

YONGWU RONG

Education

Ph.D. in Mathematics, University of Texas at Austin, 1989

B.S. in Mathematics, University of Science & Technology of China, 1983

Professional Experience

Administrative Appointments*

- Associate Dean for Research & Strategic Initiatives, Columbian College of Arts and Sciences, The George Washington University, 2007 – 2008, 2014 – present.

Research. Work with Dean and Vice-President for Research to promote and facilitate research within the Columbian College of Arts and Sciences (CCAS) of the George Washington University. As the largest academic unit of GW, CCAS houses approximately 500 full time faculty, 500 part time faculty, 5000 undergraduates, 2000 graduate students, 40 departments, 27 centers and institutes. Our faculty conducts research in a wide range of areas including arts and humanities, social sciences, and natural sciences.

Strategic Initiatives Work with department chairs and faculty to launch new academic initiatives that will enhance the learning opportunities for our students and at the same time bring in additional revenue. Areas of focus include new academic programs, online education, and international partnerships. Within two years of my appointment, the programs that I have created are generating millions of dollars of new tuition revenue to my university.

- Founding Director, The George Washington Institute for Mathematical Sciences, 2011-

Provide visionary and operational leadership for the George Washington Institute for Mathematical Sciences (GWIMS), an interdisciplinary institute that promotes collaborations between mathematics and other fields. Since 2011, the eight members of GWIMS have obtained over \$5 million of external grants (not counting grants obtained by the affiliated members).

- Chair, Department of Mathematics, George Washington University, 2011 – 2014

Act as the chief academic and administrative officer of the department. Work with faculty, students, and staff to promote excellence in research, teaching, and service. During my tenure as chair, 16 of the 19 faculty member have received external funding, three of them received NSF CAREER awards, two teams of faculty members worked together with other departments to obtain two major training grants, and the number of math majors increased from 30s to over 100.

- Program Director, National Science Foundation. 2001-2003, 2006, 2009-2011.

Work with members of the Division of Mathematical Sciences at NSF in managing a diverse portfolio in research and training with an annual budget of over \$200 million. Interact with principal investigators and reviewers (approximately 200 each year), form and facilitate merit review panels, recommend funding decisions to the Division Director, and perform budgetary analysis and forecast for the program.

* See the end of this CV for Selected Administrative Accomplishments.

Academic Appointments

- Professor, The George Washington University, 2006 –
Associate Professor, The George Washington University, Fall 1998 - Spring 2006.
Assistant Professor, The George Washington University, Fall 1992 - Spring 1998.
- Research Postdoctor, Michigan State University, Fall 1989 - Spring 1992.

Visiting Appointments

- Member, Institute for Advanced Study, Princeton, Spring 1999.
- Visiting Researcher, University of Texas at Austin, Summer 1990.

Grants

External Grants

- Principal Investigator. *Summer Undergraduate Research Fellowship (SURF)*, National Institute of Standards and Technology. May 2017 – September 2017. \$14,806.
- Principal Investigator. *Summer Undergraduate Research Fellowship (SURF)*, National Institute of Standards and Technology. May 2016 – September 2016. \$9,415.
- Principal Investigator. *EXTREEMS-QED: GW Mathematics and Statistics Training, Education, & Research (MASTER)*, with four co-PIs: M. Gualdani, M. Gupta, Y. Lai, and R. Simha, National Science Foundation, DMS-1406984. 2014-2018, \$600,000.
- Principal Investigator. *JUMP: Joint Undergraduate Mathematics and Physics Scholarships at GW*, with four co-PIs: G. Feldman, L. Medsker, S. Roudenko, and D. Ullman, National Science Foundation, DUE-1259858, 2013-2018, \$614,440.

- Co-Principal Investigator. *WIDER: Planning: GW Reform and Advancement of STEM-education Practices (GRASP)*. PI: Rahul Simha, National Science Foundation, DUE-1347516, 2013-2018, \$229,886.
- Co-Principal Investigator. *Undergraduate Mathematics Conference in Washington*, September 2012, Mathematical Association of America (MAA), \$2,000. This is to support the second Undergraduate Mathematics Conference held at George Mason University in April 2013.
- Principal Investigator. *Undergraduate Mathematics Conference in Washington*, April 2012, Mathematical Association of America (MAA), Yongwu Rong (PI), S. Roudenko (Co-PI), \$1,000. This is to support the first Undergraduate Mathematics Conference held at GWU in April 2012.
- NSF grants, DMS-1137422. This grant is to support the conference on “*Knots in Washington*” for which I am a co-organizer. (I withdraw my name as a Co-PI in order to avoid a potential conflict from my appointment at NSF).
- Principal Investigator. *Intergovernmental Mobility Assignment*, National Science Foundation grant, DMS-1057806. This grant is for my IPA appointment at NSF as a program director, 2010-2011. Awarded amount: \$174,591.
- Co-Principal Investigator. *CDI Type II: Collaborative Research: Understanding Complex Biological Networks: A Process Viewpoint*. Co-Principal Investigator, with Chen Zeng (PI), Rahul Simha (Co-PI), National Science Foundation, CMMI-0941228. 2009-2013 (extended to 2014). \$ 1,199,927.
- Principal Investigator. *Intergovernmental Mobility Assignment*, National Science Foundation grant, DMS-0963586. This grant is for my IPA appointment at NSF as a program director, 2009-2010. Awarded amount: \$151,664.
- Co-Principal Investigator. *Knots in Washington: Conferences on Knot Theory and its Ramifications 2008-2010.*, with Jozef Przytycki, Alexander Shumakovitch, and Hao Wu. National Science Foundation, DMS-0817858, May 2008 to April 2011. This is a three-year conference grant. Awarded amount: \$97,971.
- Principal Investigator. *Homological Algebra Methods in Topology and Combinatorics*. National Science Foundation grant, DMS-0513918, 2005-2008. This is a standard three-year research grant. Awarded amount: \$108,000.
- Co-Principal Investigator. *Knots in Washington XXI: Skein Modules, Khovanov Homology and Hochschild Homology*, with Jozef Przytycki and Alexander Shumakovitch. National Science Foundation grant, DMS-0555648, 2005-2006. This is a one-year conference grant. Awarded amount: \$20,000.
- NSF grant, DMS-0432284. This grant is to support the conference on “*Knots in Washington XVIII; Khovanov homology*” in May 2004, co-organized by Jozef Przytycki and me (I withdraw my name as a Co-PI in order to avoid a potential conflict from my appointment at NSF).
- Principal Investigator. *Intergovernmental Mobility Assignment*, National Science Foundation, DMS-0138363. This grant is for my IPA appointment at NSF as a program director, 2001-2003. Awarded amount: \$189,447.
- Co-Principal Investigator, with J. Bonin, R. Simion, and D. Ullman. *The Implementation of Precalculus Review with the First Course in Calculus: Implementation in New Settings*. This is a subaward from a FIPSE award made to the Moravian College (PI: Doris Schattschneider). The Department of Education.

1995-1997. Awarded amount: \$173,367.

Internal Grants (from GWU)

- Co-Principal Investigator. *Deep Learning in Big Data Analytics, Series I-II*, with C. Zeng (PI) and L. Medsker (co-PI). GW University Seminars Series Competition, \$2,200 for 2016-17 and \$2,200 for 2017-18.
- Principal Investigator. *George Washington Institute for Mathematical Sciences*, with six co-PIs: M. Alekseyev, Y. Lai, X. Ren, E. A. Robinson, S. Roudenko, and C. Zeng. The GW Center and Institute Facilitating Fund (CIFF), \$100,000, July 2014-June 2016.
- Principal Investigator. *A Stochastic Network Framework for Predicting Gene Interactions*. Columbia College Facilitating Fund, 2014-2015, \$9,655.
- Principal Investigator. *Geometry of Bubbles*. Columbia College Facilitating Fund, 2013-2014, \$5,415.
- Principal Investigator. *GWIMS Seminar* (2012-13). with three co-PIs: Y. Lai, E. A. Robinson, and S. Roudenko. GW University Seminars Series Competition, \$1,000.
- Principal Investigator. *George Washington Institute for Mathematical Sciences*, with five co-PIs: Y. Lai, X. Ren, E. A. Robinson, S. Roudenko, and C. Zeng. The GW Center and Institute Facilitating Fund (CIFF), \$ 70,000, July 2012-June 2014.
- Principal Investigator. *GWU Mathematical and Computational Biology Seminar* (2010-2011). With Yinglei Lai, E. Arthur Robinson, Guanyu Wang, and Chen Zeng. This is to support the Mathematical Application Seminar. GWU University Seminar Series Fund, \$3,500.
- Principal Investigator. *GWU Mathematical Application Seminar* (2009-2010). With E. Arthur Robinson. This is to support the Mathematical Application Seminar. GWU University Seminar Series Fund, \$2,500.
- Principal Investigator. *Algebraic and Algorithmic Analysis of the Reverse Engineering Problem*, Yongwu Rong (PI), Chen Zeng (Co-PI). Columbia College Facilitating Fund, 2009-2010, \$10,830.
- Principal Investigator. *GWU Mathematical Application Seminar* (2008-2009). This is to support the Mathematical Application Seminar. GWU University Seminar Series Fund, \$2,500.
- Principal Investigator. *Quantum Computing and Jones Polynomials of Knots*, University Facilitating Fund, GWU, 2001-2002. Awarded amount: \$7,931.
- Principal Investigator. *Distinguishing Knots Using Jones Invariants*, Junior Scholar Incentive Award, GWU, 1995-1996. Awarded amount: \$5,000.
- Principal Investigator. *Jones-Witten Invariants of Knots*, University Facilitating Fund, GWU, 1994-1995, Awarded amount: \$8,720.

Publications

Refereed research papers

- **Y. Rong** and Z. Shen, "A generalization of Hadamard's determinantal inequality," *J. China Univ. Sci. Tech.* 13, No.2, Math. Issue (1983) 272-274.

- **Y. Rong**, “Continuous linear functionals on the F-space $C_\infty[a, b]$,” *J. China Univ. Sci. Tech.* 14 No.1 (1984) 166-169.
- **Y. Rong**, “The Kauffman polynomial and the two-fold cover of a link,” *Indiana Univ. Math. Journ.* Vol. 40 No. 1 (1991) 321-331.
- **Y. Rong**, “Degree one maps between geometric three-manifolds,” *Trans. Amer. Math. Soc.* Vol. 332 No. 1, (1992) 411-436.
- **Y. Rong** and S. Wang, “The preimages of submanifolds,” *Mathematical Proceedings of the Cambridge Philosophical Society*, 112 (1992) 271 -279.
- **Y. Rong**, “Maps between Seifert fibered spaces of infinite π_1 ,” *Pacific Journal of Mathematics*, Vol. 160 No. 1 (1993) 143 -154.
- **Y. Rong**, “Some knots not determined by their complements,” *Quantum Topology, Series of Knots and Everything*, Vol. 3, edited by L. Kauffman and R. Baadhio. (1993) 339-353.
- **Y. Rong**, “Mutation and Witten invariants,” *Topology*, Vol. 33, No. 3 (1994) 499-507.
- **Y. Rong**, “Degree one maps of Seifert manifolds and a note on Seifert Volume,” *Topology and Its Applications*, 64 (1995) 191-200.
- **Y. Rong**, “Link Polynomials of higher order,” *Journ. London Math. Soc.* (2) 56 (1997) 189-208.
- W. B. R. Lickorish and **Y. Rong**, “On derivatives of link polynomials,” *Topology and Its Applications*, 87 (1998) 63-71.
- I. Kofman and **Y. Rong**, “Approximating Jones coefficients and other link invariants by Vassiliev invariants,” *Journ. Knot Theory and Its Ramifications*, Vol. 9, No. 7 (2000) 955-966.
- M. McDaniel and **Y. Rong**, “Vassiliev invariants from satellites of link polynomials,” *Kobe Journal of Mathematics*, 18 (2001) 127-145.
- **Y. Rong**, “Linear independence of derivatives of link polynomials,” *Topology and Its Applications*, 117 (2002) 191-198.
- L. Helme-Guizon and **Y. Rong**, “A categorification for the chromatic polynomial,” *Algebraic and Geometric Topology* (2005) 1365-1388.
- L. Helme-Guizon, J. Przytycki, and **Y. Rong**, “Torsions in graph cohomology,” *Fundamenta Mathematicae*, 190 (2006) 139-177.
- K. Luse and **Y. Rong**, “Examples of Knots with the Same Polynomials,” *Journ. Knot Theory and Its Ramifications*, 15 (2006) 749-759.
- F. Jasso-Hernandez and **Y. Rong**, “A categorification for the Tutte polynomial,” *Algebraic and Geometric Topology*, 6 (2006) 2031-2049.
- M. Chmutov, S. Chmutov, and **Y. Rong**, “Knight moves for chromatic graph homology,” *European Journal of Combinatorics*, 29, No. 1, (2008) 311-321.
- L. Chen and **Y. Rong**, “Linear Time Recognition Algorithms for Topological Invariants in 3D Digital Spaces.” *Pattern Recognition, 19th International Conference on Pattern Recognition* (2008) 1-4.
- L. Chen and **Y. Rong**, “Digital Topological Method for Computing Genus and the Betti Numbers,” *Topology and Its Applications*, 157 (2010) No. 12, 1931-1936.

- G. Wang, C. Du, H. Chen, R. Simha, **Y. Rong**, Y. Xiao, and C. Zeng, “Process-Based Network Decomposition Reveals Backbone Motif Structure,” *Proceedings of the National Academy of Sciences*, Vol 107 (2010) No. 23, 10478-10483.
- K. Luse and **Y. Rong**, “A categorification for the Penrose polynomial,” *Journ. Knot Theory and Ramification*, 1 (2011) 141-157.
- **Y. Rong**, C. Zeng, C. Evans, H. Chen, and G. Wang, “Topology and dynamics of Boolean networks with strong inhibition,” *Journal Discrete and Continuous Dynamical Systems, Series S*. Vol. 4 (6), 2011, 1565-1575.
- L. Helme-Guizon and **Y. Rong**, “Khovanov type homologies for graphs,” *Kobe J. Math.*, Vol. 29 (2012) 2543.
- G. Wang, **Y. Rong**, H. Chen, C. Pearson, C. Du, R. Simha, and C. Zeng, “Process-Driven Inference of Biological Network Structure: Feasibility, Minimality, and Multiplicity,” *PLoS ONE* 7(7): e40330. doi:10.1371/journal.pone.0040330.
- J. Yang, B. Zhang, C. Liang, **Y. Rong**, "A High-Order Flux Reconstruction Method with Adaptive Mesh Refinement and Artificial Diffusivity on Unstructured Moving/Deforming Mesh for Shock Capturing," *Computers & Fluids*, 2016, <http://dx.doi.org/10.1016/j.compfluid.2016.03.025>
- B. Zhang, C. Liang, J. Yang, **Y. Rong**, "A 2D Parallel High-Order Sliding and Deforming Spectral Difference Method," *Computers and Fluids* (2016), <http://dx.doi.org/10.1016/j.compfluid.2016.06.019>

Other articles

- E. Berkowitz, C. Cahill, D. Cioffi, R. Donaldson, P. Hotez, F. Maltzman, T. McCaffrey, M. Reeves, **Y. Rong**, R. Simha, and B. Wood, “The SEAS of the future”, *GW Hatchet – Opinion*. April 3, 2010. Available online at <http://media.www.gwhatchet.com/media/storage/paper332/news/2010/04/05/Opinions/Professors.The.Seas.Of.The.Future-3899828.shtml>

(This was to respond to an article “Close the engineering school” by Donald Parsons, Professor of Economics. It has generated a great deal of interests across the GW campus, including a personal thank you letter from Don Lehman, Executive Vice-President of Academic Affairs at the time).

Patents

- L. Chen and Y. Rong, Computing genus and homology groups in 3D digital space, US Patent # 8,478,025 B2 - 2013.
(This patent was built on my joint work with Dr. Li Chen on topology and imaging. I provided mathematical input, and Dr. Chen submitted the patent application, which has been approved by US Patent Office)

Selected Invited Talks

- *Degree one maps between 3-manifolds*, Seminar talk, University of Michigan, March 1991.
- *Degree one maps between geometric 3-manifolds*, American Mathematical

Society meeting -Special session on Low Dimensional Topology and Combinatorial Groups, Portland, Oregon, June 1991.

- *Gromov's norm of three-manifolds*, seminar talk, University of Michigan, December 1991.
- *Knot complement problem for 3-manifolds*, American Mathematical Society meeting -Special session on Knots and Topological Quantum Field Theory, Dayton, Ohio, October 1992.
- *3-Manifolds with the same Witten invariants*, Midwest Geometry Conference, May 1993.
- *Mutation and Witten invariants*, seminar talk, University of Maryland, March 1993.
- *Mutation and Witten invariants*, American Mathematical Society meeting -Special session on Invariants of low dimensional manifolds, Brooklyn, New York, April, 1994.
- *Link polynomials and Vassiliev Invariants*, Summer workshop in low dimensional topology, Beijing University, Beijing, P. R. China, June, 1994.
- *Periodic Maps between Small Surfaces -with an application to 3-manifold topology*, American Mathematical Society Meeting, San Francisco, January, 1995.
- *Examples of Mutative 3-Manifolds*, Seventh Lehigh University Geometry and Topology Conference, Lehigh University, June 1995.
- *On Mutative 3-Manifolds*, AMS meeting -special session on 3-manifolds, Iowa City, Iowa, March 1996
- *Gromov's norm of 3-Manifolds, with an application to degree one maps*, seminar talk, Rutgers University, April 1996.
- *A dimensional estimate for Vassiliev invariants*, AMS meeting - special session on geometric topology, Lawrenceville, NJ, October 1996.
- *On derivatives of link polynomials*, Conference on Knots in Washington, Washington, DC, October 1996.
- *Cablings of Vassiliev invariants*, seminar talk, Columbia University, October 1996.
- *Vassiliev invariants coming from link polynomials*, Chinese University of Hong Kong, November 1997.
- *Sequence of degree one maps between 3-manifolds*, Conference on Knots in Washington, University of Virginia Campus, Charlottesville, VA, April 1997.
- *Sequence of degree one maps between 3-manifolds*, 1997 Lehigh University Geometry/Topology Conference, Bethlehem, June 1997.
- *Degree one maps between 3-manifolds*, Colloquium, Peking University, Beijing, China, April 1999.
- *Quantum invariants in dimension three*, Colloquium, University of Science & Technology of China, Hefei, China, April 1999.
- *Linear independent of higher order link polynomials*, AMS meeting, special session on Knot Theory and Its Applications. Charlotte, NC, October 1999.
- *On higher order link polynomials*, Japan-US joint conference "Knots in

Washington,” Washington, DC, January 2000.

- *Subspaces in the space of Vassiliev invariants*, Knots in Montreal Conference, Montreal, Canada, April 2001.
- *Constructing Links with the same polynomial*, a series of four lectures given at the International Workshop on Low Dimensional Topology, Harbin, China, July 2001.
- *Links and 3-manifolds with the same quantum invariants*, AMS meeting -special session on Quantum Topology, Columbus, Ohio, October 2001.
- *Approximating knot invariants by Vassiliev invariants*, AMS meeting -special session on Quantum Topology in Dimension Three, Ann Arbor, Michigan, March 2002.
- *Links with the same quantum invariants*. Seminar talk, Rutgers University. October 2002.
- *On spaces of Vassiliev invariants*. AMS meeting -special session on low dimensional topology, Barton Rouge, LA, March 2003.
- *A Kauffman bracket type polynomial for Legendrian links*. Knots in Washington Conference, Washington, DC, December 2003.
- *A Khovanov type homology theory for graphs*. AMS meeting -special session on Knot Theory and Its Applications, Tallahassee, Florida, March 2004.
- *Experimenting with exact sequences*. Knots in Washington: Khovanov homology. Washington, DC, May 2004.
- *A Khovanov type homology theory for graphs*. Lehigh Geometry & Topology Conference. Bethlehem, Pennsylvania, June 2004.
- *Properties of the Khovanov type homology theory for graphs*. Special Session on Invariants of Knots and 3-Manifolds. AMS Meeting, Pittsburgh, Pennsylvania. November, 2004.
- *A categorification for the chromatic polynomial*. Special Session on Graph Polynomials. AMS Meeting, Pittsburgh, Pennsylvania. November, 2004.
- *A configuration space approach to the chromatic polynomial, after Eastwood and Huggett*. Knots in Washington Conference. Washington, DC, November 2004.
- *A Khovanov type categorification for the chromatic polynomial*, University of Virginia topology seminar, Charlottesville, Virginia, December 2004.
- *A homological algebra approach to the chromatic polynomial*, Penn State University math physics seminar, State College, Pennsylvania. February 2005.
- *Homological Algebra Methods in Graph Theory*, Mathematics Colloquium, University of South Florida, Tampa, Florida, March 2005.
- *Homological Algebra methods in graph theory*. Post-conference talk at the Conference on 3-Manifolds and Knot Theory, in honor of 60th birthday for Professor Cameron Gordon. Austin, Texas, May 2005.
- *A quadruply-graded graph homology for the Bollobas-Riordan polynomial*. Knots in Washington XXI: Skein modules, Khovanov homology and Hochschild homology, Washington, DC, December, 2005.
- *Categorifying the Tutte polynomial and more*. AMS meeting -Special Session on

Quantum Invariants of Knots and 3-Manifolds, Durham, New Hampshire, April 2006.

- *Homological algebra methods in graph theory*. AMS meeting -Special Session on Homological and K-theoretical Trends in Algebraic Combinatorics, San Francisco, April 2006.
- *Feynman diagrams and RNA folding*. Bio-Physics Seminar, GWU. April 2006.
- *An isomorphism between the Tutte homology for graphs and the Khovanov homology for knots*. Knots in Washington Conference, Washington, DC, May 2006.
- *Khovanov type homology theories for graphs*. International Conference Categoricalizations in Algebra and Topology 2006, Uppsala, Sweden, September 2006.
- *Homological algebra methods in graph theory*. Colloquium, University of Oklahoma, Norman, OK, October 2006.
- *Categoricalizations in graph theory*. Colloquium, Oklahoma State University, Stillwater, OK, October 2006.
- *A quick trip through combinatorial knot Floer homology*. Knots in Washington Conference XXIII; Quandles, their homology and ramifications, Washington, DC, November 2006.
- *A homology theory via clock moves*. AMS meeting special session on Quantum Topology, Oxford, OH, March 2007.
- *Feynman diagrams and transition polynomial*. Knots in Washington Conference XXIV; Dedicated to the memory of Xiao-Song Lin, Washington, DC, April 2007.
- *Khovanov type homologies for graphs*. Geometric Topology 2007, Beijing, China, June 2007.
- *Clock moves and a combinatorial homology*. Lehigh Geometry/Topology Conference, Bethlehem, PA, October 2007.
- *Feynman diagrams, RNA folding, and the transition polynomial*. RNA in Biology, Bioengineering and Nanotechnology, Institute for Mathematics and Its Application, Minneapolis, October 29-November 2, 2007
- *Khovanov type homologies for graphs*, Topology seminar, University of Minnesota, Minneapolis, November 2007.
- *Feynman diagrams and RNA folding*. Conference on Knotting Mathematics and Art, Tampa, November, 2007.
- *Clock moves and a combinatorial homology*. Knots in Washington XXI, Washington, DC, December 2007.
- *Constructing Links with the Same Invariants*. AMS meeting special session on Knot and 3-Manifold Invariants, Baton Rouge, March 2008.
- *Clock moves and combinatorial knot homology*. Workshop on Invariants in Low-Dimensional Topology, Oberwolfach, Germany, May 2008.
- *Some applications of pure mathematics*. Conference on Advances in Mathematics and Its Applications Hefei, China, July, 2008
- *Feynman diagrams, RNA folding, and the transition polynomial*. Workshop on

Algebraic Methods in System Biology and Statistics, SAMSI, Research Triangle, North Carolina, September 2008

- *Computational Complexity for Boolean Network*. Seminar talk at Virginia Tech, National Capital Region, Computer Science Department. April 2009.
- *Mathematics is Beautiful, Mathematics is Useful! -A quick trip from diamonds to the universe through polyhedral*. Guest speaker for the Pi Mu Epsilon Society induction ceremony at the College of William and Mary. Williamsburg, VA, March 2010.
- *Computational complexity for topology and dynamics of boolean networks*, Knots in Washington XXX; Categorification, Quantum knots and Quantum computing. Washington, DC, May 2010.
- *Topology and Dynamics of Boolean Networks*. National Science Foundation, April 2011.
- *Topology and Dynamics of Biological Networks*. Graduate Seminar. GWU, November 2011.
- *Dynamics and Topology of Boolean Networks*. American Mathematical Meeting, Special Session on Dynamics of Complex Network, Washington, DC, March 2012.
- *Categorifications for Graph Polynomials*. 2012 Shanghai Conference on Algebraic Combinatorics, Shanghai, August, 2012.
- *Topology and Dynamics of Biological Networks*. The sixth International Congress of Chinese Mathematicians (ICCM), Taipei, Taiwan, July 2013.
- *Applied Pure Mathematics*. Colloquium talk, James Madison University, October 2013.
- *Data-driven Innovations in Curriculum Enhancement*, The 14th Hawaii International Conference on Education, Honolulu, January, 2016
- *An April Fool's Conversation with JUMP students*, an informal talk at the JUMP Seminar. April 1, 2016.

Advising

Ph.D. Dissertation Supervision

- Michael E. McDaniel, 1997.
Dissertation title: *Subspaces of Vassiliev invariants using cabling*.
Currently Professor and Chair at the Aquinas College in Michigan.
- Laure Helme-Guizon, 2005.
Dissertation title: *A categorification of the chromatic polynomial*.
Currently consultant for urban projects in the Republic of Madagascar.
- E. Fanny Jasso-Hernandez, 2007.
Dissertation title: *A homological algebra approach to the Tutte polynomial*.
Currently at the Institute of Mathematics, Universidad Nacional Autónoma de México (UNAM) in Mexico.
- Kerry Luse, 2008.

Dissertation title: *Invariants of Knots, Graphs, and Feynman Diagrams*.
Currently Clare Boothe Luce Associate Professor of Mathematics at the Trinity Washington University in Washington, DC.

- Ilya Kofman, (2000 Ph.D. from University of Maryland at College Park under Bill Goldman with me).

Dissertation title: *Vassiliev invariants of knots and links in S^3 and other 3-manifolds*. Currently Professor of Mathematics at the City University of New York.

- Harpreet Bedi, (expected Ph.D. 2018).

Dissertation title: *Cohomology of Line Bundles with Rational Degree*.

Harpreet Bedi defended his dissertation successfully in August 2017, and expects to receive Ph.D. in January 2018. He has just started a position as Visiting Assistant Professor at Bucknell University Computer Science Department.

Postdoc Supervision

- Jeremy Trageser, GWIMS Postdoc. Postdoc supported by the George Washington Institute for Mathematical Sciences (GWIMS). I provided funding and mentoring for the postdoc. Fall 2015 – Spring 2017.

Senior Thesis Advisor

- Amy L. Nagahashi, 2001
Thesis: *Billiard Links in the 3-Ball*.
Currently at the National Security Agency.

Ph.D. Thesis Committees

- William P. Miller, 1995
Dissertation: *Approaches to Matroid Reconstruction Problems*.
- Sita Ramamurti, 1995
Dissertation: *Dynamics near the Essential Singularity for Zero-free Entire Vector Fields of Finite Order*.
- Tom Fitzkee, 1998
Dissertation: *Weakly Mixing Tiling Flows Arising from Interval Exchange Transformations*.
- Tatsuya Tsukamoto, 2000
Dissertation: *The fourth skein module of 3-dimensional manifolds*.
- Maxim Sokolov, 2000
Dissertation: *Quantum invariants, skein modules, and periodicity of 3-manifolds*.
- Hongxun Qin, 2000
Dissertation: *Tutte polynomials and matroid constructions*.
- Mietek Dabkowski, 2003.
Dissertation: *Burnside groups in knot theory*.
- Ataollah Togha. 2004.
Dissertation: *On Automorphisms of Structures in Logic and Orderability of Groups*

in Topology.

- Gosia Dabkowska, April 2006.
Dissertation: *Turing degree spectra of groups and their spaces of orders.*
- Michael Veve, August 2006.
Dissertation: *Skein Modules, Orderable Magmas, and Billiards.*
- Maciej Niebrzydowski, April 2007.
Dissertation: *Some Applications of Quandles and their Homology to the Geometry of Knots.*
- Jieun Lee, May 2010.
Dissertation: *Modeling the Equilibrium Configuration of a Piecewise Orthotropic Pneumatic Envelope and the Phase Separation Problem in a Membrane.*
- Yuzhong Chen (GW Physics Department), 2011-2012.
Dissertation: *Structure and Function of Protein Peptides.* Specialty Exam Committee.
- Chenghang Du (GW Physics Department), 2011-2012.
Dissertation: *Robustness-Evolvability Paradox of Biological Networks.* Specialty Exam Committee.
- Albert Hoang (GW Computer Science Department), February 2012.
Dissertation: *Derivation and Investigation of Affine Invariants for Image Processing Based on Wigner Distributions.*
- Joseph Herning, 2013
Dissertation: *Spectrum and Factors of Substitution Dynamical Systems.* Examiner.
- Steven Schluchter, 2011-2013
Dissertation: *Topological graph theory.* Thesis Research Committee.
- Examiner for the Topology qualifying exams (twice a year in most years), and the Advanced Calculus/Linear Algebra qualifying exam (in occasional years).

Services

Service to the Department

- Search Committee for the tenure track position, 2011-12, 2012-12, and 2013-14. (These three searches were successfully completed with the hiring of Professors Maria Guldani, Alexander Shumakovitch, and Yanxiang Zhao).
- Committee for Recruiting Majors, 2008-09.
- Graduate Committee, 2007-2008.
- Faculty mentor for Alexander Shumakovitch (2011-15). Faculty mentor for Hao Wu (2007-09).
- Search Committee for the tenure track position, 2006-2007. (The search was successfully completed with the hiring of Professor Hao Wu)
- Department Deputy Chair, Fall 2005.
- Topology Search Committee Chair, 2004-2005. (The search was successfully completed with the hiring of Professor Alexander Shumakovitch.)
- Undergraduate Committee Chair. 2003-2004.
- Faculty mentor for Yuka Taylor (2003-2005) and for Christopher Winfield

(2001-2002).

- Undergraduate Committee (advisor for math majors, coordinator for Putnam math competition, textbook coordinator, homepage manager, transfer credit coordinator), 1996-2001.
- Search Committee, (the search was successfully completed with the hiring of Professor Lowell Abrams), 1999-2000.
- Committee for Tenure and Promotion Guidelines (with Glick, Moses, Simion), helped for making departmental guideline for tenure and promotion cases, 1998.
- Personnel Committee (Colloquium Organizer, E & R fund coordinator), 1994-1996.
- Search Committee, (the search was successfully completed with the hiring of Professor Przytycki), 1994-1995.
- Graduate Committee (Coordinator for Graduate Qualifying Examinations), 1993-1994.
- Library Committee, 1992-1993.
- Topology Course Committee, Chair (redesigned the graduate topology course sequence), 1992-1994.
- Formulated the departmental syllabus for the Graduate Qualifying Exam in Topology, 1992-1994.

Services to the University and Other Schools:

- Search Committee for the Founding Director for the GW STEM Academy, 2014-15. The search was successfully completed with the hiring of Dr. Jerry Dwyer is joining GW in Fall 2015.
- Online Education Committee, Organizer (2014-16). This committee was convened by me as Associate Dean for Research and Strategic Initiatives.
- International Partnership Committee (2014-16). This committee was convened by me as Associate Dean for Research and Strategic Initiatives.
- Research Advisory Council (2014-16). This committee was convened by me as Associate Dean for Research and Strategic Initiatives.
- Data Science Working Committee (2014-16). This committee was convened by me as Associate Dean for Research and Strategic Initiatives.
- GW Advisory Committee for Research (2014-16)
- GW China Initiative Committee (2014-15).
- Global Bachelor Program Committee (2014-15)
- CCAS Space Committee (Chair), 2012-13. This is a committee consists of six chairs of the Columbian College of Arts and Sciences. The mission is to understand the overall space needs of the college and to present to the university and Board of Trustee.
- Search Committee for the GWU Computational Biology initiative, 2011-12. We worked with the Search firm Korn Ferry. The search was successfully completed with the hiring of Dr. Keith Crandall who became the founding director of the GW Computational Biology Institute.

- Advisory Committee for Research, 2008-2010. 2014-present. This committee works with Vice-President for Research on various research related issues.
- Working Committee for the GWU Computational Biology initiative, 2009-2010.
- Working Committee for the GWU Autism initiative, 2009-2010.
- Science Building Working Committee, 2006. The committee was to work on the planning of a \$275 million new Science and Engineering Building.
- Served on the GWU Faculty Senate Committee on Admissions Policy, Student Financial Aid, and Enrollment Management, Fall 2001-Spring 2002.
- Served in the Committee on Local Arrangements for the Annual Meeting of the American Mathematical Society, January 2000
- Served on a Ph.D. Dissertation Committee at University of Maryland. I am a joint advisor (with W. Goldman) for Ilya Kofman, 2000.
- Represented the Math Department at the GWU Spring Visit, April 1998.
- Served on a Ph.D. Specialty Examination Committee at University of Maryland (Ilya Kofman, University of Maryland at College Park, Topology), Spring 1997.
- Participated in the GWU 175th Anniversary fund raising campaign (Mathematics Department committee), 1995-1996.
- Faculty Presentation, Faculty Authors Program, The George Washington University, March 1995.

Professional Services and other leaderships

- Reviewer for the Mathematical Reviews of the American Mathematical Society.
- Reviewer for the Zentralblatt Math of the European Mathematical Society.
- Reviewer and panel member for the National Science Foundation.
- Panelist for the National Defense Science and Engineering Graduate (NDSEG) Fellowship.
- Reviewer for the Georgian National Science Foundation.
- Reviewer for the Chinese National Science Foundation.
- Judge for the Siemens National Competition, December 2012 and December 2016. Lead Judge for the Siemens National Competition, December 2015.
- Reviewer for the Russian Open Grant Competition (This is a major competition designed to attract leading scientists to Russian institutions of higher education).
- Referee for over twenty mathematics journals.
- Organizer of the American Mathematical Society meeting, special session on Low- dimensional topology, Washington D.C. on Howard University campus. April, 1993.
- Organizer for the annual American Mathematical Society Meeting, special session on "Topological Methods in Applied Mathematics," Washington, DC, January 2009.
- Co-Founder (with J. Przytycki) and Co-Organizer for the Knots in Washington conference, held twice a year since fall 1995. This is a major international conference with coverage on Washington Post.

- Co-Organizer of several special sessions of the American Mathematical Society meeting, 1997, 1998, 2000, 2012.
- Co-Founder (with M. Emelianenko, S. Roudenko, and P. Shi) and Co-Organizer for the Undergraduate Mathematics Conference, April 2012, and April 2013.
- Co-Founder (with M. Emelianenko, M. Gualdani, and P. Shi) and Co-Organizer for the Undergraduate EXTREEMS-QED Conference, April 2016, and April 2017.
- Organizer for Mathematics and Presidential Campaign, a symposium on how mathematics can be used in presidential election and presidential campaign. Over 70 participants attended the event. October 2012.
- External Reviewer for several promotion cases (Boise State University (2003-2004), United Arab Emirates University (2012-2013), and Louisiana State University (2013-2014)).

Hobbies

- **Music:** classical and 1960's.
- **Sports:** soccer, tennis, running (men's 1500m gold medalist in college, Boston Marathon qualifier)

Selected Administrative Accomplishments

Creating a new research support infrastructure When I started my current position in Fall 2014, there was a great deal of hope for improving the research support infrastructure for our faculty. At that time, such support was primarily provided by the university central offices. In particular, our Office of Vice President for Research (OVPR) was responsible for providing pre- and post-award support for external grant awards. Despite of the best efforts by everyone involved, it was felt that improved support was necessary to advance our research. That led to the idea of creating a new School Research Administrator (SRA) team within the college to provide research support and to interact with faculty more directly. Naturally this became a major task for me. I started with numerous conversations with various stakeholders including OVPR, Provost's Office, Central Finance Office, CCAS, our Research Advisory Council, as well as our faculty and chairs. These conversations helped me to understand the perspective and expectation from various parties so we could work together to come up with a plan that would best facilitate the transition. We worked out a great deal of details including plan to finance the SRA positions jointly and a detailed description for who will cover what in each step of the workflow. In order to make sure the transition will be smooth, we divided it into several steps implemented over a two year period, beginning with joint hiring of the SRAs who would report to OVPR and later transitioned to CCAS under my supervision. Careful plans were made to provide adequate training for everyone including the SRAs and the Department administrative staff. In Fall 2016, our team started to take full responsibilities for pre- and post-award support for our college. Subsequently, we hired a Research Manager who leads the team and reports to me. I am pleased to say our efforts have already paid off. Even if our staff size is smaller than before while the grant activities have increased, the feedback from our faculty has already indicated greater satisfaction in the service.

Looking ahead, I see a great deal of potential to enhance our service even further. For example, I am exploring the idea of creating a research development unit to provide personalized funding information, proposal development help, and support for large collaborative grant efforts. I am excited to see the kind of impact such efforts will lead to.

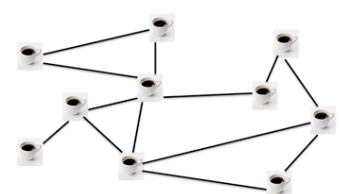
Creating a culture for research mentoring In my role as Associate Dean for Research and Outreach, and as Math Department Chair, I have devoted considerable efforts in mentoring faculty, especially junior faculty members with their grant proposals. This started naturally because of my experience at NSF and because of my role as Associate Dean for Research. Here are a few specific contributions that I have made.

- In 2010, our Vice President for Research asked me for ideas to help our faculty with grant proposals, and I came back with a suggested CAREER Mentoring Program to help junior faculty to compete for the NSF CAREER awards. This idea was well-received and implemented immediately. Within a year of launching this program, five junior faculty of GW received NSF CAREER awards. In particular, a mathematics junior faculty who worked with me closely on the proposal received the CAREER award. This is the first such award in our department history. Subsequently, two additional colleagues in Math Dept received CAREER awards, bringing the total number of CAREER recipients to three, all within a department of 19 faculty members.

- In Fall 2010, when the Simons Foundation started its program “Collaboration Grants for Mathematicians,” many people did not pay attention since it was a new program that they never heard of before. I alerted my colleagues in Mathematics Department immediately, and I encouraged all eligible colleagues to apply. Six of them applied that year, and two received the grant. The following year, two more faculty members received the grant. By now, 7 of our colleagues have received funding from this program.
- As Research Dean, I work with department chairs closely to ensure good mentoring in research for our faculty, especially junior faculty who need to get their first grant award. I also created a mentor / mentee matching system that provides mentors outside of the department with mentees in need. In addition, I created a new “Dean’s Research Excellence Award for Mentoring (DREAM)” that recognize the contributions of mentors as unsung heroes. All these have helped to promote a culture for faculty mentoring.

Promoting Interdisciplinary Collaborations I have been a strong advocate for interdisciplinary collaborations at GW. While working as a program officer at NSF, I had the opportunity to appreciate some of the most successful interdisciplinary research projects across the nation, and that planted the seed for my future involvements. Some of the milestones are as follows.

- In 2006, GW launched a "Math Initiative" which was started by our former dean. It was a great idea, but did not go very far after the dean left later within a year. But I took the opportunity and carried the flag soon after.
- In 2008, I applied for GW internal funding and obtained \$2500 seed money to start the GW Mathematical Application Seminar. It attracted people from various parts of the university, resulting a number of interdisciplinary collaboration teams. One such team (including myself) obtained a \$1.2 million research grant from the NSF Cyber-Enabled Discovery and Innovation (CDI) program in 2009, achieving a great return from the seed money.
- In 2011, I led a group of colleagues in mathematics and other fields to form the George Washington Institute for Mathematical Sciences (GWIMS), whose missions are to promote interdisciplinary collaborations in research and training that involve mathematics. Since then, the eight members of GWIMS have obtained over \$5 million in external grants.
- In 2013, I led a team of faculty in mathematics and physics on an NSF proposal “JUMP: Joint Undergraduate Mathematics and Physics Scholarships at GW,” which was subsequently awarded by NSF. It is the first S-STEM award made to GW.
- In 2014, I led another team of faculty on campus to obtain NSF funding to launch the Data-driven Mathematics and Statistics Training, Education, & Research (Data MASTER) program. This project aims at enhancing data-driven computational skills for our students, and has led to a great deal of interests among our undergraduates.
- Faculty CAN: Faculty Coffee and Networking. This is a coffee and networking event series that helps our faculty to interact with each other. It is among the new activities that



Coffee and Networking

I started as Associate Dean for Research and Strategic Initiatives. Created in 2014, with Faculty WIN to be launched in 2015.

- WoW^{TALK} (What's our Work) Series. This is a TED talk type seminar series aimed at bringing people together in our newly constructed Science and Engineering Hall to explore interdisciplinary collaborations. Each event consists of four talks, 15 minutes each, designed to introduce and wow the audience to research. These are followed by a tour to the labs of the speakers. Refreshments are provided for conversations after. Created in 2016

Academic Growth As Research Dean, I managed to make a major contribution to the financial health of GW. This may sound unusual since research generally cost money. Here is how I did it. In Fall 2014 when I started my current position as Associate Dean for Research and Strategic Initiatives, GW faced a major challenge financially like many other universities. Indeed, the graduate enrollments were decreasing as the improved economy provided attractive job opportunities for our potential graduate applicants. At the same time, GW had made commitments to major investments such as the new Science and Engineering Hall (SEH) and the renovation for the former Corcoran Gallery of Art Building. Therefore, my immediate focus had to be on the strategic initiative side – to explore new initiatives to increase our graduate enrollments. After identifying some of the most promising ideas in my mind, I worked hard with several groups of faculty and came up with a number of new programs and initiatives. As an example, the new Masters' Program in Data Science, which I spearheaded, was launched in Fall 2015 and is already attracting hundreds of students from all over the world each year. I am pleased to see that our university is now in a much healthier financial situation. That allows us to invest in education and research which are our core missions. I think it is fair to say that my efforts have made a major contribution to the come back.

Student Engagement Over the past several years, I have been working with my colleagues in various ways to engage our students. In 2009, I gave a public lecture "Mathematics is Beautiful, Mathematics is Useful" that attracted over 50 GW undergraduate students (before this event, our colloquium talks rarely attracted more than 5 undergraduates). When I became the chair of Mathematics Department, I appointed a new advising team and worked with them to establish a new advising system that provided improved and more individualized advice to our students. I also worked with our Undergraduate Committee to create a number of new topics courses that are of interest to our students. Our efforts in Teaching Excellence also inspired heightened interests in mathematics across our campus. Our NSF sponsored program, Joint Undergraduate Mathematics and Physics (JUMP) Scholarship Program at GW, has led to a great deal of new interests among our undergraduates. Our latest NSF grant, GW Mathematics and Statistics Training, Education, & Research (MASTER), led to the next level of excitement. Therefore, it is not a surprise that we have seen a dramatic increase in our course enrollments and our majors, both reaching record highs. In Fall 2013, over 2,000 students enrolled in our undergraduate courses, a 35% increase from Fall 2011 (when the enrollment of the college was slightly down). Our graduate enrollment reached 100 in Fall 2013, up from 61 in 2011. The number of math majors skyrocketed to over 100, representing a 10-fold increase in 10 years.