

BIOGRAPHICAL SKETCH: QIANG DU

Department of Applied Physics and Applied Mathematics, and Data Science Institute, Fu Foundation School of Engineering and Applied Sciences, Columbia University, New York, NY 10027. 1-212-853-0689, www.columbia.edu/~qd2125 qd2125@columbia.edu

(a) Professional Preparation

- 1986 - 1988 **Ph.D.**, Mathematics, Carnegie Mellon University, Pittsburgh, PA
- 1984 - 1986 **M.S.**, Applied Mathematics, Carnegie Mellon University, Pittsburgh, PA
- 1980 - 1983 **B.S.**, Mathematics, Univ. of Sci. and Tech. of China, Hefei, China

(b) Appointments

- 2014 - present **Fu Foundation Professor of Applied Mathematics**,
and Chair of Applied Mathematics Program Committee (2015-),
Fu Foundation School of Engineering and Applied Science, Columbia University
- 2014 - present **Affiliated Faculty Member**, Data Science Institute, Columbia University
- 2006 - 2015 **Verne M. Willaman Professor** of Mathematics, Penn State University
- 2005 - 2015 **Professor**, Dept. of Materials Sciences, Penn State University
- 2001 - 2006 **Professor**, Dept. of Math., Penn State University
- 1996 - 2002 **Senior Lecturer and Full Prof.**, Dept. of Math., HK Univ. of Sci. & Tech.
- 1997 & 1999 **Associate and Full Prof.**, Dept. of Math., Iowa State University
- 1994 - 1995 **Associate Professor with tenure**, Dept. of Math., Michigan State University
- 1990 - 1994 **Assistant Professor**, Dept. of Math., Michigan State University
- 1988 - 1990 **L. E. Dickson Instructor**, Dept. of Math., University of Chicago
- 1984 - 1988 Teaching and Research Assistant, Carnegie Mellon University
- 1984 Summer Faculty of Mathematics, University of Science and Technology, China

(c) Visiting and Adjunct Positions

- 2017-2020 Oversea Assessment Expert, Chinese Academy of Sciences.
- 2015-2017 Adjunct Professor, Department of Mathematics, Penn State University
- 2014-present Adjunct Professor, School of Mathematics, Peking University, China
- Fall 2012 Long term visitor, Institute of Pure and Applied Mathematics (IPAM), UCLA
- 2011-present Visiting Professor, Beijing Computational Science Research Center
- Fall 2011 Visiting Professor, Beijing International Center for Mathematical Research, and Mt. Everest Program for Gifted Students, School of Mathematics, Peking University
- 2007-2013 Member, NSF-IUCRC (PennState-GaTech) CCMD, Penn State University
- Fall 2006 Senior Fellow, IPAM, UCLA
- 2005 - 2010 Oversea Outstanding Scholar (program by Chinese Bureau of Foreign Experts and Chinese Ministry of Education) and Jingshi Scholar, Beijing Normal University
- 2004-2006 Member, Center for Machine Learning and Applications, Penn State University
- Fall 2004 Long term visitor and tutorial lecturer, special program in material sciences, IMA, UMN
- 2002-present Member, MRI (Materials Research Institute), Penn State University
- 2002-present Adjunct Professor, Hong Kong University of Science and Technology
- 1999 - 2002 Adjunct Professor, University of Science and Technology of China
- 1998 - 2004 Chief Scientist, Large Scale Scientific Computation, a national key basic research project, Lab for Scientific and Engineering Computing, Chinese Academy of Sciences
- Spring 1993 Visiting Associate Professor, Dept. of Math. Sciences and Center of Nonlinear Studies, Carnegie Mellon University
- Summer 1989 Faculty Research Participation, Mathematics & Computer Science Division, Argonne National Laboratory, Chicago, Illinois
- Summer 1988 Staff Research Assistant, Computing & Communication Division, Los Alamos National Laboratory, Los Alamos, New Mexico
- 1983 - 1984 Training for inaugural S. S. Chern program selected by a special AMS-SIAM committee.

(d) **Research Interests:** applied and computational mathematics

- Numerical algorithms and scientific computation:
numerical analysis, applied analysis and PDEs, multiscale models, adaptive algorithms
- Selected applications in physical, biological and materials sciences:
superfluids, vortices, complex fluids, membranes, phase transformations, rare events
- Selected applications in information sciences:
data mining, model reduction, meshing, tessellations and image analysis

(e) **Honors and Awards:**

- 2018 **Invited lecturer at ICM** (International Congress of Mathematicians);
2017 **AAAS Fellow**, for distinguished contributions to the field of applied and computational mathematics, particularly for theoretical analysis and numerical simulations of mathematical models in various applications;
2017 **Distinguished speaker for the principal lectures** of NSF-CBMS regional research conference on Nonlocal Dynamics Theory, Computation and Applications;
2017 **Inaugural Science in China prize for excellent paper in Chinese**;
2016 **SIAM outstanding paper prize**, for a paper published in SIAM Journal in Numerical Analysis, (co-authored with Ph.D student Xiaochuan Tian, 2013);
2016 **ACM Gordon-Bell prize finalist**; for largest and fastest 3D phase field microstructure coarsening simulations (co-authored with former postdoc Dr. Jian Zhang, lead author, and other team members);
2013 **SIAM Fellow**, for contributions to applied and computational mathematics with applications in materials science, computational geometry, and biology;
2007 Recipient of the **Eberly College of Science Medal**, Penn State University;
2005 Recipient of the **Feng Kang Prize in Scientific Computing**;
2000 Co-recipient of the **Liberal Arts and Sciences Award for Outreach/extension**, ISU;
1992 Recipient of **Frame Faculty Teaching Award**, Michigan State University;
1988 Recipient of 1987 **J. D. Liang Fellowship**, Carnegie Mellon University.

(f) **Service:**

- Editorial boards:

Section Editor (2015–), SIAM JOURNAL OF APPLIED MATHEMATICS;
Associate Editor (2003–2012, 2014–), SIAM JOURNAL OF NUMERICAL ANALYSIS;
Associate Editor (2012–), SIAM JOURNAL OF APPLIED MATHEMATICS;
Associate Editor (2016–), MATHEMATICS OF COMPUTATION (AMS);
Member of editorial board (2016–), JOURNAL OF SCIENTIFIC COMPUTING (Springer);
Associate Editor (2000–2005, 2018–), JOURNAL OF COMPUTATIONAL MATHEMATICS;
Member of editorial board (2001–2005), COMMUNICATIONS IN PURE AND APPLIED ANALYSIS;
Member of editorial board (2002–2007), CHINESE JOURNAL OF COMPUTATIONAL PHYSICS;
Editor (2002–2016), APPLIED MATHEMATICS RESEARCH EXPRESS;
Member of editorial board (2006–), DISCRETE AND CONTINUOUS DYNAMICAL SYSTEMS - B;
Member of editorial board (2004–2007), JOURNAL OF INFORMATION AND COMPUTATIONAL SCIENCE;
Associate editor (2009–), NUMERICAL MATHEMATICS: THEORY, METHODS AND APPLICATIONS;
Member of editorial board (2009–), JOURNAL OF MATHEMATICAL RESEARCH AND APPLICATIONS;
Associate editor (2010–), COMMUNICATIONS IN COMPUTATIONAL PHYSICS;
Associate editor (2017–), INTERFACES AND FREE BOUNDARIES, (EMS);
Associate editor (2018–), JOURNAL OF PERIDYNAMICS AND NONLOCAL MODELING, Springer;
Member of editorial board (2018–), COMMUNICATION ON APPLIED MATHEMATICS AND COMPUTATION;
Member of editorial board (2012–), COMMUNICATIONS IN MATHEMATICS AND STATISTICS;
Member of editorial board (2013–), JOURNAL OF MATHEMATICAL STUDY;
Member of editorial board (2014–), COMMUNICATIONS IN MATHEMATICAL SCIENCES;
Editor of book series (2015–), **Handbook of Numerical Analysis**, (Elsevier).

- Professional Societies:

Chair (2014-2016), SIAM Activity Group on Mathematical Aspects of Materials Science.
 Chair (2014-2015), SIAM Peter Henrici Prize Selection Committee.
 Conference Co-Chair, SIAM Conference on Mathematical Aspects of Materials Science (2016).
 Member of Scientific Committee, USNCTAM 2018.
 Co-Chair in Computational Mathematics, World Congress of Computational Mechanics, WCCM 2018.
 Member of Scientific Program Committee, ICIAM 2019.
 SIAM representative (2015-2019) to the US National Committee -Theoretical and Applied Mechanics
 Research (USNC-TAM), the National Academies.
 Member (2015-2018), Scientific Advisory Board, Institute for Computational and Experimental
 Research in Mathematics (ICERM).
 Member (2017-2018), Physical and Computational Sciences Directorate Advisory Committee,
 Pacific Northwest National Laboratory (PNNL).
 Member (2017), Visiting Committee for Academic Review, Chinese University of Hong Kong.
 Oversea Assessment Expert (2017-2020), Chinese Academy of Sciences.
 Member (2014-present), 9th Council, Chinese Computational Mathematics Society (CCMS).
 Standing Committee member (1998-2002), 5th Council, (CCMS).

(g) Publications:

- Over 250 refereed publications (220+ in professional journals, 25+ in conference proceedings and 5 book-chapters. 1 edited book and 3 edited special journal issues). Over 12000 Google Scholar citations with an H-index 58 and 6000 SCI citations with an H-index 40. Published in many disciplinary fields including computational and applied mathematics, atmospheric, computer, imaging and materials sciences, atomic, biological and condensed matter physics, biomedical and mechanical engineering,etc.
- Full list of publications can be found at www.columbia.edu/~qd2125
- Selected publications:
 - *Trace theorems for some nonlocal energy spaces with heterogeneous localization*, with X. Tian, **SIAM J. Math. Anal.**, 49, 1621-1644, 2017.
 - *Recent developments in computational modeling of nucleation in phase transformations*, with L. Zhang, W.-Q. Ren and A. Samanta, **npj Computational Materials**, 2, 16003, 2016.
 - *Extreme-scale phase field simulations of coarsening dynamics on the sunway taihulight supercomputer*, with J. Zhang, C. Zhou, Y. Wang, L. Ju, X. Chi, D. Xu, D. Chen, Y. Liu, Z. Liu, **Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis**, SC2016, Article No.4, Salt Lake City, IEEE Press, 2016. (ACM Gordon Bell Prize Finalist).
 - *On the variational limit of some nonlocal convex functionals of vector fields*, with T. Mengesha, **Nonlinearity**, 28, 3999-4035, 2015.
 - *Asymptotically compatible schemes and applications to robust discretization of nonlocal models*, with X. Tian, **SIAM J. Numer. Anal.**, 52, 1641-1665, 2014.
 - *A nonlocal vector calculus, nonlocal volume-constrained problems, and nonlocal balance laws*, with M. Gunzburger, R. Lehoucq and K. Zhou, **Math. Mod. Meth. Appl. Sci.**, 23, 493-540, 2013.
 - *Analysis and comparison of different approximations to nonlocal diffusion and linear peridynamic equations*, with X. Tian, **SIAM J. Numer. Anal.**, 51, 3458-3482, 2013 (SIAM Outstanding Paper Prize).
 - *Analysis and approximation of nonlocal diffusion problems with volume constraints*, with M. Gunzburger, R. Lehoucq and K. Zhou, **SIAM Review**, 54, 667-696, 2012.
 - *Robust Modeling of Constant Mean Curvature Surfaces*, with P. Hao, Y.-K. Choi, Y. Liu, W. Hu, K. Polthier, C. Zhang, W. Wang, **ACM Trans. Graphics (SIGGRAPH12)**, 31, Article 85, 2012.
 - *Shrinking Dimer Dynamics and its Applications to Saddle Point Search*, with J.Y. Zhang, **SIAM J. Numer. Anal.**, 50, 1899-1921, 2012.
 - *Analysis of a stochastic implicit interface model for an immersed elastic surface in a fluctuating fluid*, with M. Li, **Archive for Rational Mech. Anal.**, 199, 329-352, 2011.
 - *Vortex solutions of the high- κ high-field Ginzburg-Landau model with an applied current*, with J. Wei and C. Zhao, **SIAM J. Math. Anal.**, 42, 2368-2401, 2010.
 - *Numerical approximations of a norm preserving gradient flow and applications to an optimal partition problem*, with F.-H. Lin, **Nonlinearity**, 22, 67-83, 2009.

- *Modelling and simulations of multi-component lipid membranes and open membranes via diffuse interface approaches*, with X. Wang, **J. Mathematical Biology**, 56, 347-371, 2008
- *Adhesion of vesicles on patterned substrates*, with S. Das, **Phys. Rev. E**, 77.011907 (1-7), 2008 (selected for the Jan 15, 2008 issue of Virtual J. Biological Phys. Res. by APS).
- *Diffuse-interface description of strain-dominated morphology of critical nuclei in phase transformations*, with L. Zhang and L.Q. Chen, **Acta Materialia**, 56, 3568-3576, 2008.
- *Morphology of critical nuclei in solid state phase transformations*, with L. Zhang and L. Chen, **Physical Review Letters**, 98, No.25, 265703, 2007.
- *From micro to macro dynamics via a new closure approximation to the FENE model of polymeric fluids*, with C. Liu and P. Yu, **Multiscale Modeling and Simulations**, 3, 895-917, 2005.
- *Computing the ground state of the Bose-Einstein condensate via normalized gradient flow*, with W. Bao, **SIAM J. Scientific Comp.**, 25, 1674-1697, 2004.
- *A phase field approach in the numerical study of the elastic bending energy for vesicle membranes*, with C. Liu and X. Wang, **J. Computational Physics**, 198, 450-468, 2004.
- *Dissipative flow and vortex shedding in the Painlevé boundary layer of a Bose Einstein condensate*, with A. Aftalion and Y. Pomeau, **Physical Review Letters**, 91, 090407, 2003.
- *Tetrahedral mesh generation and optimization based on centroidal Voronoi tessellations*, with D. Wang, **Int. J. Numer. Meth. Eng.**, 56, 1355-1373, 2003.
- *Vortices in the Bose-Einstein condensate: the critical velocities and energy diagrams in the Thomas-Fermi regime*, with A. Aftalion, **Physical Review A**, 64, 063603(1-11), 2001.
- *Centroidal voronoi diagrams and its applications*, with V. Faber and M. Gunzburger, **SIAM Review**, 41, 637-676, 1999.
- *Ginzburg-Landau vortices: dynamics, pinning and hysteresis*, with F.H. Lin, **SIAM J. Math. Anal.**, 28, 1265-1293, 1997.
- *High-kappa limit of the time dependent Ginzburg-Landau model for superconductivity*, with P. Gray, **SIAM J. Appl. Math.**, 56, 1060-1093, 1996.
- *Spectral viscosity methods for multidimensional hyperbolic conservation laws*, with G. Chen and E. Tadmor, **Mathematics of Computation**, 61, 619-643, 1993.
- *Analysis and approximation of the Ginzburg-Landau model of superconductivity*, with M. Gunzburger and J. Peterson, **SIAM Review**, 34, 54-81, 1992.
- *Numerical studies of a continuum model of Phase Transition*, with R. A. Nicolaides, **SIAM J. Numer. Anal.**, Vol.28, No.5, 1310-1322, 1991;
- *A finite difference domain decomposition algorithm for numerical solution of the heat equation*, with C. Dawson, & T. Dupont, **Mathematics of Computation**, 57, 63-71, 1991;