Equations in Three Variables and Their Applications in Color-Imaging Technology*. This document is **HP CONFIDENTIAL**.
- Weiqing Gu and Ingeborg Tastl (2005), *Analyzing and Comparing Interpolation Methods in Generating ICC Profiles*. **HP CONFIDENTIAL**.
- Weiqing Gu and Ingeborg Tastl (2005), *An Iterative Method in Generating ICC Profiles*. **HP CONFIDENTIAL**: in the process of **patent through hp Invent**. (The results from this research are being implemented by current hp Clinic team at Harvey Mudd.)
- Weiqing Gu and Ingeborg Tastl (2005), *Inventing a New Continuous Model in Generating ICC Profiles*, **HP CONFIDENTIAL**, is in the process of **patent through hp Invent**.

- Weiqing Gu and Ingeborg Tastl (2005), *A New Method of Dealing With Subtle Color Regions Such As Gray and Skin-Tone*. HP CONFIDENTIAL.
- Weiqing Gu and Ingeborg Tastl (2005), *Develop “Smart” CMM (Color Manager Model)*. In preparation, HP CONFIDENTIAL.

4. Applications to Math-Biology

- Weiqing Gu and Helen Moore, *A mathematical model for treatment-resistant mutations of HIV*, **Mathematical Biosciences and Engineering**, Vol. 2, No. 2. April 2005, pp.363-380.
- L. G. de Pillis, W. Gu, and A. E. Radunskaya, *Mixed immunotherapy and chemotherapy of tumors: modeling, applications and biological interpretations*. Appearing soon in **Journal of Theoretical Biology**.
- Weiqing Gu and Helen Moore, *Optimal therapy regiments for treatment-resistant mutations of HIV*, **Submitted to Proceedings from the Joint Research Conference on Modeling the Dynamics of Human Diseases**.
- L. G. de Pillis, W. Gu, and F. Fister, *Chemotherapy for Tumors: An Analysis of the Dynamics and a Study of Quadratic and Linear Optimal Controls*. **Submitted to Mathematical Biosciences**.
- Weiqing Gu, Lisette de Pillis, Will Chang, Eric Malm, *An Immunotherapeutic Extension of the Jackson 3D Tumor Model*. **In preparation for submission**.
- Weiqing Gu and Jeffrey Jauregui, *Applying Level Set Methods to the Modeling of Tumor Growth and Response to Chemotherapy*. **In preparation for submission**.
- L. G. de Pillis, W. Gu, and F. Fister, *Optimal Control of Mixed Immunotherapy and Chemotherapy of Tumors*. **In preparation for submission**.
- L. G. de Pillis, W. Gu, and F. Fister, *Seeking Bang-Bang Solutions in Mixed Imuno-Chemo-therapy of Tumors*. **In preparation**.

TEACHING:

- I began teaching Calculus and Linear Algebra back in China when I was 18 years old. After teaching for two years, I resumed my studies at Shanghai Teachers' University, but then I paid special attention to how the best teachers taught their classes. When I went back to the college to continue teaching, I received the *Outstanding Teaching Award* each year for the next two years. At that time, I taught Calculus, Linear Algebra, Abstract Algebra, Ordinary Differential Equations, and Statistics.

- It was a challenge when I started as a Teaching Assistant at the University of Pennsylvania. I was worried. However, it turned out that I really enjoyed it, and I was pleased with the students reactions and comments. At Penn, I taught all levels of Calculus as a Teaching Assistant, and had full responsibility for summer courses in Calculus, Fourier Series & Boundary Value Problems, and Linear Algebra. **A videotape of the summer course on Linear Algebra that I taught at Penn has been a “model” for the three years from 1993 to 1996 in the Department’s Instructional Program for new Teaching Assistants.**
- Since I have been at Harvey Mudd, I have taught Advanced Differential Geometry, Linear Algebra, Elementary Differential Geometry, Multi-variable Calculus and Advanced Linear Algebra. Usually, I teach three courses or sections in the fall semester and two courses in the spring semester. The teaching evaluation of my courses is around 6 points out of a total 7 points. (The highest one was 6.87 out of 7.) I held weekly evening problem sessions on Sunday nights in addition to my regular office hours, held review sessions on weekends, and held extra office hours to help students with weak backgrounds. My students greatly appreciated my hard work.
- Here are some examples of course evaluations:
 - *Prof. Gu is very enthusiastic about teaching and put a lot of effort and work into helping the students understand the material. She makes linear algebra a very enjoyable and understandable course. Gu often holds homework sessions for us and gives us a lot of extra material to help us study. She is very nice and approachable professor and one of my favorite teachers.*
 - *Professor Gu was interested in the course and taught the material well. I liked how she did not go in the order of the book. The organization was very good. She cares about her students a lot.*
 - *Professor Gu was energetic and motivating which made everyone want to do their best work. She also explained material very clearly.*
 - *A lot of challenging material was covered. It was fun to learn so much...very dedicated and well-prepared...whenever there were gaps in our knowledge, Prof. Gu would quickly and effectively review...Kept a good pace going through material: when it was simple it was covered quickly, but more difficult subjects were given more time and useful examples.*
 - *Professor Gu is an excellent teacher with a clear mastery of advanced mathematics. I liked that the class was able to cover some advanced material in depth...The “big picture” guides were very helpful for the organizing the material in my mind...The material was extremely challenging, but Prof. Gu did an excellent job of making it interesting and understandable.*

- In order to improve my teaching constantly, I have been observing how some of the best professors at Harvey Mudd teach their classes. I learned a lot from their teaching techniques. Still there is much more for me to learn. Throughout these years, I have thoroughly enjoyed my teaching, and intend to keep doing it for the rest of my life.

INDUSTRY CLINIC PROJECTS SUPERVISED:

- Faculty consultant for the Bank of America Clinic, 97-98.
- Faculty consultant for Environmental Systems Research Institute Clinic, 98-99.
- Faculty Clinic adviser for ViaSat, Inc. Clinic, 01-02. **The team received the Best Math Clinic Award.**
- Faculty adviser for Summer 2002 IPAM (Institute for Pure and Applied Mathematics) Research in Industrial Projects for Students. (The project that I supervised comes from Los Alamos National Laboratory.)
- Faculty Clinic adviser for Sandia N.L. Clinic, 03-04. **The team received the Best Math Clinic Award.**
- Faculty Clinic adviser for HP Clinic project on *Analyzing and Correcting Printer Drift*, Spring, 04-05. **The team received the Best Math Clinic Award and gifts from HP.**
- Faculty adviser for another HP Clinic project on *Implementation of New Methods of Generating ICC Profiles*, 05-06.

COURSE DEVELOPMENT:

- Developed a multi-media course on the Geometry of Curves and Surfaces with Applications to Computer Aided Geometric Design. (As the principal investigator on this three-summer Mellon funded project), supervised 7 summer working students and collaborated with Professor Michael Moody and Professor Ran Libeskind-Hadas in the summer of 97.
- Modified Math 73 (Linear Algebra) and its successors in the new core math curriculum and Math 173 (Advanced Linear Algebra) so that they fit better into the college curriculum.
- Reestablished a course, Math 142 (Elementary Differential Geometry) which had not been taught at HMC for many years.

- Created a new course, Math 143 (Topics in Geometry), to provide a strong background for our advanced mathematics and physics students in their future graduate study.
- Created a Geometric Modeling Course, Math 460. Currently being taught at CGU.
- I am currently writing a book on “Differential Geometry for Advanced Undergraduate Students” following an invitation from the AMS. (Please see the included draft in my submitted folder).
- Currently updating Math 12 and Math 63.

COURSES TAUGHT:

- *Fall, 2005*
 1. Math 12-3, Linear Algebra/Discrete Dynamic Systems (meet 4 times per week).
 2. Math 12-5, Linear Algebra/Discrete Dynamic Systems (meet 4 times per week).
 3. Math 142, Elementary Differential Geometry.
 4. Math 193, Math Clinic.
 5. CGU-Math 460, Geometric Modeling.
- *Summer, 2005*
 1. Math 63, Section 1, Linear Algebra II (summer math).
 2. Math 63, Section 2, Linear Algebra II (summer math).
- *Spring, 2005*
 1. Math 173, Advanced Linear Algebra.
 2. Math193, Math Clinic.
 3. Math 196, Independent Study supervising.
- *Fall, 2004*
 1. Math 142, Elementary Differential Geometry.
 2. Math 193, Math Clinic, Faculty Adviser.
 3. Math 196, Independent Study supervising.
- *Summer, 2004*
 1. Math 61, Section 1, Multi-variable Calculus II (summer math).
 2. Math 61, Section 2, Multi-variable Calculus II (summer math).
- *Spring, 2004*

1. Math 143, Topics in Geometry.
 2. Math 193, Math Clinic.
 3. Math 196, Independent Study supervising. (In order for me attending workshops in geometry at MSRI, Art arranged my teaching so that I had a heavier load in 2003 instead.)
- *Fall, 2003*
 1. Math 12-1, Linear Algebra/Discrete Dynamic Systems, meet 4 times per week.
 2. Math 12-2, Linear Algebra/Discrete Dynamic Systems, meet 4 times per week.
 3. Math 142, Elementary Differential Geometry.
 4. Math 193, Math Clinic, Faculty Adviser.
 5. Math 196, Independent Study.
 - *Summer, 2003*
 1. Math 61, Section 1, Multi-variable Calculus II (summer math).
 2. Math 61, Section 2, Multi-variable Calculus II (summer math).
 - *Spring, 2003*
 1. Math 14, Section 1, Multi-variable Calculus I.
 2. Math 14, Section 2, Multi-variable Calculus I.
 3. Math 173, Advanced Linear Algebra.
 4. Math 196, Independent Study.
 5. Math198, Math Forum, taking care for both Monday and Wednesday sections.
 - *Fall, 2002*
 1. Math 142, Elementary Differential Geometry.
 2. Math 12-4, Linear Algebra/Discrete Dynamic Systems, meet 4 times per week.
 3. Math 12-6, Linear Algebra/Discrete Dynamic Systems, meet 4 times per week.
 4. Math198, Math Forum, taking care for both Monday and Wednesday sections.
 5. Math196, Independent Study, supervising three students.
 - *Spring, 2002*
 1. Math 14, Multivariable Calculus I, Section 3.
 2. Math 14, Multivariable Calculus I, Section 4.
 3. Math 143, Advanced Geometry.
 4. Math 193, Mathematics Clinic.

5. Math 196, Independent Study.
 6. Math 197, Senior Thesis coordinator.
- *Fall, 2001*
 1. *Math 142, Elementary Differential Geometry.*
 2. *Math 198 and 198c, Undergraduate Math Forum.*
 3. *Math 193, Mathematics Clinic.*
 - *Spring, 2001*
 1. Math 14, Multivariable Calculus I, Section 1.
 2. Math 14, Multivariable Calculus I, Section 5.
 3. Math 14, Multivariable Calculus I, Section 6.
 4. Math 196, Algebraic Topology.
 - *Fall, 2000*
 1. Math 142, Elementary Differential Geometry of Curves and Surfaces.
 2. Math 173, Advanced Linear algebra.
 3. Math 196, Lie groups and Lie algebra.
 - *Spring, 2000*
 1. Math 73, Linear Algebra, Section 1.
 2. Math 73, Linear Algebra, Section 2.
 3. Math 143, Topics in Differential Geometry.
 - *Spring, 1999*
 1. Math 73, Linear Algebra, Section 2.
 2. Math 173, Advanced Linear algebra.
 - *Fall, 1998*
 1. Math 73, Linear Algebra, Section 1.
 2. Math 73, Linear Algebra, Section 2.
 3. Math 142, Elementary Differential Geometry of Curves and Surfaces.
 - *Spring, 1998*
 1. Math 73, Linear Algebra, Section 1.
 2. Math 143, Topics in Differential Geometry with Applications to Einstein's Relativity.

- *Fall, 1997*
 1. Math 73, Linear Algebra, Section 1.
 2. Math 73, Linear Algebra, Section 2.
 3. Math 142, Elementary Differential Geometry of Curves and Surfaces.
- *Spring, 1997*
 1. Math 73, Linear Algebra, Section 1.
 2. Math 143, Seminars in Advanced Differential Geometry.
- *Fall, 1996*
 1. Math 73, Linear Algebra, Section 1.
 2. Math 73, Linear Algebra, Section 2.

RESEARCH STUDENTS:

SUMMER RESEARCH STUDENTS SUPERVISED:

- **Dylan Helliwell:** *Quaternion Numbers and Spin Structures*, Summer 1997.
- **Naveen Mathew:** *Computer Aided Geometric Design*, Summer 1998.
- **Ryan Haskett:** *Vector Calculus, Fields and Flows on 3-dimensional Manifolds*, Summer 1999.
- **Ian Weiner:** *Minkowski Geometric Algebra of Quaternion Sets*, Summer 2000.
- **Christopher Pries:** *Examples of Cayley Manifolds in R^8* , Summer 2001.
- **Micah Smukler:** *Minimal Symmetrizing Sets of Multiaffine Polynomials*, Summer 2001.
- **Ross Richardson:** *Averaging Curves in the Plane*, Summer 2002.
- **Christopher Pries:** *Classification of Symmetric Cayley Graphs*, Summer 2002.
- **Micah Smukler:** *Topology and Geometry of Minkowski Products of Plane Curves*, Summer 2002.
- The following students were co-supervised with Professor Lisette de Pillis on our joint research project: *Optimizing Immunotherapy and Chemotherapy of Tumors through Mathematical Modeling*, Summer 2003.
 - **William Chang**
 - **Lindsay Crowl**

- Eric Malm
- Katherine Todd-Brown
- Lorraine Thoms
- Michael Vrable
- **Jeffery Jauregui:** *Applying Level Set Methods to the Modeling of Tumor Growth and Response to Chemotherapy*, Summer 2004.
- The following students were co-supervised with Professor Lisette de Pillis on our joint research project: *Optimal Control of Immunotherapy and Chemotherapy of Tumors*, Summer 2005.
 - Tiffany Head
 - Kenneth Maples
 - Anand Murugan
 - Kenji Yoshida

SENIOR THESES STUDENTS SUPERVISED:

- **Dylan Helliwell:** *Quaternion Determinant and its Applications*, 9/97–5/98
- **Ryan Haskett:** *Examples of Volume-Preserving Great Circle Flows on the Three Sphere*, 9/99–5/2000.
- **Yinan Song:** *Finite Invariance in Cayley Calibrations*, 9/99–5/2000.
- **Ian Weiner:** *Associative 3-Manifolds in R^7* , 9/2000–5/2001.
- **Lara Mercurio:** *Special Lagrangian Submanifolds in C^3* , 9/2001–5/2002.
- **Ross Richardson:** *Applications of Matrix Theory, Lie Group and Lie Algebra Theory to CAGD*, 9/2002–5/2003.
- **Christopher Pries:** *Finding Super Symmetric Cycles in Calabi-Yau Manifolds*, 9/2002–5/2003.
- **Micah Smukler:** *Geometry and Topology and Minkowski Products and Their Applications in Biological Modeling*, 9/2002–5/2003.
- **Kira Sushkoff:** *Minkowski Actions of Quaternion Sets and Their Applications in CAGD*, 9/2002–5/2003.
- **Matthew Holdon:** *Geometries of Associative Manifold*, 9/2003–5/2004
- **Jeffery Jauregui:** *Calibrated Cycles in G_2 Manifolds*, 9/2004–5/2005
- **Ruben Arenas:** *Explaining the Universe: Exploring the Structure of G_2* , 9/2004–5/2005

- **Tyler Seacrest:** *Matrix Perturbation Theory and Its Applications in Image Processing*, 9/2005–5/2006
- **Kenneth Maples:** *Optimal Control of Tuned Mass Damper During Strong Earth Quake*, 9/2006–5/2006

Many of my research students have won the Chavin Prize for the best mathematics thesis. Almost all of my graduated thesis students are now doing graduate work at universities such as U. Washington, UC Berkeley, UCLA, UCSD, Chicago, Duke, Caltech, Stanford, and Cambridge. When I received the thank-you-note from Dylan Helliwell when he got his tenure track job at Seattle University, tears were in my eyes.

BEING A SECOND READER FOR FOLLOWING SENIOR THESIS STUDENTS (Please see <http://www.math.hmc.edu/seniorthesis/>):

- **Zachary Walters**
- **Colin Little**
- **Wesley Turner**
- **Melissa Banister**
- **William Chang**
- **David Clarke**
- **Robert Gaebler**
- **Steven Avery**
- **Eric Malm**
- **Kathe Todd-Brown**

MELLON PROJECTS, STUDENTS SUPERVISED:

- **Naveen Mathew:** *Mellon Project, on the part of Multimedia Design*, Summer 1997, Summer 1998 and Spring 1999.
- **Drew Bernat:** *Mellon Project, on the part of Implementation*, Summer, 1997.
- **Bill Williams:** *Mellon Project, on the part of Implementation*, Summer, 1997.
- **Michael Schubmehl:** *Mellon Project, on the part of the Initial Electronic Library of Curves and Surfaces*, Summer, 1999 and Spring 2000.
- **Timothy Prescott:** *Mellon Project, on the part of A Tool-box for Visualization*, Summer 1999.

- **Brian Kappus:** *Mellon Project, on the part of Web Design and preparing in LaTeX the solution keys to homework assignments*, Summer 1999, Summer 2000 and Fall 2000.

INDEPENDENT STUDY, STUDENTS SUPERVISED:

- **Dylan Helliwell:** *Matrix Groups by Morton Curtis*, Spring 1997.
- **Yinan Song:** *Introduction to Compact Lie Group by Howard Fegan*, Spring 1999.
- **Shane Markstrum:** *Topics in Elementary Differential Geometry by Tore*, Spring 2000.
- **Bradley Forrest, Josh Greene, Ian Weiner, Karl Mahlburg, Stephen Griffeth:** *Advanced Topics in Algebra based on my study notes*, Fall 2000.
- **Josh Greene:** *Commutative Algebra and its Applications to Algebraic Geometry*, Spring 2001.
- **Ian Weiner and Stephen Griffeth:** *Algebraic Topology, a Basic Course, by Massey*, Spring 2001.
- **Christopher Pries:** *Matrix Groups*, Fall 2001.
- **Christopher Pries:** *Spinors and Calibrations*, Spring 2002.
- **Ross Richardson:** *Computational Line Geometry*, Fall 2002.
- **Christopher Pries:** *Symplectic Geometry and Topology*, Fall 2002.
- **Micah Smukler:** *Geometric Modeling*, Fall 2002.
- **Kira Sushkoff:** *Computer Aided Geometric Design*, Fall 2002–present.
- **Matthew Holdon** *Spinors and Calibrations*, 2003.
- **Matthew Holdon:** *Calibrations and Spinors*, Spring 2004.
- **Ruben Arenas:** *Differential Geometry, Gauge Theories, and Gravity*, Spring 2004
- **Jeffery Jauregui:** *Topology and Geometry for Physicists*, Fall 2004.
- **Anand Murugan:** *Matrix Groups*, Fall 2004.

CGU PH.D. THESIS STUDENTS SUPERVISED

- **Ying Teng:** *Modeling and Simulation of Aeroservoelastic Control with Multiple Control Surfaces Using μ -Method*. 5/2002–12/2005, Graduating Soon. (Passed Thesis Defense on October 7, 05.)
- **Timothy Ahern:** *Applying Geometric Modeling Techniques in Design Products in Boeing*, Current student.

OTHER STUDENT ADVISING:

- Senior thesis students coordinator, spring 2002. Supervising about 15 students.
- Faculty freshman adviser.
- Math major adviser (each year supervising about 4-7 mathematics students).

GRANTS:

- NSF Grants:
 1. Together with Professor Lisette de Pillis, we obtained NSF grant: \$328,283 on “Mathematical Modeling of the Chemotherapy, Immunotherapy and Vaccine Therapy of Cancer”, NSF proposal code: 0414011.
 2. Together with Professors Ali Nadim and Ellis Cumberbatch, we obtained NSF grant, \$424,135 on “CGU-Boeing partnership in Geometric Modeling for Industrial Applications”, NSF proposal code: 0538663.
- Mellon Grants:
 1. Mellon Faculty Career Development New Venture Grant, \$ 23,739. Period: Summer 2005 – Summer 2006.
 2. Mellon Grants at Harvey Mudd College, Weiqing Gu (Principal investigator), Ran Libeskind-Hadas and Michael Moody, Summer 1997, (Supervising three students.)
 3. Mellon Grants at Harvey Mudd College, Summer, 1998. (Supervising two students.)
 4. Mellon Grants at Harvey Mudd College, Summer, 1999. (Supervising three students.)
- Beckman Summer Research Grants, Various Travel Grants and Other Grants:
 1. Faculty Research Grant at Harvey Mudd College, Summer, 1997. (Supervising one research student.)
 2. Faculty Research Grant at Harvey Mudd College, Summer, 1999. (Supervising one research student.)
 3. Faculty Research Grant at Harvey Mudd College, Summer, 2000. (Supervising one research student.)
 4. Faculty Research Grant at Harvey Mudd College, Summer, 2001. (Supervising two research students.)
- Obtain several HMMI and QLS funds for my summer research students.
- Various Travel Grants and Other Grants:

1. Travel grant from NSA and NSF to participate in the Julia Robinson Celebration of Women in Mathematics Conference at MSRI, July, 1996.
2. Travel grant from ONR to attend the Joint Math Meetings and AWM Workshop at San Diego, California, January, 1997.
3. Travel grant to attend Pacific NW Geometry Conference at MSRI, February, 1997.
4. Travel grants from NSF and AWM to attend the 12th Geometry Festival at Duke University, March, 1997.
5. Travel grants to attend Midwest Geometry Conference at the University of Kansas, April, 1997 and Sixth Southern California Geometry Analysis Seminar at the University of California, Irvine, May, 1997.
6. Partial travel grant from the Research Foundation of State University of New York to attend a conference of Connections in Modern Mathematics and Physics at Stony Brook, NY, April, 1998.
7. Travel grant from the Pacific Institute for the Mathematical Sciences to attend the Pacific Riemannian Geometry Conference at University of British Columbia, Vancouver, Canada, June, 1998.
8. Travel grant from the University of Pennsylvania to attend the 14th Geometry Festival, April, 1999.
9. Travel grant from PNGS to attend the Pacific Northwest Geometry Seminar at the University of Washington at Seattle, May 1999.
10. Travel grant from MSRI to attend the Workshop on Mathematical Foundations of Computer Aided Design, June, 1999.
11. Grants from Mathematical Sciences Research Institute for attending the MSRI 1999 Summer Program in Lie groups and the method of moving frame/Exterior Differential Systems, 1999.
12. Grants from Association for Women in Mathematics (AWM) for attending the Olga Taussky Todd Celebration of Careers in Mathematics for Women, July, 1999.
13. Travel grants from University of Notre Dame, Indiana University Purdue University and Stanford University to give talks, November 2000.
14. Travel grants from International Conference in Applied Mathematics Winter 2002, Scuola Superiore G. Reiss Romoli, L'Aquila, Italy for giving a keynote speech, January, 2002.
15. Travel grant from Stanford to attend Geometry Analysis: In honor of Richard Melrose, March, 2002.
16. Travel grant from Annual Southeast Geometry Conference for giving a talk, April, 2002.
17. Travel grant from American Mathematics Society to attend the International Congress of Mathematicians in Beijing China, August, 2002.
18. Travel grant from MSRI for attending workshop on Ricci Flow and Geometrization of 3-manifolds, Part I at AIM and PartII at MSRI, December, 2003.
19. Travel grant from MSRI for attending Workshop: Von Neumann Symposium on Complex Geometry, Calibrations, and Special Holonomy, MSRI, August, 2003.
20. Full support from IPAM for attending Symplectic Geometry and Physics Retreat at Lake Arrowhead, June, 2003.
21. Partial support from IPAM for attending workshops from I-IV on Symplectic Geometry and Physics Workshop IV, March–June, 2003.
22. Travel support from UC Irvine for attending 10th Southern California Geometric Analysis Seminar, August, 2003.

23. Travel grant from AWM and NSF for attending conference on Women Mathematicians Taking a Leadership Role at the University of Maryland, March, 2004.
 24. Travel grant from Stanford for giving invited talks at its Geometry Seminar and at MSRI.
 25. Partial travel grant for attending Yamabe Symposium at the University of Minnesota, September, 2004.
 26. Travel grant for giving 3 invited talks during my trip in China, 10/14/04—10/24/04, at the Math Dept, Fudan University; the Center of Mathematical Sciences, ZhiJiang University; and the Shanghai Research Institute, China Technology University.
 27. Partial travel grant from Courant Institute of Mathematics Science for attending conference: Submanifolds, Singularities and Stratified Spaces, March, 2005.
 28. Obtained living support from the Center of Mathematical Sciences, ZhiJiang University for attending International Conference in Geometry and Analysis in Celebration of Prof. Leon Simon's 60th Birthday, at the Center of Mathematical Sciences, ZhiJiang University, June, 2005.
 29. Obtained full support from AIM to attend Numerical Methods for Optimal Control in High Dimensions, August, 2005.
- Currently preparing an NSF grant for “Developing Student Leadership Through Case Studies”

INVITED TALKS, COLLOQUIA, POSTS OR MEETINGS ATTENDED:

- The Year of 1996
 1. University of Westchester, Department of Mathematics, Spring, 1996.
 2. University of Pittsburgh, Department of Mathematics and Statistics, Spring, 1996.
 3. University of Arizona (at Tucson), Department of Mathematics, Spring, 1996.
 4. Lycoming College, Department of Mathematics, Spring, 1996.
 5. Drexel University, Department of Mathematics, Spring, 1996.
 6. The Richard Stockton College of New Jersey, Spring, 1996.
 7. University of Maine, Department of Computer Science, Spring, 1996.
 8. 1996 Meeting of Association for Women in Mathematics at MSRI, Summer, 1996.
- The Year of 1997
 1. University of Southern California, Geometry and Topology Colloquium, Fall, 1997.
 2. The Joint Math Meetings and AWM Workshop, January, 1997.
 3. The Claremont Colleges of Mathematics Colloquium, Spring, 1997.
 4. MW Geometry Conference, Spring, 1997.
 5. The Workshop on Geometry and Complexity at the Fields Institute for Research in Mathematical Sciences at University of Toronto, May, 1997.
 6. 1997 Lehigh University Geometry/Topology Conference, Summer, 1997.

- The Year of 1998
 1. Pacific Northwest Geometry Seminar, 1998 Winter Meeting at MSRI, February, 1998.
 2. The Symposium in Geometry, a conference in honor of S. S. Chern at Mathematical Sciences Research Institute, Berkeley, CA, March, 1998.
 3. Connections in Modern Mathematics and Physics at Stony Brook, NY, April, 1998.
 4. Mellon Project Presentation, Harvey Mudd College, April, 1998.
 5. Seminar on Differential Geometry and Teaching Styles of U.S.A, Shanghai Teacher's University, Feng-Xian Campus, Shanghai, China, June, 1998.
 6. Pacific Riemannian Geometry Conference at University of British Columbia, Vancouver, Canada, July, 1998.
 7. International Congress of Mathematicians, ICM 1998, Berlin, Germany, August, 1998.
- The Year of 1999
 1. The summer 1999 Workshop of the Association for Women in Mathematics, July, 1999.
 2. A research meeting at the University of California, Davis and where I established collaborative work with Rida Farouki and Hwan Pyo Moon. September, 1999.
 3. The 91st Southern California Topology Colloquium at Caltech Topology. December, 1999.
 4. Attended all seminar talks and conferences at UC Irvine, Spring 1999 while spending my one-semester sabbatical there.
- The Year of 2000
 1. The Topology/Geometry Seminar at the University California at Riverside, January, 2000.
 2. The Topology Seminar at Caltech, February, 2000.
 3. The Claremont topology seminar, March and April, 2000.
 4. Distinguished Lecture Series by Prof. Gang Tian at UCLA, May, 2000.
 5. Panorama of Mathematics conference in honor of S. S. Chern, 09/13/00–09/16/00.
 6. Geometry seminar at Notre Dame, 11/2/00.
 7. Colloquium talk at Indiana University Purdue University, 11/03/00–11/04/00.
 8. Stanford Geometric Seminar, 11/08/00.
 9. Math Department Colloquium at Stanford, 11/09/00.
 10. Contact Geometry Conference at Stanford, 12/13/00–12/17/00.
- The Year of 2001
 1. Geometric Aspects of Spectral Theory Workshop at MSRI, 03/12/01–03/16/01.

2. Conference on Symplectic Geometry and Applications to Physics at UC Irvine, 04/12/01–04/15/01.
 3. Distinguished Lecture Series by Richard Schoen on A Survey of Recent Progress in Differential Geometry and General Relativity, 05/16/01–05/18/01.
 4. Stauffer Talk on Volume Minimizing Cycles and Submanifolds Calibrated by Certain Invariant Differential forms at Harvey Mudd College, 6/28/01.
 5. SIAM Conference on Geometric Design and Computing, Sacramento, California, 11/05/01–11/08/01.
 6. Fall Meeting of the Southern California Section of the Mathematical Association of America, Loyola Marymount University, 10/13/01.
 7. 972nd American Mathematics Society Meeting, UC Irvine, 11/10/01–11/12/01.
- The Year of 2002
 1. Joint Mathematics Meetings, San Diego, 01/06/02–01/09/02.
 2. International Conference in Applied Mathematics Winter 2002, Scuola Superiore G. Reiss Romoli, L'Aquila, Italy, 01/21/02–01/27/02.
 3. 9th Southern California Geometric Analysis Seminar, 02/02/02–02/03/02.
 4. Geometry Seminar, UCLA, 02/26/02.
 5. Geometry Analysis Conference in honor of Richard Melrose, MIT, 03/23/02–03/25/02.
 6. Topology Seminar, UCSD, 04/02/02
 7. Annual Southeast Geometry Conference, 04/19/02–04/21/02.
 8. Minimal Varieties in Geometry and Physics—A Conference on the Occasion of Braine Lawson's 60th Birthday, Stony Brook, 06/01/02–06/07/02.
 9. IPAM RIPS Talks and Presentations, UCLA, Summer 2002.
 10. International Congress of Mathematicians, Beijing, 08/20/02–08/28/02.
 - The Year of 2003
 1. Workshop: Ricci Flow and Geometrization of 3-manifolds, Part II, MSRI, 12/15/03–12/19/03.
 2. Conference: Ricci Flow and Geometrization of 3-manifolds, Part I, AIM Research Conference center, 12/9/03–12/13/03.
 3. Mt. Baldy Conference on Mathematics Biology, HMC, 11/8/03.
 4. Workshop: Von Neumann Symposium on Complex Geometry, Calibrations, and Special Holonomy, MSRI, 8/11/03–8/20/03.
 5. Symplectic Geometry and Physics Retreat at Lake Arrowhead, 6/8/03–6/13/03.
 6. Symplectic Geometry and Physics Workshop IV: Symplectic Geometry and String Theory, IPAM, 6/2/03–6/6/03.

7. Symplectic Geometry and Physics Workshop III: Geometry and Physics of G_2 Manifolds, IPAM, 4/29/03–5/2/03.
 8. Symplectic Geometry and Physics Workshop II: Geometry of Lagrangian Submanifolds, IPAM, 4/14/03–4/18/03.
 9. Symplectic Geometry and Physics Workshop I: Symplectic Geometry, IPAM, 3/24/03–3/28/03.
 10. Symplectic Geometry and Physics: Tutorials, IPAM, 3/18/03–3/21/03.
 11. MAA meeting at HMC, 3/8/03.
 12. Kyoto Conference at UCSD, 3/5/03.
 13. 10th Southern California Geometric Analysis Seminar, 02/08/03–02/09/03.
 14. Joint Mathematics Meetings at Baltimore, 1/15/03–1/18/03.
- The Year of 2004
 1. Seminar: 11th SCGAS at UC Irvine, 2/21/04.
 2. Workshop: Geometric Flow Workshop at IPAM, 2/23/04–2/27/04.
 3. Conference: Women Mathematicians Taking a Leadership Role at the University of Maryland, 3/11/04–3/14/04.
 4. Workshop: Symplectic Geometry and Math Physics at MSRI, 3/22/04 –3/26/04.
 5. SIAM Applied Math Symposium at HMC, 4/24/04.
 6. Invited Talk: at Stanford, 4/28/04.
 7. Invited Talk: at MSRI, 5/13/04.
 8. Yamabe Symposium at the University of Minnesota, 9/17/04–9/19/04.
 9. Contributed talk at the Mathematical Association of America, Southern California-Nevada Section, 10/9/04–10/10/04.
 10. Gave 3 Invited Talks during my trip in China, 10/14/04—10/24/04, at the Math Dept, Fudan University; the Center of Mathematical Sciences, ZhiJiang University; and the Shanghai Research Institute, China Technology University.
 11. Mellon Workshop on Mathematical Modeling, 11/5/04–11/7/04, Pomona College.
 - The Year of 2005
 1. 12th Southern California Geometry and Analysis Seminar at UCSD, 2/19/05–2/20/05.
 2. Conference: Submanifolds on Singular Varieties and Stratified Spaces, Courant Institute of Mathematical Sciences, 3/13/05–3/16/05.
 3. Given a talk on Calibrated Exceptional Geometry at 1007th AMS Meeting, also attended the meeting, 4/16/05–4/17/05.
 4. Given a talk on Optimal Control of Immunotherapy and Chemotherapy of Tumors, Claremont College Math Colloquium, 4/27/05.

5. Professional Grant Proposal Writing Workshop, The Grant Institute, San Diego State University, 5/23/05–5/25/05.
6. International Conference in Geometry and Analysis in Celebration of Prof. Leon Simon's 60th Birthday, at the Center of Mathematical Sciences, ZhiJiang University, 6/24/05–6/26/05.
7. Numerical Methods for Optimal Control in High Dimensions, 8/31/05–9/2/05.

SERVICE:

BEING AN ACTIVE MEMBER OF COLLEGE COMMITTEES:

- **Scholarly Standing Committee**
- **College Planning (Mellon Proposal Writing) Committee**
- **College Computing Committee**
- **College Faculty Research Committee**
- **College Presentations Day Committee**
- **HMC-Scripps Mellon Implementation Committee**
- I had been on the Scholarly Standing Committee for several years and helped the school interpret and propose academic regulations.
- **I helped Scripps and Harvey Mudd Colleges obtain over \$2 million of Mellon funds** for faculty career development.

BEING AN ACTIVE MEMBER OF DEPARTMENT COMMITTEES:

- **Math Department Faculty Search Committee**
- **Math Department Curriculum Committee**
- **Math Department Computer and Technology User Committee**
- **Math Department Assessment and Self-Study Committee**
- **Other Departmental Ad hoc Committees**
- I have been on the Department Faculty Search Committee many times and worked very hard to help the department recruit excellent faculty members.
- I also have been on the Department Curriculum Committee many times, dealing with each petition very carefully. Currently I am participating in the process of reforming our core courses.

FUND RAISING:

- Helped Harvey Mudd College and Scripps College obtain large Mellon Grant, gained my two NSF grants, several Beckman Faculty Research grants, Mellon Grants, and many travel grants. **I am currently writing grant proposals to raise funds for the following two activities:**
 1. Developing HMC student leadership through case studies
 2. Establishing Claremont Math-Industry, Mathematical Science Research Center

INDUSTRIAL COLLABORATIONS AND CONNECTIONS:

- Besides being an HMC faculty Clinic adviser or consultant for 6 industry math clinics, I have made connections and collaborated with people at the following organizations:
 1. Been a faculty adviser for Summer 02 IPAM (Inst. for Pure and Applied Mathematics) Research in Industrial Projects for students. (The project I supervised comes from Los Alamos National Lab.)
 2. Conducted research with Dr. Louis Romero and Dr. Jeff Mason at the Computer Science Research Institute of Sandia National Laboratories on the research project of COSPAS-SARSAT (Search And Rescue Satellite-Aided Tracking).
 3. Worked at the HP Lab, Summer 2005, and collaborated with the color and image scientist, Ingeborg Tastl, in developing new models for effective production of ICC profiles. **There are two patents under consideration by hp** according to our research results.
 4. Made connections to people at industry or National labs for future possible math Clinic projects. For example, invited by Wayne Johnson, vice president for Hewlett-Packard Company, University Relations Worldwide to meet his group and discuss the further collaboration between HMC and HP.
 5. **Currently I am the Associate Math Clinic Director and will be the Math Clinic Director starting next academic year.**

SUPERVISING, MENTORING, EVALUATING AND ACTIVELY INVOLVING STUDENTS IN RESEARCH, CLINIC PROJECTS AND SERVICE:

- In addition to supervising in research and technology efforts of 14 senior thesis students, 20 summer research students, 7 Mellon project students, 18 independent study students, 22 industry math Clinic project students, and many mathematical majors, I have guided the students in applying to graduate schools or industry jobs. I have helped students participating in national and regional conferences, summer programs, preparing talks and posters, and gaining graduate fellowships, internships, and various other funds. I have participated in hundreds of rehearsals and given my feedback to the students in order for them to give excellent presentations and talks. I have read, discussed, and given my comments back to the students for hundreds of draft reports of senior theses, Clinic reports, and research papers in order to have professionally written reports. (Please see <http://www.math.hmc.edu/seniorthesis/>).

I have written dozens of recommendations for the above students and other students each year. **Almost all the students I have supervised have done and have been doing graduate work at top universities or found jobs at companies, many of them Fortune 500 companies.**

ACTIVE IN INFORMATION DISSEMINATION THROUGH ELECTRONIC COURSE DEVELOPMENT, CONFERENCE ORGANIZATIONS AND SPEAKER ENGAGEMENTS:

- Besides developing or updating several courses for HMC, I have shared my teaching experience with many other professors at Claremont or at other universities since almost all my course materials are in electronic forms (I even LaTeX solution sets for most of my courses).
- Organized Mt. Baldy Conference on Differential Geometry, Fall 2001. Arranged several colloquium speakers for math and computer science students. Guided math forums at HMC.
- National and International invited and keynote speaker, U.S., Italy, Canada, China, including support from NSF, AMS, AWM, IPAM, AIM, ONR, MSRI and various universities at U.S.

DEVELOPMENT OF NEW PROGRAMS AND INNOVATION:

- Developed four new research programs at Harvey Mudd College and more broadly at the Claremont Colleges as mentioned in my research statement:
 1. Differential Geometry and its Applications in String Theory
 2. Geometric Modeling and Design
 3. Applications of Mathematics and Computer Science to Industrial Problems
 4. Applications to Math-Biology

I did this by publishing papers, collaborating with many researchers in other institutions, and actively involving undergraduates at HMC in my research. Such research programs will definitely help HMC in many ways, including raising funds and attracting prospective students.

SERVICE TO PROFESSION:

PROFESSIONAL MEMBERSHIPS:

- American Mathematical Society
- Mathematical Association of America
- Association for Women in Mathematics
- The International Linear Algebra Society
- The Mathematics Education Program and People to People Ambassador Program organized by the Ministry of Education of the Chinese government and the Peking Normal University

REFEREEING:

- **Reviewed certain parts of books:** For example, reviewed three chapters from the book *Finslerian Geometries*, edited by P. L. Antonelli, for Kluwer Academic Publishers.
- **Reviewed several NSF proposals:** For example, reviewed the NSF proposal of John Zweck on *Characteristic Currents of Vector Bundle Maps* for the Division of Mathematical Sciences of NSF, Proposal code: 98-03383; and the NSF proposal of Daniel Burns on *Complex Analysis and Geometry* for the Division of Mathematical Science of NSF. Proposal code: 0072155.
- **Reviewed many papers:** For example, reviewed a paper by Benham, Lin, and Miller on *Subspaces of knot spaces* for Proceeding of the American Mathematical Society; and a paper of Jiri Dadok and Reese Harvey on *The Pontryagin 4-Form* for Proceeding of the American Mathematical Society.

SUPERVISING STUDENTS FROM OTHER CLAREMONT COLLEGES TO MAINTAIN CLOSE RELATIONSHIP WITH OTHER SISTER COLLEGES:

- Supervising two Ph.D. thesis students for CGU. One of them has passed his thesis defense.
- Supervising several Pomona math senior theses such as Matt Holden who won a Downing Fellowship, and is attending Cambridge University in England for Advanced Study in Mathematics in the Part III Tripos program.

MAKING INTERNATIONAL CONNECTIONS:

- Attended international conferences, giving talks in Canada, Italy, Germany, and China.
- Collaborated with Professor Helmut Pottmann at the Institute für Geometrie, Technische Universität Wien.
- Made connections to Fudan University, the Center of Mathematical Sciences and Math department, ZhiJiang University, and the Shanghai Research Institute, China Technology University. Recently, I invited Professor Fan Chunn Graham to visit and give presentations at the Shanghai Research Institute.

CONTRIBUTED TO CONFERENCES AND WORKSHOPS THROUGH FOLLOWING ACTIVITIES:

- Since 1996, I have attended about 100 conferences and workshops and given many talks, presentations, introduced many speakers, submitted papers, participated in discussions, and collaborated with other researchers.

- Chairman for some of differential geometry and computer aided geometric design sessions of several conferences such as ICM (International Congress of Mathematicians) 1998, (at Berlin) and 2002 (at Beijing).
- I have organized conferences such as Mt. Baldy conference on Differential Geometry at HMC.

PERSONAL:

- U. S. Citizen.
- Music: Pee-Par (A Chinese instrument), Piano and Chinese folk dancing.
- Sports: aerobics, biking and ping-pong.
- Languages: proficiency in Chinese, English and Shanghai dialect; knowledge in German, French and Japanese.