

Taft Center Fellows Cover Sheet

Date of Application: 8/8/12

Applicant Name: ANGELA POTOCHNIK

Department: PHILOSOPHY

Rank: ASSISTANT PROFESSOR

Title of Research Project:

DOING SCIENCE IN A COMPLEX WORLD

Intended Results of funded research, e.g., concrete plans for publication or conference presentations:

1. A completed book manuscript, to be published by a prominent university press with a specialty in philosophy of science.
2. At least one invited talk at an international conference on material related to the book project.

Other Funding Applied For or Received For This Project Conference (list source and amounts requested and awarded):

NONE

Checklist

Applications of 1,000 to 1,400 should include, but are not limited to:

- Justification of the project as a major work that will result in significant contributions to the applicant's field and established record of research (see Taft website for more details).
- An explanation of how the project may be moved forward through the specific experience of serving as a Taft Center Fellow.
- A project schedule that details how the project will be completed during the Center Fellowship year.
- Two letters from outside experts (to be uploaded by external reviewers).
- A 2-page, recently updated curriculum vitae.

Review Taft website for full application guidelines.

Taft Grants Received in the Last Five Years

1. Type and Dates: Taft Conference Funding, 2012
Amount: \$9,000
Project Title: Socially Engaged Philosophy of Science
Resulting Publications and Presentations:
 - Upcoming three-day conference (in October) with nine prominent, invited speakers and seven cosponsoring UC departments
 - Subsequent special journal issue of *Erkenntnis* based on the conference proceedings

2. Type and Dates: Taft Summer Research Fellowship, 2011
Amount: \$8,000
Project Title: Games in Evolution
Resulting Publications and Presentations:
 - “Modeling Social and Evolutionary Games,” *Studies in History and Philosophy of Biological and Biomedical Sciences*, 2012, 43(1): 202-208
 - “The Limitations of Hierarchical Thinking,” with Brian McGill, *Philosophy of Science*, 2012, 79(1): 120-140
 - “Modeling Social and Evolutionary Games, invited talk in the UC Biology Department

3. Type and Dates: Taft Domestic Travel Grant, 2011
Amount: \$700
Project Title: Idealizing the Realizers
Resulting Publications and Presentations:
 - “Idealizing the Realizers,” presentation at the American Philosophical Association, Pacific Division Meeting, April 2011
 - “Idealizing the Realizers,” article draft in progress based on the conference presentation

Doing Science in a Complex World

Angela Potochnik

Background and Significance

At this point in my short career, I have written more than a dozen articles on a variety of topics in philosophy of science and philosophy of biology. My positions and arguments on this range of apparently distinct topics are interrelated and mutually supportive. They are ultimately united by a shared theme, a “big picture” view that can only be adequately developed in a sustained, book-length manuscript. The primary thesis of the book is that several features of scientific practice are shaped by what I call causal complexity—the complicated and variable ways in which causal influences interact.

This planned book is an important project that will significantly contribute to the state of debate in philosophy, especially philosophy of science and philosophy of biology. The project will demonstrate that common views on topics such as scientific modeling and explanation have surprising consequences. Several of those consequences are opposed to consensus, such as the classic philosophical understanding of levels of organization—that is, the classic conception of how atoms compose molecules, cells compose organisms, etc. The project’s focus is perhaps most similar to Cartwright’s *The Dappled World* (1999, Cambridge UP), Dupré’s *The Disorder of Things* (1995, Harvard UP), and Mitchell’s *Biological Complexity and Integrative Pluralism* (2003, Cambridge UP). Yet my approach is novel. I use similar observations about complexity, but I focus on my notion of causal complexity in particular, and I use those observations to motivate a much more optimistic interpretation of the present state of play in science, wholly distinct from the views in any of these books. See the next section for details about the project.

This book project will significantly contribute to my research program. The book will provide a sustained treatment of philosophical positions that I will argue are interrelated, and it will explicitly develop a prominent theme of my research program. Furthermore, philosophy is a discipline to which both articles and books are of importance, and as my research program develops, it is important for me to think strategically about the uptake of my research products. A book with a well-regarded press garners a different kind of attention than does a series of articles. This project will thus advance my research trajectory considerably.

Proposed Taft Project

The proposed book project will comprise six chapters, each of roughly 10,000 to 12,000 words. A brief description of the chapters follows; I also indicate the relationship each chapter bears to my existing research.

1: Introduction and Overview

In this introductory chapter, I will argue that philosophy of science should attend to scientific practice as it presently occurs, instead of “rationally reconstructing” an ideal science or anticipating what an eventual, more successful science may involve. This position is currently popular in philosophy of science but is seldom explicitly defended. I will also discuss the scope and outline of the book and address how the book’s main topics bear on present debates in philosophy of science and philosophy of biology.

2: Causal Complexity and Simplified Models

I will then motivate the idea that complex causal processes, that is, causal influences that combine and interact in myriad ways, are ubiquitous and significantly influence scientific practice. This view of causal complexity is based on my existing article, “A Neurathian Conception of the Unity of Science,” but here I will draw out the implications of that view. Perhaps the most widespread strategy in science for dealing with causal complexity is the deployment of highly simplified models. The practice of “model-based science” has received significant philosophical attention in recent years, though the role of scientific

models is still contested. I will argue that simplified models are in such widespread use in virtue of their ability to capture partial regularities in phenomena that resist full causal analysis due to their complexity and irregularity.

3: Science Isn't After the Truth

An implication of the foregoing chapter is that it is incorrect to construe science as the pursuit of truth or even successful prediction, which are the main views in philosophy of science. Instead, a variety of projects are central to science, many of which are at cross-purposes with the pursuit of truth and the confirmation of predictions. This argument stems from my article "Explanatory Independence and Epistemic Interdependence," though in this chapter I will explore additional projects besides explanation. The resulting conception of science paves the way for social values to exert a broader influence on science, as I began to show in my article "Feminist Implications of Model-Based Science."

4: The Limits of Stratification

Causal complexity also undermines the classic view of hierarchical levels of organization, a view popular in the sciences as well as philosophy of science. In this chapter I will use my existing research from "The Limitations of Hierarchical Organization" (coauthored with an ecologist) and "Levels of Explanation Reconceived" to demonstrate the problems with the classic view of levels of organization and to establish an alternative conception of the role of hierarchy and scale that holds more promise. A further result of this analysis is a revised view of the relationship among fields of science.

5: There's a Simple Explanation

The view of science that has emerged from earlier chapters informs a distinct approach to understanding the nature of scientific explanations. An emphasis on actual scientific practice grounds a so-called *communicative* approach to explanation, which is much less well explored in philosophy than the competing ontological approach. From this starting point, I will motivate a distinctive account of explanation. Like most contemporary accounts of explanation, it is a broadly causal account, but I will demonstrate this account's crucial differences from prominent accounts of causal explanation. This work is based in part on my research in "Explanation and Understanding" and a not-yet published manuscript, "Non-Causal Features of Causal Explanations." A full defense of the view cannot be accomplished in a single article, as it relies essentially on the points developed in earlier chapters of this book project.

6: Philosophy of Scientific Practice in a Complex World

In this final chapter I will assemble the view of science that emerges from the individual foregoing elements. I will also attend more explicitly to the resulting conception of philosophy of science's role. This work will be grounded in part in my article "Feminist Implications of Model-Based Science," the conference on socially engaged philosophy of science I have organized for October 2012, and an invited talk I will give in Germany in June 2013.

Serving as a Taft Center Fellow for 2013-2014 would provide the ideal conditions for the completion of this project. First, my research has always benefitted from interdisciplinary dialogue, as demonstrated by my past collaborations and the seven cosponsoring departments of my upcoming conference in October (five, including philosophy, are Taft departments). Second, the Fellowship would enable fulltime research on a single, sustained project that would otherwise be difficult for me to make substantial progress on. Finally, the timing is perfect for my research trajectory.

Timeline

May-June 2013

1. Book proposal completed; write and revise Chapter Three.
2. Shop the proposal and sample chapter to prominent philosophy of science presses, beginning with Oxford University Press and Cambridge University Press.
3. Invited talk at a conference in Bielefeld, Germany, related to Chapters Three and Six (June).

July-October 2013

Write and revise Chapters Two and Four. Chapter Two involves a significant amount of new material; Chapter Four is based more substantially on existing research.

November-December 2013

1. Draft and revise Chapter Five, which is partly based on existing research.
2. Solicit comments on Chapters Two through Five, the heart of the book project, from colleagues who work on related topics.

January-April 2014

1. Draft Chapters One and Six, both of which involve a significant amount of new material but will be based on the research completed for the other chapters.
2. Solicit comments on the entire manuscript from a few colleagues.

May-August 2014

1. Revise the book manuscript in response to peer feedback.
2. Submit the manuscript to a publisher by August 2014.

Academic Year 2014-2015

1. I expect to receive reviewer comments sometime in autumn.
2. Complete all revisions and send the final manuscript to a contracted publisher by March 2015.

Curriculum Vitae
Angela M. Potochnik

AREAS OF SPECIALIZATION

Philosophy of Biology; Philosophy of Science; History of Logical Empiricism

AREAS OF COMPETENCE

Logic; History of Analytic Philosophy; Metaphysics; Epistemology; History of Biology

ACADEMIC APPOINTMENTS

University of Cincinnati

Assistant Professor of Philosophy, 2010 – present

Affiliated Faculty, Women's, Gender, and Sexuality Studies, 2012 – present

Michelle R. Clayman Institute for Gender Research, Stanford University

Research Fellow, Autumn and Winter Quarters, 2010 – 2011

Oklahoma State University

Assistant Professor of Philosophy, 2008 – 2010

Affiliated Faculty, Gender and Women's Studies, 2009 – 2010

Stanford University

Teaching Fellow, 2007 – 2008

EDUCATION

Stanford University: Philosophy, MA 2004, PhD 2007

Dissertation: *Evolution, Explanation, and Unity of Science*

Hendrix College: Philosophy, BA 2002

Honors in Philosophy, *Summa cum Laude*

GRANTS, FELLOWSHIPS, AND AWARDS

Taft Award to partially fund a three-day conference, University of Cincinnati, 2012

University Research Council Summer Research Fellowship, University of Cincinnati, 2012

Marjorie Grene Prize, awarded for the best manuscript based on a graduate student presentation at the International Society for History, Philosophy, and Social Studies of Biology, 2011

Taft Summer Research Grant, University of Cincinnati, 2011

Visiting Research Fellowship, Clayman Institute for Gender Research, Stanford University, 2010 - 2011

Dean's Incentive Grant, Oklahoma State University, 2009

Fae Rawdon Norris Grant to organize a visiting lecture, Oklahoma State University, 2009

President's Medal, for the senior "best exemplifying the highest ideals of the college," Hendrix, 2002

PUBLICATIONS

"Biological Explanation," invited contribution to *Philosophical Issues in Biology Education*, Springer, forthcoming.

“Feminist Implications of Model-Based Science,” *Studies in History and Philosophy of Science*, 2012, 43(2): 383-389.

“Modeling Social and Evolutionary Games,” *Studies in History and Philosophy of Biological and Biomedical Sciences*, 2012, 43(1): 202-208.

“The Limitations of Hierarchical Thinking,” with Brian McGill, *Philosophy of Science*, 2012, 79(1): 120-140. Primary authorship.

“Sex and Sensibility: The Role of Social Selection,” Erika Milam, Roberta Millstein, Angela Potochnik, and Joan Roughgarden, *Metascience*, 2011, 20(2), 253-277.

“A Neurathian Conception of the Unity of Science,” *Erkenntnis*, 2011, 34(3): 305–319.

“Explanation and Understanding: An Alternative to Strevens’ *Depth*,” *The European Journal for the Philosophy of Science*, 2011, 1(1): 29-38.

“Explanatory Independence and Epistemic Interdependence: A Case Study of the Optimality Approach,” *The British Journal for the Philosophy of Science*, 2010, 61(1): 213–233.

“Levels of Explanation Reconceived,” *Philosophy of Science*, 2010, 77(1): 59–72.

“Optimality Modeling in a Suboptimal World,” *Biology and Philosophy*, 2009, 24(2): 183–197.

“Optimality Modeling and Explanatory Generality,” *Philosophy of Science*, 2007, 74(5): 680–691.

“Revisiting Galison’s ‘Aufbau/Bauhaus’ in Light of Neurath’s Philosophical Projects,” with Audrey Yap, *Studies in History and Philosophy of Science*, 2006, 37(3): 469–488. Equal authorship.

WORKS IN PROGRESS

“Non-Causal Features of Causal Explanations,” in revision.

“Defusing Ideological Defenses in Biology,” revise and resubmit from *BioScience*.

“Idealizing the Realizers,” in preparation.

Special Issue on Socially Engaged Philosophy of Science, *Erkenntnis*, to be edited in conjunction with conference on the same topic in Oct. 2012, in preparation.

SELECTED PRESENTATIONS

Invited talk at conference on “Cognitive Attitudes and Values in Science,” University of Bielefeld, Germany, June 2013 (upcoming)

“Defusing Ideological Defenses in Biology,” Philosophy of Science Association Biennial Meeting, San Diego, Nov. 2012 (upcoming)

“Modeling Social and Evolutionary Games,” Dept. of Biology, University of Cincinnati, April 2012

“Idealizing the Realizers,” American Philosophical Association, Pacific Division Meeting, April 2011

“The Limitations of Hierarchical Thinking,” Dept. of Philosophy, Stanford University, Nov. 2010

“A Dispute over the Basics of Nature,” International Society for the History, Philosophy, and Social Studies of Biology, University of Sydney, July 2009

“Science in a Complex World: Lessons from Biology,” Steel Center Lecture, Hendrix College, Mar. 2009

“Cooperation, Competition and the Evolution of Sex,” Dept. of Philosophy, Hendrix College, Mar. 2009

“Evolution and Contextual Explanation,” Dept. of Philosophy, University of Washington, Jan. 2009

“Philosophical Lessons from the Historical Sciences,” School of Geology, Oklahoma State University, Sept. 2008

“Situating the Optimality Approach in Population Biology,” Dept. of Zoology, Oklahoma State University, Sept. 2008

“Optimality Explanation as Anti-Reductionism,” International Society for the History, Philosophy, and Social Studies of Biology, University of Exeter, July 2007

“Generality, Complexity, and Approaches to Explanation,” American Philosophical Association, Pacific Division Meeting, San Francisco, April 2007

“Optimality Modeling and Explanatory Generality,” Philosophy of Science Association Biennial Meeting, University of British Columbia, Nov. 2006

“Another Kind of Unity: The Case of Evolutionary Modeling,” International Society for the History, Philosophy, and Social Studies of Biology, University of Guelph, July 2005

“Another Kind of Unity: The Case of Evolutionary Modeling,” Philosophy of Biology Workshop, Stirling University, May 2005

“A Shift in Wittgenstein's Position on Syntax,” The International Society for the History of Philosophy of Science, University of San Francisco, June 2004

RECENT TEACHING AND SERVICE

Graduate Courses at UC

Phil 8060: Socially Engaged Philosophy of Science (upcoming; new course offering)	2012
Phil 796: History of Logical Empiricism (new course offering)	2012
Phil 740: Philosophy and Evolutionary Biology (new course design)	2011

Undergraduate Courses at UC

Phil 1032: How Science Works (upcoming; new course offering)	2012
Phil 123: Introduction to Logic (new course design, then successfully revised)	2011, 2012
Phil 336: Gender and Science (new course offering)	2011
Phil 212: Twentieth Century Philosophy (new course design)	2011

Current Graduate Committees

Vanessa Bentley, PhD committee; co-chair for WGSS MA committee	2012 – present
Nina Atanasova, PhD committee	2011 – present
Hayden Thornburg, PhD committee	2011 – present

Selected Recent Service and Professional Development

Member of the Department of Philosophy's Diversity Task Force	2011 – present
Member of the Department of Philosophy's Graduate Studies Committee	2011 – present
Leaf Editor for PhilPapers (Unity of Science Leaf)	2010 – present
Reviewer for 12 journal articles and three book manuscripts/proposals	2008 – present
Organizer of Fall 2012 Philosophy Colloquium (upcoming three-day conference)	2012
Participant in two CET&L workshops, University of Cincinnati	2011, 2012
Member of departmental review committee for Taft Undergraduate Fellowship	2011
Participant in the Function and Evolution Working Group at the National Institute for Mathematical and Biological Synthesis	2009 – 2010