

# CURRICULUM VITAE

PENGFEEI GUAN

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## Education:

Ph.D in Mathematics (1989), Princeton University (advisor: J.J. Kohn).  
M.S. in Mathematics (1986), Princeton University.  
Graduate Student (1984-1985), University of North Carolina, Chapel Hill.  
Graduate Student (1982-1984), Institute of Mathematics, Chinese Academy of Sciences (Advisors: Q. Lu and J. Zhong).  
B.S. in Mathematics (1982), Zhejiang University, China.

## Awards and Honors:

Alfred P. Sloan Fellowship (1993-1995),  
Canada Research Chair (2004-),  
Fellow of Royal Society of Canada (2008-).

## Employment:

Assistant Professor (1989-1993, McMaster University)  
Associate Professor (1993-1997, McMaster University)  
Professor (1997-2004, McMaster University).  
Professor (2004-, McGill University)

## Visiting Memberships:

Princeton University (Sept. 1994 - Dec. 1995)  
Australian National University (Jan. 1996 - May, 1996)  
NCTS, National Hsinhua University Taiwan (Sept. 1999- Dec. 1999)  
Issac Newton Institute, Cambridge University (Jan. 2001- May 2001)  
Max-Planck Institute, Leipzig, Germany (May 2001-July 2001)

Center of Mathematical Sciences, Zhejiang University, China (July1-31, 2004)

**Area of Interest:**

Partial Differential Equations, Geometric Analysis, Several Complex Variables.

**Research Fundings:**

NSERC Research Grant 1990-1993, 1993-1996, 1996-2000, 2000-2005, 2005-2010.

**Publication:**

- (1) B. Bian and P. Guan, *A Microscopic Convexity Principle for Nonlinear Partial Differential Equations*, to appear in *Inventiones Mathematicae*.
- (2) P. Guan, C.S. Lin and X. Ma, *The Existence of Convex Body with Prescribed Curvature Measures*, to appear in *International Mathematics Research Notices*.
- (3) B. Bian and P. Guan, *Convexity Preserving for Fully Nonlinear Parabolic Integro-Differential Equations*, to appear in *Methods and Applications of Analysis* (accepted in 2008).
- (4) P. Guan, X. Ma, N. Trudinger and X. Zhu, *A form of Alexandrov-Fenchel inequality*, to appear in *The Journal of Pure and Applied Mathematics Quarterly* (accepted in 2008).
- (5) E. Sawyer and P. Guan, *Regularity of Subelliptic Monge-Ampère Equations in the Plane*, to appear in *Transactions of American Mathematical Society* (accepted in 2007).
- (6) L. Caffarelli, P. Guan and X. Ma, *A constant rank theorem for solutions of fully nonlinear elliptic equations*, *Communications on Pure and Applied Mathematics*. V. 60, (2007), 1769-1791.
- (7) P. Guan, C.S. Lin and G. Wang, *Local gradient estimates for quotient equations in conformal geometry* *International Journal of Mathematics*, Vol. 18, No. 4 (2007) 349-361 .
- (8) P. Guan and G. Wang, *Conformal deformations of the smallest eigenvalue of the Ricci tensor*, *American Journal of Mathematics*, Vol. 129, (2007), 499-526.
- (9) P. Guan, X. Ma and F. Zhou, *The Christoffel-Minkowski problem III: existence and convexity of admissible solutions*, *Communications on Pure and Applied Mathematics*, V.59, (2006) 1352-1376.
- (10) P. Guan, C.S. Lin and X. Ma, *The Christoffel-Minkowski problem II: Weingarten curvature equations*, *Chinese Annals of Mathematics, Series B*. Vol. 27B(6), (2006), 595-614.

- (11) P. Guan, C.S. Lin and G. Wang, *Schouten tensor and some topological properties*, Communications in Analysis and Geometry, V.13, No. 5, 2005, pp. 887-902.
- (12) P. Guan and G. Wang, *Geometric inequalities on locally conformally flat manifolds*, Duke Math. Journal, V.124, (2004), 177-212.
- (13) P. Guan and X. Ma, *Convex solutions of elliptic differential equations in classical differential geometry*, "Geometric Evolution Equations", Workshop on Geometric Evolution Equations, Edited by S. Chang, B. Chow, S. Chu and C.S. Lin, Contemp Math. V.367, AMS. pp. 115-128.
- (14) P. Guan, C.S. Lin and G. Wang, *Application of The Method of Moving Planes to Conformally Invariant Equations*, Mathematische Zeitschrift, V. 247 (2004), pp. 1-19.
- (15) P. Guan and X. Ma, *Christoffel-Minkowski problem I: convexity of solutions of a Hessian equation*, Inventiones Mathematicae, V.151 (2003), 553-577.
- (16) P. Guan and G. Wang, *Local estimates for a class of fully nonlinear equations arising from conformal geometry*, International Mathematics Research Notices, V. 2003, Issue 26(2003), 1413-1432.
- (17) P. Guan, *Nonlinear Degenerate Elliptic Equations*, Proc. of ICCM2001, Taiwan, 2001. Edited by C.S. Lin, L. Yang and S.T. Yau, International Press, (2004), 257-266.
- (18) P. Guan and G. Wang, *A fully nonlinear conformal flow on locally conformally flat manifolds*, Journal fur die reine und angewandte Mathematik, V. 557 (2003), 219-238.
- (19) P. Guan, J. Viaclovsky, G. Wang, , *Some properties of the Schouten tensor and applications to conformal geometry*, Transactions of American Math. Society, V.355 (2003), 925-933.
- (20) P. Guan, *Extremal Function associated to Intrinsic Norms*, Annals of Mathematics, 156(2002), 197-211.
- (21) B. Guan and P. Guan, *Convex Hypersurfaces of Prescribed Curvature*, Annals of Mathematics, 156(2002), 655-674.
- (22) P. Guan, N. Trudinger and X. J. Wang, *Boundary regularity for degenerate Monge-Ampere equations*, Acta Math. 182, (1999), 87-104.
- (23) P. Guan and X. Wang, *On a Monge-Ampere Equations Arising in Geometric Optics*, Journal of Diff. Geometry, 48, (1998), 205-222.
- (24) P. Guan and E. Sawyer, *Oblique Derivative Problem*, CRM Proc. and Lecture Notes, Vol.12 (1997), 145-158.
- (25) P. Guan,  *$C^2$  A Priori Estimates for Degenerate Monge-Ampere Equations*, Duke Math. Journal, 86, (1997), 323-346.
- (26) P. Guan, *Quasilinear Degenerate Elliptic Equations in Divergence Form*, Contemporary Math., AMS, 205, (1997), 93-100.

- (27) P. Guan and Y. Li,  $C^{1,1}$  *Regularity for Solutions of a Problem of Alexandrov*, Comm. Pure and Appl. Math., 50, (1997), 789-811.
- (28) P. Guan, *Regularity of a Class of Quasilinear Degenerate Elliptic Equations*, Advances in Mathematics, Vol. 132(1997), 24-45.
- (29) P. Guan and E. Sawyer, *Regularity Estimates for Oblique Derivative Problem on Nonsmooth Domains (II)*, Chinese Ann. Math., Ser. B, 17, (1996), 1-36.
- (30) P. Guan and E. Sawyer, *Regularity Estimates for Oblique Derivative Problem on Nonsmooth Domains (I)*, Chinese Ann. Math., Ser. B, 16, (1995), 299-324.
- (31) P. Guan and Y. Li, *On Weyl Problem With Nonnegative Gauss Curvature*, Journal of Differential Geometry, 39 (1994), 331-342.
- (32) P. Guan and E. Sawyer, *Regularity Estimates of Oblique Derivative Problem*, Annals of Mathematics, 137, (1993), 1-70.
- (33) P. Guan, *On An Example of Subelliptic Boundary Value Problem*, Proc Symposia in Pure Math.,AMS, 52 (1991), 173-177.
- (34) P. Guan, *Holder Regularity of Subelliptic Pseudo-differential Operators*, Duke Math. Journal, 60 (1990), 563-598.

#### Lecture Notes:

- (1) P. Guan, *Monge-Ampère Equations and Related Topics*, Morningside Institute, Academic Sinica, Beijing, China, 1998.
- (2) P. Guan, *Topics Geometric fully nonlinear equations*, lecture notes, 147-page manuscript (2004).

#### Selected Talks:

- (1) *On some nonlinear equations in conformal geometry*, Annual Joint Meetings of AMS, Phoenix, Jan. 7, 2004.
- (2) *Convexity of solutions of fully nonlinear PDEs*, 11th Southern California Geometric Analysis Seminar, UC Irvine, Feb. 21, 2004.
- (3) *A fully nonlinear conformal flows and applications*, Workshop on Geometric Flows: Theory and Computation, IPAM, UCLA, Feb. 25, 2004.
- (4) *Elliptic and parabolic curvature equations*, Principal Lecturer, 5-lectures in the International Summer School of Mathematics, CMS, Zhejiang University, July 1-21.
- (5) *Convexity of solutions of nonlinear geometric equations*, CRM colloquium, CRM U de M., Montreal, September 17, 2004.
- (6) *Conformal deformation of Ricci tensor*, CMS Winter meeting, Montreal, December 11, 2004.
- (7) *Homogeneous Weingarten curvature equations*, CMS Winter Meeting, Montreal, December 12, 2004.

- (8) *Convexity problems in nonlinear geometric equations*, plenary speaker at Fields Institute's *Young Mathematicians' Conference in PDE and Dynamical Systems*, Hamilton, January 29, 2005.
- (9) *A constant rank theorem for nonlinear partial differential equations*, Workshop on introductory to elliptic nonlinear PDE, MSRI, August, 2005.
- (10) *A convexity principle for elliptic and parabolic equations*, seminar at Columbia University, April 27, 2006.
- (11) *Nonlinear geometric differential equations: open problems*, "International Conference on nonlinear elliptic differential equations and its applications in geometry", Huangshan, China, May 28, 2006.
- (12) *Plurisubharmonic solutions to nonlinear differential equations*, "International Conference in Several Complex Variables, Beijing", China, June 8, 2006.
- (13) *Nonlinear Differential Equations in Geometr*, Plenary speaker at The first joint meeting of the Mexican Math Society (SMM) with the Canadian Math Society (CMS), September, 2006 in Guanajuato, Mexico.
- (14) *Constant rank theorems for nonlinear differential equations*, March, 2007.
- (15) *Isoperimetric inequalities for quermassintegrals*, Workshop on minimal surfaces, BIRS, December, 2007.
- (16) *Geometric inequalities and curvature flows*, seminar talk at Tongji University, China, December 23.
- (17) Alexandrov-Fenchel inequalities for starshaped domains, workshop in Nonlinear Geometric PDE, University of Sciences and Technology of China, January 6, 2008.
- (18) *A microscopic convexity principle for nonlinear PDE.*, seminar talk at Fudan University, China, January 9, 2008.
- (19) *Curvature functions and geometric PDE*, Initial Condition Workshop of Special Year in Nonlinear Dynamics, CRM, Montreal, Jan. 24, 2008.
- (20) *A Microscopic Convexity Principle for geometric nonlinear equations*, The Southeast Geometry Seminar, Emory University, March 30, 2008.
- (21) A microscopic convexity principle for geometric nonlinear equations, Conference on Differential Geometry, ICTP, Trieste, Italy, June 17, 2008.
- (22) Quermassintegrals, curvature measures and isoperimetric inequalities, Summer School of PDEs, Naples, Italy, June 23, 2008.
- (23) Topics of nonlinear partial differential equations in complex geometry, Conference on Complex Analysis, Fribourg, Switzerland, July 7, 2008.
- (24) *The problem of prescribing curvature measures*, "Geometric Analysis: Present and Future", International Conference to celebrate the birthday of Prof. Yau, Harvard University, August 30, 2008.

**Teaching Experience:**

I have been teaching from first year undergraduate Calculus/Linear Algebra to advanced graduate mathematics courses at McMaster University and McGill University since 1989.

**Supervision of the graduate students since 2003:**

*M.S.:* Qun Li (completed in 2003), Quiping Lu (completed in 2004), Jesse McKeown (completed in 2007), Thomas Getgood (started in July 2007), Xiangwen Zhang (started in July 2007).

*Ph.D.:* Qun Li (May, 2008).

**Supervisorships of postdoctor fellows since 2003:**

M. Zhu. (completed in 1999), P. Lu (completed in 2002), F. Wu (completed 2004), Jun-Fang Li (completed in 2008).

**Administrative Responsibilities**

ISM Executive Committee (2005-2006)

Department graduate committee (2005-)

NSF Review Panels (2005, 2008)

NSERC grant selection committee (CGA337, 2006-2007)

Department Advisory Committee (2006-),

**Editorship:**

Associate editor (2004-2008), Canadian Journal of Mathematics.

**Referee of Journals:**

Advances in Mathematics

Acta Mathematica

Annals of Mathematics

Bulletin of Canadian Mathematical Society

Calculus of Variations and Partial Differential Equations

Canadian Journal of Mathematics

Chinese Annals of Mathematics,

Communications in Analysis and Geometry

Communications in Partial Differential Equations

Communications on Pure and Applied Mathematics

Duke Mathematical Journal

Indiana University Mathematics Journal

Inventiones Mathematicae

Journal für die reine und angewandte Mathematik

Journal of American Mathematical Society

Journal of Applied Mathematics

Journal of Differential Equations  
Journal of Differential Geometry

**Referee of Research proposals**

Australian Research Council (ARC)  
Chinese National Science Foundation  
Hong Kong University Grants Committee (UGC)  
National Sciences and Engineering Council of Canada (NSERC)  
National Science Foundation (NSF)

**Organization of conferences and workshops:**

Symposium in Partial Differential Equations, Math-2000 conference of Canadian Mathematics Society, Hamilton, June 2000.

BIRS workshop on Monge-Ampere equations and applications, August 2003.

Fields Colloquium on Geometric Analysis, Spring Semester of 2004.

"Geometric Analysis" session at AMS meeting, Delaware, April, 2005.

ISM-CRM Colloquium series, 2005-2006.

Ciget geometric seminar, 2006-

Scientific Committee of "International summer school in several complex variables", Beskidy, Poland, June 19-23, 2006.

"Differential Geometry" Session at the joint meeting of CMS-SMM, September 21-23, 2006 in Guanajuato, Mexico.

"Initial Conditions Workshop" for the Thematic year on "Dynamical systems and evolution", CRM, Montreal, Jan. 24-25, 2008.

Workshop on "Geometric Evolution Equations", April 16-27, 2008.

"Geometric and Nonlinear Analysis" session at the Second Congress Canada-France 2008, University of Montreal, June 2-5, 2008.