Robert Hugh Caldwell Moir

CONTACT INFORMATION

Department of Computer Science
The University of Western Ontario
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CITIZENSHIP

Canada, United Kingdom

EDUCATION

PhD, Applied Mathematics (with Scientific Computing) 2013-2017
Western University, London, Canada
Thesis: *Feasible Computation in Symbolic and Numeric Integration*
Supervisors: Robert Corless and Marc Moreno Maza
Examiners: Chris Smeenk and David Stoutemyer

PhD, Philosophy 2004-2013
Western University, London, Canada
Thesis: *Structures in Real Theory Application: A Study in Feasible Epistemology*
Supervisors: Robert Batterman and John Bell
Examiners: William Harper, Chris Smeenk and Mark Wilson

MSc, Applied Mathematics 2009-2010
Western University, London, Canada
Thesis: *Reconsidering Backward Error Analysis for Ordinary Differential Equations*
Supervisor: Robert Corless

MA, Philosophy 2003-2004
Western University, London, Canada

BA, Mathematics and Philosophy (*First Class Joint Honours*) 2001-2003
McGill University, Montréal, Canada
Honours Thesis: *Infinity and Physical Theory*
Supervisor: Michael Hallett

BSc, Physics (minor Chemistry) (*First Class Honours*) 1995-2001
McGill University, Montréal, Canada

AREAS OF SPECIALIZATION

Applied Mathematics, Computational Science, Philosophy of Applied Mathematics, Philosophy of Physics

AREAS OF COMPETENCE

Logic, Philosophy of Mathematics, Philosophy of Science

AWARDS AND DISTINCTIONS

ACADEMIC AWARDS

Canadian Society for the History and Philosophy of Mathematics
- CSHPM Annual Conference (held at MathFest 2013):
  Best Contributed Paper by a Graduate Student ($750), 2013

Chemical Institute of Canada National High School Chemistry Examination
- Toronto District Winner, 1995

Research Awards

Faculty of Science, Western University
- Postdoctoral Fellowship ($50,000/a), 2018-2020

Government of Ontario, Western University
- Queen Elizabeth II Graduate Scholarship in Science and Technology ($15,000), 2015-2016

Western University
- Western Graduate Research Scholarship ($8,000/a), 2013-2015, 2016-2017

Department of Applied Mathematics, Western University
- PhD Entrance Scholarship ($2,500), 2013-2014

University of Pittsburgh
- Visiting Scholar ($26,000), 2011-2012

Western University
- Western Graduate Research Scholarship ($8,000), 2009-2010

Social Sciences and Humanities Research Council of Canada
- Doctoral Fellowship ($40,000), 2007-2009

Western University
- Western Graduate Research Scholarship ($8,000), 2005-2006

Western University
- Special University Scholarship ($13,000), 2003-2005

Publications

Articles

- **Moir, RHC, Corless, RM, Moreno Maza, M and Xie, N. (2019) "Symbolic-Numeric Integration of Rational Functions." *Numerical Algorithms.* (forthcoming)
- **Asadi, M, Brandt, A, Moir, RHC and Moreno Maza, M. (2019) "Algorithms and Data Structures for Sparse Polynomial Arithmetic." *Mathematics*, 7(5), 441 DOI: 10.3390/math7050441
- **Moir, RHC. (2019) "Effective Validity: A Generalized Logic for Approximate Inference." In: Fillion, Nicolas, Corless, Robert and Kotsireas, Ilias (Eds.), *Algorithms and Complexity in Mathematics, Epistemology and Science*, Fields Institute Communications, no. 82, pp. 225–268.
- **Corless, RM, Kaya, CY and Moir, RHC. (2018) "Optimal residuals and the Dahlquist test problem." *Numerical Algorithms*, Online First, DOI: 10.1007/s11075-018-0624-x, pp. 1–22.
- **Fillion, N and Moir, RHC. (2018) "Explanation and Abstraction from a Backward-Error Analytic Perspective." *European Journal for Philosophy of Science*, v. 8, no. 3, pp. 735–759, DOI: 10.1007/s13194-018-0208-6.
- **†Moir, RHC (2018). "Feasible Computation: Methodological Contributions from Computational Science." In: Cuffaro, M and Fletcher, S (Eds.), *Physical Perspectives on Computation, Computational Perspectives on Physics*, Cambridge University Press, pp. 172–194.
- **Bangu, S and Moir RHC (2018). "The 'Miracle' of Applicability? The Curious Case of the Simple Harmonic Oscillator." *Foundations of Physics*, v. 48, no. 5, pp. 507–525.

†Invited **Peer-reviewed

Proceedings

- **Asadi, M, Brandt, A, Moir, RHC and Moreno Maza, M (2018). "Sparse Polynomial Arithmetic with the BPAS Library." In: Gerdt V., Koepf W., Seiler W., Vorozhtsov E. (Eds.) *Computer Algebra in Scientific Computing*. CASC 2018. Lecture Notes in Computer Science, vol 11077.
- **Moir, RHC, Corless, RM, Jeffrey, DJ, (2014). "Unwinding Paths on the Riemann Sphere for Continuous Integrals of Rational Functions." In: Elias, J, Fernández-Sánchez, J, and Sombra, M (Eds.), *Proceedings de Encuentro de Álgebra Computacional y Aplicaciones (EACA) XIV* (EACA trans: Meeting on Computer Algebra and Applications), Barcelona, June 2014, pp. 139-142.

Software

- **Chen, C, Covanov, S, Mansouri, F, Moir, RHC, Moreno Maza, M, Xie, N and Xie, Y (2016). "The basic polynomial algebra subprograms." *ACM Communications in Computer Algebra*, v. 50, no. 3, pp. 97-100.

**Peer-reviewed

Dissertations

- Moir, RHC (2017). "Feasible Computation in Symbolic and Numeric Integration." *University of Western Ontario - Electronic Thesis and Dissertation Repository*. Paper 5155.
- Moir, RHC (2013). "Structures in Real Theory Application: A Study in Feasible Epistemology." *University of Western Ontario - Electronic Thesis and Dissertation Repository*. Paper 1578.

Posters

- Batterman, RW, Fillion, N, Moir, RHC, Overton, J (2010). "Idealization in Scientific Explanation." Western Research Day, Western University, March 24, 2010. Poster 1.

Talks

Conference Talks

- *(2019) "Modeling Scientific Reasoning with Effective Logic." MCMP-Western Ontario Workshop on Computation in Scientific Theory and Practice, Munich Center for Mathematical Philosophy, LMU Munich, Germany, June 2.
- *(2019) "A Logical Structure for Reducing Complexity." Simplicities & Complexities: Interdisciplinary Perspectives on Simplicity and Complexity in Scientific Knowledge and Practices, University of Bonn, Germany, May 24.
- **(2018) with M. Asadi et al. "Sparse Polynomial Arithmetic with the BPAS Library." Computer Algebra in Scientific Computing, Université de Lille, France, September 19.
- **(2016) with C. Chen et al. "Basic Polynomial Algebra Subprograms." Software demo at the International Symposium on Symbolic and Algebraic Computation (ISSAC), Wilfred Laurier University, Waterloo, July 20.
- †(2016) "The Practical Computational Character of (Pure and Applied) Mathematical Inference." Workshop on Philosophy of Applied Mathematics, IHPST, Université Paris 1—Panthéon-Sorbonne, Paris, May 23-27.
- (2016) "Toward a Computational Model of Scientific Discovery." ACMES2: Computationally Assisted Mathematical Discovery and Experimental Mathematics, Western University, London, Ontario, May 12-15.
- (2015) "Effectively Valid Inference in Computational Mathematics." Algorithms

and Complexity in Mathematics, Epistemology and Science (ACMES) Conference, Western University, London, Ontario, May 6-8.
- †(2014) with Corless, RM, Jeffrey, DJ. "Unwinding Paths on the Riemann Sphere for Continuous Integrals of Rational Functions." 20th Conference on Applications of Computer Algebra, Fordham University, New York City, Jul 9-12.
- **(2014) with Corless, RM, Jeffrey, DJ. "Unwinding Paths on the Riemann Sphere for Continuous Integrals of Rational Functions." Encuentro de Álgebra Computacional y Aplicaciones XIV (EACA–Meeting on Computer Algebra and Applications), Institut d'Estudis Catalans, Barcelona, June 18-20.
- *(2013) "Rational Discovery of the Natural World: An Algebro-Geometric Response to Steiner" MathFest 2013/Canadian Society for the History and Philosophy of Mathematics (MathFest 2013/CSHPM) Conference, Hartford CT, 1-3 August.
- *(2011) with Corless, RM. "Computation for Confirmation." Conference on The Plurality of Numerical Methods and their Philosophical Analysis. Université Paris 1—Panthéon-Sorbonne, Paris, November 3-4.
- *(2010) with Fillion, N. "Explanation and Abstraction: The Case of Backward Error Analysis" Philosophy of Science Association (PSA) Biennial Meeting, Montréal, Québec, 4-6 November.

Posters

- (2018) with Asadi M, Brandt A and Moreno Maza, M. "Algebraic tools supporting comprehensive optimization of parametric GPU kernels." CASTLE 2018, IBM, Markham, 7-8 May.
- *(2011) "Dynamics Backward: Backward Error Analysis for Ordinary Differential Equations." Epistemology of Modeling & Simulation National Conference, Pittsburgh, 1-3 April.
- (2008) "Theories, Models and Representation: Lessons from Solid State Physics." Western Research Day, 28 March, and Arts and Humanities Research Day, 2 April.

†Invited **Peer-reviewed *Abstract Submission

Academic Experience

Assistant Professor

Western University 2018-2019

- Data Structures & Algorithms in Python (Half-Year Course), 2019
- Foundations of Computer Science I (Half-Year Course), 2018
- Dealing with Data: Analysis & Visualization (Half-Year Course), 2018

Instructor

Western University 2010-2013

- Metaphysics and Epistemology of Witchcraft (Full-Year Course), 2012-2013
- Introduction to Logic (12-week Accelerated, full-year course equivalent), 2011
- Critical Thinking (Full-Year Course), 2010–2011

Research Assistant

Western University 2008-2014,2018

- Marc Moreno Maza, Department of Computer Science, 2018
- Robert Corless, Department of Applied Mathematics, 2009–2010, 2013–2014
- Rotman Canada Research Chair in Philosophy of Science, 2009–2010
- Rotman Institute of Philosophy, 2008-2009

Teaching Assistant

Western University 2003-2017

- Applied Mathematics for Engineers II (Half-Year Course) 2017
- Biocalculus (Half-Year Course) 2017
- Graduate Introduction to Numerical Methods (Half-Year Course), 2013,2016
- Intermediate Calculus II (Half-Year Course), 2014
- Numerical Analysis (Half-Year Course), 2014
- Linear Algebra for Engineers (Half-Year Course), 2010
- Calculus (Half-Year Course), 2009
- Introduction to Philosophy (Full-Year Course), 2005–2006, 2007–2008
- Critical Thinking and Reasoning (Full-Year Course), 2003–2005

Workshop Leader

Rotman Institute of Philosophy 2008-2009

- Modern Mathematics for Philosophers (Algebra and Analysis), 2008-2009

Conference Organization

Professional Conferences

Conference Coodinator and Organizer 2014-2015

- Algorithms and Complexity in Mathematics, Epistemology and Science (ACMES)
  Co-organizer with Corless R, Smeenk, C and Fillion, N.
  Depts. of Applied Math and Philosophy, Western University, May 6-8, 2015.
  Funding provided by:
  - Fields Institute for Research in Mathematical Sciences
  - Rotman Institute of Philosophy

Graduate Conferences

Conference Organizer 2006

- 7th Annual Logic, Mathematics, and Physics Graduate Philosophy Conference
  Co-organizer with Noland, J and MacDonald, D, 2006.
  Department of Philosophy, Western University,
  Keynote Speaker: Michael Hallett (McGill University)

Service

Programming

- *Game Theory Simulation Programmer* 2014
  University Course "Game Theory and Social Structure",
  Departments of Economics, Philosophy and Applied Mathematics,
  Western University.

Workshops

- *Workshop Leader* 2009-2010
  A Survey of Mathematical Modeling,
  Department of Philosophy, Western University.

Associations & Societies

- *Webmaster and Email Coordinator* 2004-2006
  Philosophy Graduate Students Association (PGSA), Western University.

Computing Skills

Mathematical Programming

MATLAB: numerical computing system
MAPLE: symbolic and numerical computing system
OCTAVE: open source numerical computing system

Programming Languages

General Purpose

C: efficient code for scientific computing
C++: object-oriented design
Java: platform-independent object-oriented design
Python: data analysis and visualization

Parallel and Distributed Computing

MPI: multicore (CPU) programming extension for C, C++
CilkPlus: multicore (CPU) programming extension for C++
CUDA: manycore (GPU) programming extension for C, C++

Other

LaTeX Typesetting

Graduate Coursework

Applied Mathematics

- Advanced Numerical Analysis (Corless, R)
- Asymptotics and Special Functions (Corless, R)
- Game Theory and Social Structure (Streufert, P, Harper, W)*
- Integration in Finite Terms (Corless, R)
- Mathematical Modeling and Simulation (Yu, P)
- Partial Differential Equations (Reid, G)
- Scientific Computation, (Denniston, C)

Computer Science

- Distributed and Parallel Systems (Moreno Maza, M)

Mathematics (Pure)

- Category Theory (Bell, JL)
- Set Theory and Model Theory (Bell, JL)
- Topos Theory (informal course) (Bell, JL)*

Philosophy

- Applicability of Mathematics (Reading Course) (Batterman, R)
- Category Theory (Bell, JL)*
- Explanation and Reduction (Batterman, R)
- Gravitation (Newton) (Harper, WL)
- Historical Development of Electromagnetism (Prospectus Course) (Batterman, R)
- Introduction to Philosophy of Mathematics (Seig, W)*
- Philosophy of Applied Mathematics (Batterman, R)*
- Philosophy of Mathematics (Bell, JL)
- Philosophy of Probability (Pitowsky, I)
- Philosophy of Quantum Mechanics (Myrvold, WM)
- Space and Time (DiSalle, R)
- The Completeness of Quantum Mechanics (Pitowsky, I)
- The Continuous and the Discrete (Bell, JL)
- Toposes and Local Set Theories (Bell, JL)
- 20th Century Philosophy of Science (DiSalle, R)*

Physics

- Advanced Statistical Mechanics, (Grant, M)
- Gauge Theory (Burton, H)
- General Relativity (Myers, R)
- General Relativity (Valluri, SR)
- Particle Physics (Patel, P)
- Quantum Theory (Gale, C)
- Solid State Physics (Ryan, DH)

Planetary Science

- Impact Cratering: Processes and Products (Field Course) (Osinski, G)

* Audit

Main References

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