

University of Minnesota, Morris
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Updated: March 11, 2009

CURRICULUM VITAE

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Unit: Mathematics

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EDUCATION

College and University Education

- 1998 Ph.D., Department of Physics, University of Manitoba, Dissertation Title: *Molecular Collisions: Effect on the HD Infrared Spectrum and Development of a Moyal Quantum Mechanical Description*, Advisors: G.C. Tabisz and T.A. Osborn.
- 1992 M.Math., Department of Applied Mathematics, University of Waterloo, Dissertation Title: *Energy Eigenvalues of Perturbed Relativistic Schrödinger Equations*, Advisor: E.R. Vrscaj.
- 1990 B.Sc. 4-Yr (Mathematics, Physics) University of Winnipeg.

Undergraduate Honors and Awards

- University of Winnipeg Gold Medal in Physics (General) (May 1990)
- University of Winnipeg Student of Highest Distinction (1989/90)
- University of Winnipeg Board of Regents Academic Proficiency Scholarship (1989)
- University of Winnipeg Student of Highest Distinction (1988/89)
- University of Winnipeg Student of Distinction (1987/88)
- University of Winnipeg Board of Regents Special Entrance Scholarship (October 1985)

Graduate Honors and Awards

- Nominated by The University of Manitoba for the NSERC Doctoral Prize (1999)
- NSERC PGS-B Scholarship (September 1992–September 1994)
- University of Waterloo Graduate Fellowship (May 1992)
- University of Waterloo Graduate Fellowship (January 1992)

EMPLOYMENT

Professional Employment

- Associate Professor of Mathematics (August 2006–present)
- Assistant Professor of Mathematics (August 2000–August 2006)
Division of Science and Mathematics
University of Minnesota, Morris
Morris, MN 56267 USA
- Postdoctoral Fellow (August 15, 1998–July 15, 2000)
Chemical Physics Theory Group (Paul Brumer) – Department of Chemistry
University of Toronto
Toronto, ON M5S 1A1 Canada

PROFESSIONAL MEMBERSHIPS AND HONORS

Professional Organization Memberships

- * Member of the University of Minnesota's Academy of Distinguished Teachers (2008–Present)
- * The Mathematical Association of America (MAA) (2001–Present)
- * Society for Industrial and Applied Mathematics (SIAM) (1999–Present)
- * The American Physical Society (APS): Divisions: Atomic, Molecular, and Optical Physics (DAMOP) (1998–Present)
- o The Canadian Association of Physicists (CAP) (1998–2001)

Professional Honors and Awards

- * Horace T. Morse - University of Minnesota Alumni Association Award for Outstanding Contributions to Undergraduate Education (2008)
- * Nominated for the University of Minnesota John Tate Award for Excellence in Undergraduate Advising (2008)
- * Nominated for the UMM Alumni Association Teaching Award (UMMAATA) (2004, 2005, 2007, 2008)
- o Named to "Who's Who Among America's Teachers" (2004, 2005)

TEACHING AND ADVISING

University of Minnesota, Morris Courses Taught

2008/09 Academic Year:

* MATH 4901 Senior Seminar	2 students
* MATH 2401 Differential Equations	F08 24 students, S09 1 student
* MATH 1011 Precalculus	F08 25 students, S09 33 students
* MATH 1001 Survey of Math	32 students
* MATH 0901 Basic Algebra	24 students
* IS 1051 Intro College Learning Skills (Math Component)	Summer08 24 students

2000-2009 Academic Years:

o MATH 4994 Senior Honors Project	1 student	Fall 2003
o MATH 4993 Directed Study: Borel Resummation, 2cr (S-N)	1 offering	Spring 2006
o MATH 4993 Directed Study: Navier-Stokes Equations, 2cr (S-N)	1 offering	Spring 2006
o MATH 4993 Directed Study: Partial Differential Equations, 2cr	2 offerings	Fall 2002, 04
o MATH 4993 Directed Study: Random Number Generation, 1cr	1 offering	Fall 2001
o MATH 4901 Senior Seminar	20 students	2000–present
o MATH 4452 Mathematical Modeling	1 offering	Spring 2002
o MATH 4401 Numerical Methods	3 offerings	Spring 2003, 06, 08
o MATH 2401 Differential Equations	9 offerings	Fall 2000–08
o MATH 2101 Calculus III	2 offerings	Spring 2001, 08
o MATH 1102 Calculus II	5 offerings	Spring 2001–03, 05, 07
o MATH 1101 Calculus I	6 offerings	Fall 2000–04, 2006
o MATH 1011 Precalculus	5 offerings	Fall 2003, 08 Spring 2004, 06, 09
o MATH 1001 Survey of Math	7 offerings	Spring 2004–09 Summer 2005
o MATH 0901 Basic Algebra	2 offerings	Fall 2007, 08
o IS 1051 Intro College Learning Skills (Math Component)	1 offering	Summer 2008
o IS 1001 First Year Seminar: Beauty, Ritual, and Identity	1 offering	Fall 2005

Curricular Innovations

- Created the First Year Seminar *Beauty, Ritual, and Identity*. The seminar examines ideas about the body, including beauty, ritual, and ceremony, focussing on how personal identity and culture interact (fall 2005).
- Created under the umbrella course Math 4450 Variable Topics in Applied Mathematics the course Math 4452 Mathematical Modeling. The course shows a wide range of mathematical methods (optimization, continuous and discrete dynamical systems, and probability) implemented in real world modeling situations (spring 2002).

Special Teaching Methods Implemented

- * Incorporated extensive use of course web pages to relay information to students in all courses (2001–present).
- * Incorporated use of concept maps to help students understand the connections between the material studied in Math 1011 Precalculus, Math 1101 Calculus I, Math 1102 Calculus II, and Math 2401 Differential Equations (2006–present).
- * Incorporated mandatory final course projects (paper and oral presentation) into:
 - Math 4452 Mathematical Modeling (spring 2002)
 - Math 4401 Numerical Methods (spring 2003–present)
 - Math 2401 Differential Equations (fall 2007–present)
- * Incorporated weekly journal entries by students in Math 1011 Precalculus (fall 2008–present), Math 1101 Calculus I (fall 2002–present), Math 1102 Calculus II (spring 2002–present), and Math 4452 Mathematical Modeling (spring 2002).
- Incorporated lectures and student assignments using Excel to analyze data and study personal finance in Math 1001 Survey of Math (spring 2005–present).
- Incorporated the extensive use of computer software into the teaching of Math 4452 Mathematical Modeling (spring 2002) and Math 4401 Numerical Methods (spring 2003–present).
- Created the document How to Succeed in My Courses (<http://cda.morris.umn.edu/~mcquarrb/HowToSucceed.html>) which contains a discussion on problem solving in mathematics, lecture and exam preparation tips, and The Three Step Study Session (fall 2004).
- *Enhancing Student Learning Through Innovative Teaching and Technology Strategies* Bush Triad group member which focused on the use of L^AT_EX in teaching (\$300 stipend) (2003/04).

Advising and Instruction–Related University Activities

- * 2008/09: 16 advisees
- From 2001–present: average of 14 advisees per year.
- * Participating in The Deciding Project, a pilot advising program at UMM for entering first year students who are undecided about their majors (fall 2004–present)
- * Undergraduate Research Activities:
 - * Morris Academic Partnership (MAP) for the project titled *Advanced Techniques for Summing Divergent Series* with David Nieves (UMM 2010) (summer/fall 2008).
 - Supervised Christopher Orth (UMM 2006), who presented the oral presentation *Borel Resummation of a Divergent Series* at the 2006 Undergraduate Research Symposium at the University of Minnesota, Morris (April 2006).
 - Morris Academic Partnership (MAP) for the project titled *Bivariate Statistical Distributions via a Partial Differential Equations Approach* with Chris Zabinski (UMM 2004) (2003/04).
 - Supervised Daniel Enderton (UMM 2002), who presented the poster *Multidimensional Integration* at the 2002 Undergraduate Research Symposium at the University of Minnesota, Morris (April 2002).

* Mathematics Senior Seminar Advisees:

- * S. Duffy: Billiards (2009)
- * K. Struss: The Arnold Cat Map and Cryptology of Images (2008/09)
- * L. Stone: How Flat Can a Soap Bubble Be? (2007/08)
- o L. Paulson: Deterministic Problems in Genetics Using Dynamical Systems (2006/07)
- o T. Cathers: Finite Markov Chains and Processes (2006/07)
- o A. Johnson: Modeling Catalytic Converters (2005/06)
- o D. Metcalf: Modeling Traffic Flow (2005/06)
- o C. Orth: Padé and Algebraic Approximants Applied to the Quantum Anharmonic Oscillator (2005)
- o D. Harms: Population Landscapes in Evolutionary Computation (2004/05)
- o C. Zabinski: Summation of Divergent Series (2003/04)
- o M. Gilkey: Fractional Derivatives: The Mystery of What's Between Integer-Order Derivatives (2003/04)
- o C. LaForge: Linear Algebra Techniques for Solving Differential Equations (2003/04)
- o J. Kallstrom: Finite Difference Solution to a Linear Partial Differential Equation (2003)
- o P. Westby: Getting Around That π^2 Corner (2002/03)
- o J. Stenberg: Cyclotomic Polynomials at a High School Level (2002)
- o B. Gluth: Loess: A Nonparametric Data Smoother (2002)
- o D. Enderton: Multidimensional Numerical Integration (2001/02)
- o Z. Heinen: Solving the Time Independent Schrödinger Equation (2001/02)
- o A. Simon: Pendulums Through the Years (2000/01)
- o J. Brown: Using Mathematical Models to Describe Epidemiology (2000/01) (co-advisor Peh Ng)
- o Participated in the Next Generation of the Professoriate program as a faculty mentor (\$250 stipend) (2003/04). Attended two day workshop (January 8–9, 2004) on instructional technology.
- o Created a flowchart of the prerequisite structure of the mathematics major (fall 2003)
<http://www.morris.umn.edu/academic/math/advising2.html>.
- o Participated in the mini-conference on teaching excellence at UMM entitled *Opening the Door: Sharing the Craft of Teaching* (April 1 2002).
- o Created a sample 5–year course plan for Mathematics majors seeking secondary education teaching licensure (July 2001).
- o Official Observer in a study of Teaching Assistant habits, University of Toronto, Department of Physics (Contact: Prof. Anthony Key) Duties: Observe TA during lab session, noting certain behaviors and interaction patterns, in an effort to determine if certain behaviour patterns influenced student learning (November 1999).

SCHOLARLY, PROFESSIONAL AND CREATIVE ACTIVITY

Publications

Articles:

- o McQuarrie, Barry R., Abrashkevich, Dmitri G., and Brumer, Paul (2003) Classical Wigner phase space approximation to cumulative matrix elements in coherent control, *Journal of Chemical Physics* 119: 3606-3618.
- o McQuarrie, B.R., and Brumer, Paul (2000) Semiclassical initial value representation techniques for chaotic systems, *Chemical Physics Letters* 319: 27-44.
- o Osborn, T.A., Kondrat'eva, M.F., Tabisz G.C., and McQuarrie, B.R. (1999) Mixed Weyl symbol calculus and spectral line shape theory, *Journal of Physics A: Mathematical and General* 32: 4149-4169.
- o McQuarrie, B.R., Osborn, T.A., and Tabisz, G.C. (1998) Semiclassical Moyal quantum mechanics for atomic systems, *Physical Review A* 58: 2944-2961.
- o McQuarrie, B.R., and Tabisz, G.C. (1996) Collisional Interference in the Infrared Spectrum of HD: Calculation of the Line Shape of Vibrational Transitions for HD-He, *Journal of Molecular Liquids* 70: 159-168.
- o McQuarrie, B.R., Tabisz, G.C., Gao, B., and Cooper J. (1995) Role of the induced dipole moment in the collisional interference in the pure rotational spectrum of HD-He and HD-Ar, *Physical Review A* 52: 1976-1981.

- McQuarrie, B.R., and Vrscay, E.R. (1993) Rayleigh-Schrödinger perturbation theory at large order for radial Klein-Gordon equations, *Physical Review A* 47: 868-875.

Conference Papers and Presentations

- Tabisz, G.C. (presenter), McQuarrie, Barry R., and Osborn, T.A. (2006) Collision-Broadened Line Shapes: A Different Perspective via Moyal Quantum Mechanics in *Spectral Line Shapes* vol. 18, Proceedings of the 18th International Conference on Spectral Line Shapes, edited by Eugene Oks, American Institute of Physics, New York: 151-161.
- McQuarrie, Barry R. (presenter), Abrashkevich, Dmitri G., and Brumer, Paul (2003) Classical-Wigner Phase Space Approximation to Cumulative Matrix Elements in Coherent Control, poster presented at the meeting of the Division of Atomic, Molecular, and Optical Physics of the American Physical Society (DAMOP), Boulder, Colorado, USA.
- Mahmood, M. (presenter) and McQuarrie, B.R. (2003) New Statistical Distributions via a Differential Equation Approach, presented and abstract published in Hawaii International Conference on Statistics and Related Fields.
- McQuarrie, B.R. (presenter) and Brumer, Paul (2001) Semiclassical Approximation to Direct Part of Channel Specific Photodissociation Cross Sections, poster presented at the Joint meeting of the Division of Atomic, Molecular, and Optical Physics of the American Physical Society (DAMOP) and the Division of Atomic and Molecular Physics of the Canadian Association of Physicists (DAMP), London, Ontario, Canada.
- McQuarrie, B.R. (presenter) and Brumer, Paul (2000) Semiclassical Initial Value Representation Techniques for Chaotic Systems, poster presented at the Canadian Association of Physicists Congress, York University, Canada.
- McQuarrie, B.R. (1999) Proceedings of the Faraday Discussion 113: Stereochemistry and Control in Molecular Reaction Dynamics.
- McQuarrie, B.R., Osborn, T.A., Kondrat'eva, M.F., and Tabisz, G.C. (presenter) (1999) Moyal Quantum Dynamics: Atomic Scattering and Line Shapes in *Spectral Line Shapes* vol. 10, Proceedings of the 14th International Conference on Spectral line Shapes, edited by R. Herman, American Institute of Physics, New York: 332-335.
- McQuarrie, B.R., and Tabisz, G.C. (presenter) (1997) Collisional Interference in the Vibration-Rotation Spectrum of HD-He in *Spectral Line Shapes* vol. 9, Proceedings of the 13th International Conference on Spectral line Shapes, edited by M. Zoppi and L. Ulivi, American Institute of Physics, New York: 507-510.
- Tabisz, G.C. (presenter), McQuarrie, B.R., Gao, B., and Cooper, J. (1995) Collisional interference in the Rotational Spectrum of HD-He in *Laboratory and Astronomical High Resolution Spectra*, edited by A.J. Sauval, R. Blomme, and N. Grevesse, Astronomical Society of the Pacific, San Francisco: 312-313.

Other Presentations

- Barry R. McQuarrie, (January 29, 2004) A Semiclassical Approach to Molecular Photodissociation, talk given in the UMM Chemistry Discipline's seminar series.

Grants Received

Within the University:

- Out of State Travel Allowance (May 2001, May 2003, January 2008)
- Faculty Enrichment Program Grant Mentor (\$500 stipend) (2005/06)
- Faculty Enrichment Program Grant Mentee (\$250 stipend) (May 2001)

Professional Meetings Attended

- Joint National Meeting of American Mathematical Society (AMS) & Mathematical Association of America (MAA), San Diego, California, USA (January 2008).
- The Mathematical Association of America (MAA) North Central Section Fall 2006 Meeting, University of Minnesota, Morris (October 27-28, 2006).
- Meeting of the Division of Atomic, Molecular, and Optical Physics of the American Physical Society (DAMOP), Boulder, Colorado, USA (May 2003).

- Joint meeting of the Division of Atomic, Molecular, and Optical Physics of the American Physical Society (DAMOP) and the Division of Atomic and Molecular Physics of the Canadian Association of Physicists (DAMP), London, Ontario, Canada (May 2001).
- Canadian Association of Physicists (CAP) Congress, York University, Canada (June 2000).
- Faraday Discussion 113: Stereochemistry and Control in Molecular Reaction Dynamics, University of Leeds, UK (July 1999).

Other Meetings Attended (not research based)

- * Academy of Distinguished Teachers Annual Retreat *Responding to Diverse Learners* (October 10-12, 2008).
- UMM Fall Faculty Retreat *Planning for the Future: Making it Happen* (August 20-21, 2007).
- UMM Fall Faculty Retreat *Enhancing Our Academic Environment* (August 21-22, 2006).
- UMM Fall Faculty Retreat *Collegiality and Rhythms of Academic Life* (August, 2005).
- UMM Fall Faculty Retreat *Teaching and Learning for a Multi-Cultural Society* (August 2004).
- UMM Fall Faculty Retreat *Enhancing Learning and Teaching Through Technology Strategies* (August 2001).
- UMM Fall Faculty Retreat *Service Learning* (August 2000).

Research and Scholarly Activities in Progress

- * Solutions to Schrödinger's Equation using perturbation theory.
- * Application of Moyal quantum mechanics to (i) line shape problems for molecule-rare gas scattering, and (ii) other physical systems.

SERVICE

UMM Service

Committees:

- * Chair of Scholastic Committee (summer 2007–present)
- * Chair of Financial Aid Satisfactory Academic Progress (SAP) Appeals Committee (summer 2007–present)
 - * Reviewed and ruled on appeals from students whose Financial Aid had been suspended.
 - * Talked with students who had questions about their appeal.
- * Member of Suspension Appeals Subcommittee (summer 2006–present)
 - * Reviewed and ruled on appeals from students who had been suspended by the Scholastic Committee for academic reasons.
- * Chair of Self-Study Subcommittee #3: Criterion Three: Student Learning and Effective Teaching (2008/09)
- * Chair of Program Coordinator in Academic Assistance Search Committee (summer 2008)
- Mathematics Discipline Coordinator (fall 2001, spring 2004, spring 2007)
 - Drafted report on enrollment in Math discipline (2007).
 - Created the three year UMM portion for a dual UMM math major and UMTC engineering degree (2001).
 - Updated the prerequisite structure for the Mathematics Discipline (2001).
- Scholastic Committee (2001–04, 2006/07)
 - Academic Integrity subcommittee (2002/03, 2006/07).
 - Convener of Academic Integrity web site creation subcommittee (2004/05).
 - Convener of Academic Integrity Brochure Revision subcommittee (2003).

- Co-Chair of UMM's Academic Alert Committee (spring 2005–fall 2007)
 - Attended weekly meetings with other members of the alert team to determine appropriate interventions for particular students.
 - Assisted in creating Academic Alert procedures.
 - Served as contact between instructor and advisor for alerted students.
 - Developed the Early Alert web site with Kathryn Gonier-Klopffleisch (summer 2005).
 - Co-facilitator of session on Early Alert at UMM Fall Faculty Retreat (August 2005).
 - Alternate Member of Financial Aid Satisfactory Academic Progress (SAP) Appeals Committee (2005–summer 2007)
 - Student Counseling Associate Counselor Search Committee Member (spring 2007)
 - Admissions Counselor and International Admissions Counselor Search Committee Member (spring 2007)
 - Member of Teacher Education Committee (2005/06)
 - Computer Science Tenure Track Position Search Committee Member (2004/05)
 - Elementary Education Tenure Track Position Search Committee Member (2005)
 - Member of Writing Subcommittee (2004/05)
 - Member of Morris Academic Staff Award Committee (spring 2005)
 - Member of UMM's Early Alert/At Risk Student Intervention Committee (fall 2004)
 - Physics Tenure Track Position Search Committee Member (2003/04)
 - Mathematics Tenure Track Position Search Committee Member (2002/03)
 - Mathematics Temporary Position Search Committee Member (2002)
 - Mathematics Tenure Track Position Search Committee Member (2001/02)
 - Kaufman–McCree Award Committee (spring 2001, 2002)
- Other:
- * Math Discipline Education Division liaison (2002–present)
 - helped match math courses to state standards for Education Division's Professional Education Program Evaluation Report (PEPER) (2006)
 - * Math Discipline assessment issues (2001–present)
 - created year end assessment report detailing assessment activities in the discipline (2007–present)
 - created new assessment instrument for presentation component of Math 4901 Senior Seminar (2005)
 - with Michael O'Reilly from 2001–03.
 - * Math Discipline bulletin revision paperwork coordinator (fall 2002, 2004 (with Dave Roberts), 2006, 2008)
 - Math Discipline Math Room Tutors Contact (2006/07)
 - created posters for the Math Room (2007)
 - Division of Science and Mathematics Grievance Officer (2005–07)
 - Division of Science and Mathematics "Teaching Buddy" (help acclimate a new faculty member to UMM) (fall 2003)
 - Math Discipline webmaster (2002/03)
 - Math Discipline class scheduling (2002/03)
 - Math Discipline High School math contact (2001/02)
 - Math Discipline math computer room management
 - with Michael O'Reilly for Sci 3650 (2002–04)
 - with David Craig for MRC 10 (2000/01)

- Math Club Advisor
 - with David Roberts and Michael O'Reilly (2001/02)
 - with David Roberts (2000/01)
- Organized campus visit of Dr. John Hamilton of Kodak Research Lab through Society of Industrial and Applied Mathematics Visiting Lecture Program (fall 2001)
- Math Discipline Faculty Seminars coordinator with Munir Mahmood and John Rosson (2000/01)

Professional Service Activities

- * Referee for *Journal of Physics A: Mathematical and Theoretical* (2004, 2007)
- * Referee for *International Journal of Computer Mathematics* (2007, 2008)

Public Service Activities

- * Assisted Jay Fier (Engineering Surveyor/Inspector for Morris) in calculating lot sizes on Circle Pines for use in assessment of sewer/road renovations. (fall 2008)
- Assisted Jay Fier (Engineering Surveyor/Inspector for Morris) in calculating concrete amounts used in the Columbia Avenue road resurfacing project. Subsequently turned this question into an assignment used in Calculus II. (fall 2004)
- Completed Safe Zone I and II training. (April 2004)
- Attended a reception at Eastcliff for potential UMM students around the Twin Cities (March 1, 2004). Event organized by UMM admissions office.
- Drafted and signed a letter for the Math Discipline which was sent to students admitted to UMM who identified themselves as potential math majors (2003 & 2004)
- Met with prospective students and their parents to discuss the mathematics program at UMM during the Education Minnesota Visit Days (October 2001).