DOUGLAS BERTRAND MARSHALL

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Education

Harvard University, Ph.D. Philosophy, 2011
Ph.D. Thesis: *Investigations into the Applicability of Geometry*
Committee: Charles Parsons (Chair), Ned Hall, Jeffrey McDonough
Harvard University, M.A. Philosophy, 2004
M. A. Thesis: *Deduction and the Uses of Experiment in Descartes' Natural Philosophy*
Advisor: Alison Simmons
Williams College, B.A. Philosophy and Mathematics, *summa cum laude*, 2000
Honors Thesis: *Mathematical Fictionalism*
Advisor: Bojana Mladenović

Academic Appointments

Assistant Professor of Philosophy, Carleton College (September 2014 – present)
Postdoctoral Fellow, Minnesota Center for Philosophy of Science (June 2011 – July 2014)
Visiting Fellow, Minnesota Center for Philosophy of Science (September 2010 – May 2011)

Areas of Specialization

Early Modern Philosophy, Philosophy of Mathematics, Philosophy of Science

Areas of Competence

Logic (through the incompleteness theorems), Metaphysics, Kant, Early Analytic Philosophy, History of the Physical Sciences

Dissertation

Title: *Investigations into the Applicability of Geometry*

Abstract: Philosophical reflection about the sciences from Aristotle onwards has given rise to worries that mathematics, while true of its own special objects, is inapplicable to the physical world. Drawing on the histories of philosophy and science, I articulate a series of challenges to the applicability of geometry based on the general idea that geometry fails to fit nature. I then examine how two early modern thinkers, Galileo and Leibniz, develop notions of approximation as a way of overcoming these challenges. I conclude with an argument that the applicability of geometry—which by present-day standards is an established fact in need of explanation—imposes substantial constraints on the relationship between geometry and nature.

Awards

2016 Large Faculty Endowment Grant, Carleton College
2011 Leibniz Society of North America Essay Competition Winner; winning essay "Leibniz: Geometry, Physics, and Idealism"
2010 Bechtel Prize in Philosophy, Harvard Philosophy Department: Awarded annually to the best essay on a philosophical subject by a Harvard graduate or undergraduate student; essay title "Galileo's Defense of the Application of Geometry to Physics in the *Dialogue*"
2002-03 Martin Fellowship, Harvard Philosophy Department
2000 Arthur B. Graves Essay Prize in Philosophy; awarded by Williams College for B.A. thesis, *Mathematical Fictionalism*
2000 Goldberg Prize for best mathematics colloquium given by a graduating senior to the Williams Mathematics Dept., Williams College
2000 Phi Beta Kappa

Publications

"Review of *The Language of Nature: Reassessing the Mathematization of Natural Philosophy in the Seventeenth Century*" *HOPOS: The Journal of the International Society for the History of Philosophy of Science* **7** (2017), pp. 383-386.

"Galileo's Defense of the Application of Geometry to Physics in the *Dialogue*" *Studies in History and Philosophy of Science* **44** (2013), pp. 178 – 187.

"Leibniz: Geometry, Physics, and Idealism" *The Leibniz Review* **21** (2011), pp. 9 – 32.

Papers in Progress

"Conway's Demonstration of the Existence of a Mediator Between God and Creatures" (co-authored with Alexandra Chang; under review at *Journal of Modern Philosophy*)

"Internal Applications and Puzzles of the Applicability of Mathematics"
(under review at *Philosophia Mathematica*)

"Impurity of Methods in Finite Geometry"
(in preparation)

Presentations

"Conway's Demonstration of the Existence of a Mediator Between God and Creatures" Carleton - St.Olaf Joint Colloquium Series in Philosophy (Fall 2019)

"Impurity of Methods in Finite Geometry"
Midwest PhilMath Workshop 20, University of Notre Dame (Fall 2019)

"An Approach to Two Puzzles Concerning the Applicability of Mathematics"
Group in Logic and the Methodology of Science, UC Berkeley (Spring 2018)

"Impurity of Methods: Finite Geometry in the Early Twentieth Century"
International Society for the History of Philosophy of Science, University of Minnesota (Summer 2016)
Tanner Workshop, University of Toronto (Summer 2016)
Working Group in the History and Philosophy of Logic, Mathematics, and Science, Department of Philosophy, UC Berkeley (Fall 2017)

"The Application of Abstract Algebra to Finite Geometry"
Case Studies in Mathematical Practice, Université Paris Diderot (Summer 2015)

"Taking Applications of Mathematics To Mathematics Seriously"
Workshop in Philosophy of Mathematics, University of Pittsburgh (Summer 2011)
Philosophy Department, University of Minnesota (Spring 2012)
Midwest PhilMath Workshop 14, University of Illinois at Urbana-Champaign (Fall 2013)

Invited comments on Emily Carson's "Locke, Kant, Mathematics and Nature"
Rotman Institute Workshop, *The Language of Nature: Reconsidering the Mathematization of Science*, University of Western Ontario (Fall 2012)

"Leibniz: Geometry, Physics, and Idealism"
Philosophy Department, Macalester College (Spring 2012)
International Society for the History of Philosophy of Science, Dalhousie University (Summer 2012)
Leibniz Society of North America, Concordia University (Fall 2012)

"Challenging the Applicability of Geometry"
Minnesota Center for Philosophy of Science, University of Minnesota (Fall 2010)
Philosophy Department, Williams College (Spring 2010)

"The Problems of the Applicability of Mathematics"
Workshop in Philosophy of Mathematics, University of Pittsburgh (Summer 2005)

"Deduction and the Uses of Experiment in Descartes' Natural Philosophy"
Metaphysics and Epistemology Workgroup (Eminees), Harvard-MIT (Spring 2004)

Memberships and Affiliations

Minnesota Center for Philosophy of Science (Resident Fellow)
International Society for the History of Philosophy of Science (HOPOS)
Canadian Society for the History and Philosophy of Mathematics
Leibniz Society of North America
American Philosophical Association

Teaching

At Carleton College:

Early Modern Philosophy, Fall 2014, Winter 2016, Spring 2017, Winter 2019, Spring 2020, Winter 2021, Spring 2022 – A detailed study of some key philosophical texts of the early modern era: Descartes' *Meditations*, Conway's *Principles*, Leibniz's *Discourse on Metaphysics*, and Hume's *An Enquiry Concerning Human Understanding*.

Philosophy of Mathematics, Spring 2015, Winter 2017, Spring 2019, Winter 2022 – Starting with Lakatos's classic *Proofs and Refutations*, this course engages with several issues central to the methodology and practice of mathematics: mathematical proof, mathematical explanation, and the growth of mathematical knowledge.

Kant's Metaphysics, Spring 2021 – An undergraduate course on the initial segment of Kant's *Critique of Pure Reason* including the Transcendental Aesthetic and Transcendental Analytic

Logic, Winter 2015, Winter 2017, Winter 2020, Winter 2021 – A first course in propositional and quantificational logic using Barwise *et. al.*, *Language, Proof, and Logic*

Skepticism, God, and Ethical Dilemmas, Winter 2015, Spring 2015, Fall 2015, Fall 2016, Winter 2020, Spring 2020, Fall 2020 – An introductory undergraduate course in philosophy; topics include responses to skepticism, attempts to prove or disprove God's existence, and the Trolley Problem

Evidence, Objectivity, and Realism in the Sciences, Fall 2019 – A course covering several central topics in the philosophy of science: the problem of demarcating the sciences from other endeavors; the nature of scientific evidence; relationships between scientific values and scientific objectivity.

Kant's Critique of Pure Reason, Spring 2016, Spring 2019 – An undergraduate seminar on the initial segment of Kant's *Critique of Pure Reason* including the Transcendental Aesthetic and Transcendental Analytic

Philosophy of Science, Fall 2015, Fall 2016 – A survey of the key developments in the philosophy of science since the peak of logical positivism in the 1930's; the main themes of the course are scientific confirmation and the rationality of science.

Note: In the academic terms from Spring 2020 to Spring 2021 (inclusive), my courses were entirely online. Starting in Winter 2022 I returned to in person teaching.

At the University of Minnesota:

Kant, Spring 2013 – A course for upper-level undergraduates and beginning graduate students wholly devoted to understanding the metaphysics and epistemology developed in Kant's *Critique of Pure Reason*

Scientific Reasoning, Fall 2010 – An introductory course for undergraduates focusing on the evaluation of theoretical and statistical arguments in the empirical sciences; based on Giere et. al. *Understanding Scientific Reasoning*.

At Harvard University:

Kuhn and Scientific Rationality, Spring 2007 – An undergraduate seminar on Kuhn's *The Copernican Revolution* and *Structure of Scientific Revolutions*, the interaction of philosophical and historical considerations, and scientific realism

Advising in Philosophy

2019-2020: Second reader for senior theses of Adam Klaits and Warren Situ.

2018-19: Second reader for senior theses of Austin Baxter, Ross Pergande, Noah Plewa, and Elliot Schwartz

2016-17: Second reader for senior theses of Caleb Rakestraw-Morn, Patton Small, and Carly Yu

2015-16: Senior thesis advisor for Marianna Bible, Alexandra Chang, Alexander Chin, Carolyn Friedhoff, Abby Hellman, Katie Koza, Jacqueline Liu, Olivia Oberle, David Racine, and Andrew Rodgers

2014-15: Second reader for senior theses of Austen Yeager and Beret Fitzgerald

Service

Carleton's organizer for the joint Carleton-St. Olaf Philosophy Colloquium Series, 2015-17, 2019-21

Junior Faculty Member, Junior Faculty Affairs Committee (JFAC), for 2018-19 and 2019-20

Search committee member, Philosophy Department search for a tenure-track assistant professor in Ancient Philosophy in 2018-19

Advisory role on job searches for a postdoctoral fellow in the Philosophy Department and a tenured or tenure-track position in the Humanities and Technology, 2018-19

Junior Faculty Member, Carleton Responsible Investment Committee (CRIC) for 2015-16 and 2016-17; main editor of CRIC's annual report in 2016

Graduate Coursework (audited courses marked with an asterisk)

History of Philosophy:

Aristotle's *Posterior Analytics* (Gisela Striker)
The Continental Rationalists (Alison Simmons)
Leibniz* (Donald Rutherford)
Leibniz* (Samuel Levey)
Introduction to Kant's *Critique of Pure Reason* (Paul Guyer)
Kant's *Critique of Pure Reason* (Charles Parsons)
Quine (Peter Hylton)
The Philosophies of Rudolf Carnap and W.V. Quine* (Warren Goldfarb)

History of Science:

History of Ancient Science (John Murdoch)
Archimedes* (Mark Schiefsky, Barry Mazur, John Murdoch)
Science Before Newton, 1600 – 1684* (George Smith, Tufts University)
Newton's *Principia Mathematica** (George Smith, Tufts University)

Philosophy of Mathematics:

Philosophy of Mathematics: Structuralism (Charles Parsons)
Philosophy of Mathematics: History of Structuralism* (Charles Parsons)
Philosophy of Mathematics (Stephen Yablo, MIT)
Mathematical Realism* (Vann McGee, MIT)
Frege's Philosophy of Mathematics* (Richard Heck)
Kant's Philosophy of Mathematics* (Daniel Sutherland)

Logic, Metaphysics and Epistemology:

Logic & Philosophy (Warren Goldfarb)
Theories of Truth (Richard Heck)
Realism & Anti-Realism (Thomas Scanlon)
Philosophical Theories of Color (Jim Pryor, Alison Simmons)

Ethics and Practical Reason:
The Theory of Action (Richard Moran)
Morality and Action (Thomas Scanlon)
Kant's Ethical Theory (Christine Korsgaard)

Languages

Native: English
Extensive speaking, reading, and writing abilities: German, Spanish
Some reading knowledge: French, Latin, Italian

Dissertation Abstract

Dissertation Title: *Investigations into the Applicability of Geometry*

Philosophical reflection about the sciences has persistently given rise to worries that mathematics, while true of its own special objects, is inapplicable to nature or to the physical world. Focusing on the case of geometry, and drawing on the histories of philosophy and science, I articulate a series of challenges to the applicability of geometry based on the general idea that geometry fails to fit nature. This series of challenges then plays two major roles in the dissertation: it clarifies the ways in which the applicability of geometry poses a problem for two major early modern natural philosophers, *viz.*, Galileo and Leibniz, and it allows for the investigation of the relationship between geometric structures and nature by means of an investigation of the applicability of geometry.

I begin with the challenge pressed by some thinkers in the Aristotelian tradition that the results which geometry proves about its objects are false when interpreted as assertions about objects in nature. Despite the durable influence of this challenge and the Aristotelian theory of science which inspires it, I argue that Aristotle himself did not oppose the use of geometry in empirical inquiry, but rather offered an account of it. I then examine how Galileo takes on the objection that geometric results are false if understood as claims about nature in his *Dialogue Concerning the Two Chief World Systems*. On my interpretation, Galileo argues the objection should be recast as the claim that there are no geometric points, lines, or surfaces in nature. This is an objection both Galileo and Leibniz take seriously in developing their new mathematical physics, although I argue that Galileo and Leibniz react to the objection very differently: Galileo *rejects* the objection as false and grounded on a misconception of the relationship between geometry and nature, whereas Leibniz *grants* the truth of the objection and tries to show that it is not damaging for the project of mathematical physics.

In defending the applicability of geometry, both Galileo and Leibniz help to develop and employ notions of approximation in the sciences. Their work highlights an important presupposition of approximations: that there must be determinate discrepancies between an object being approximated and its approximation. I conclude the dissertation with an argument that actual applications of geometry in empirical science require that there be determinate discrepancies between geometric structures and nature.