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April 26, 2016

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Carol A. Fierke
Dean and Vice Provost for Academic Affairs

Molecular Signposts of the Physics and Chemistry of Star Formation

Lauren Cleeves

Ph.D., Astronomy, University of Michigan, 2015
B.S., Astrophysics, Rice University, 2009

I wish to offer my highest praise of Dr. Lauren Cleeves' dissertation work. Dr. Cleeves works in the emergent field of planet formation; she works to constrain the chemistry of protoplanetary disks by studying disk ionization, this helps us understand the earliest epochs of star and planet formation. Dr. Cleeves is both a theoretician and an observer; much of her works focuses on the presence/absence of cosmic rays, which is significant to the formation of planetesmials and the creation of molecular species such as water. As young stars turn on, they produce magnetic fields and winds, and as Dr. Cleeves has shown, magnetic fields in disks exclude the production of cosmic rays. This is significant because cosmic rays are highly energetic, and they ionize the material in the protoplanetary disk -- a lack of cosmic rays means a protoplanetary disk is quiescent and ideal for planet formation. Dr. Cleeves has also worked on understanding the origin of water on the Earth. Water is rich in deuterium and it's long been a mystery how it got that way - did it form in our protoplanetary disk or did we inherit it from other systems? Dr. Cleeves theorized that if cosmic rays were not present, then the planet-forming disk would not be able to provide the deuterium enrichment in water that we see today. She then worked out a detailed solution that showed, given cosmic ray exclusion, that water in the solar system is mostly inherited. This has profound impact in understanding the interconnectedness of systems.

- Comments by Sarah Loebman

Dissertation Committee:
Edwin Bergin, Chair
Fred Adams
Nuria Calvet
Lee Hartmann
Ewine Van Dishoeck

The Ecological Factors that Structure the Composition and Function of Saprotrophic Fungi: Observational and Experimental Approaches

Lauren Cline

Ph.D., Natural Resources and Environment, University of Michigan, 2015
B.S., Program in the Environment, University of Michigan, 2008

Dr. Cline's thesis is an important contribution to our understanding of community assembly, through the lens of fungal diversity in wild populations. The work required an impressive mastery and integration of disparate scientific disciplines and techniques, including comparative genomics, soil geochemistry, experimental manipulations, fungal biodiversity, and statistics. It is rare to see a thesis that so successfully integrates field ecology and soil chemistry with cutting-edge genetic laboratory methods, while also making a strong conceptual contribution to an important topic in ecology and evolution. Through these integrated approaches, Dr. Cline has demonstrated how the historical contingency of initial colonization by fungi, as well as the dispersal of different fungi throughout the landscape, have important downstream influences on the composition of fungal ecological communities. Both of these influences were previously under-appreciated in fungi, and reveal how fungal communities may serve as model systems for understanding community assembly more generally. In many ways, the thesis is a 'model' science dissertation: each chapter is a distinct contribution with a unique purpose, but together the chapters relate strongly to a cohesive, conceptually-driven theme. The rigor and distinctness of each chapter is evidenced by the fact that all three have already been published in top peer-reviewed journals.

- Comments by Benjamin Winger

Dissertation Committee:
Donald R. Zak, Chair
Joel D. Blum
Bradley Cardinale
Timothy Y. James
Thomas M. Schmidt

Public Benefits and Private Safety Nets: Demographic Disparities in Resources Following Job Loss

Alix Gould-Werth

Ph.D., Social Work and Sociology, University of Michigan, 2015
M.S.W., Community Organizing & Community and Social Systems, University of Michigan, 2012
B.A., History and Sociology/Anthropology, Swarthmore College, 2007

This is a superb dissertation that makes path-breaking contributions in multiple fields: sociology, social work, applied economics, and public policy. Dr. Gould-Werth examines a relatively understudied life disruption—the loss of a job—and uses qualitative and quantitative research methods to understand the disparities and consequences of job loss across race, educational background, and class. Each chapter builds off the findings of the previous chapter—evidence of Dr. Gould-Werth's capacity to design new research studies based on pressing questions. The first paper examines why some individuals apply for the Unemployment Insurance (UI) program (the safety net designed to buffer individuals from hardship during periods of job loss) and others do not. Dr. Gould-Werth found that demographically disadvantaged groups (particularly people with no more than a high school diploma) are less likely to access UI benefits. For the second paper, she discovered one cause behind this disparity—namely, the former employer. In the final paper, she focuses on disparities in individuals' private safety nets, finding that regardless of educational level, Black Americans who lose their jobs are less able to deploy private resources to cope with job loss and thus less able to recover from the experience. Dr. Gould-Werth's results urge scholars, policy makers, and the broader public to focus on job loss as a turning point in the life course (alongside incarceration or eviction), as this is a point in which, as she puts its, "racial inequality is magnified and reproduced." She makes a clear case for the implications of her results for public policy and social work practice.

- Comments by Amanda Alexander

Dissertation Committee:
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Kristin S. Seefeldt

Beyond the Blueprint: Black Literary Radicalism and the Making of a Cold War Avant-Garde

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Konstantina Karageorgos

Ph.D., English Language and Literature, University of Michigan, 2015
M.A., English and American Literature, University of Illinois, Urbana-Champaign, 2007
B.A., Literature and History, Wayne State University, 2004

Dr. Karageorgos' dissertation offers a reconsideration of three post-war African American novelists – Richard Wright, Rosa Guy, and Sarah Wright -- each of whom maintained a vexed relationship with Marxian theory and particular communist and socialist parties. The dissertation aims to recuperate these three authors as unorthodox Marxian theorists and formally innovative writers, against dominant readings that either downplay their investment in materialism or disparage their literary works. Dr. Karageorgos is particularly sharp when she is showing how marginal writings by or about the writers in question help illuminate, and demonstrate the social-historical consequence of, the authors' sometimes misread or devalued aesthetic acts (e.g., Rosa Guy's blending of naturalist and surrealist elements in Bird at My Window). Her work offers an important corrective not only to partial readings of these three writers, but also to interpretive tendencies within studies of the post-war literary Left (including the devaluing of non-party-affiliated writers; or the prioritization of gender- and sexually-normative, and otherwise affirmative, works). Her research will significantly reshape narratives of post-war African American literature, and offers portraits of writers whose work can open new critical and literary vistas in the present.

- Comments by Amanda Armstrong

Dissertation Committee:
Alan Wald, Chair
Marjorie Levinson
Xiomara Santamarina
Jonathan Freedman

Disentangling the Effects of Mutation and Selection on the Evolution of Gene Expression

Brian Metzger

P h.D., Ecology and Evolutionary Biology, University of Michigan, 2015
B.S., Genetics, University of Wisconsin-Madison
B.S., Microbiology, University of Wisconsin-Madison

This thesis provides an insight into the molecular mechanisms through which regulatory divergence in gene expression occurs over evolutionary time. Dr. Metzger conducted ambitious experiments utilizing 60 different yeast strains sourced from a variety of environments, to explore how mutation and selection have altered the expression of a key gene involved in carbohydrate metabolism. By sequencing naturally occurring mutations and comparing their effects to laboratory-induced random mutations, the he was able to ascertain how evolution has either maintained or altered gene-expression in different environments. He has further been able to determine how mutations occurring at different regions of the genome, with specific or more general regulatory effects, differentially alter gene expression and interact with one another as evolution occurs. The use of necessarily sophisticated techniques — sequencing and ancestral state reconstruction, mutagenesis, reporter gene expression — to answer evolutionary questions highlights the highest level of technical ability. The questions addressed are at the heart of evolutionary biology, and fundamental to our understanding of how species evolve and populations diverge.

- Comments by Michael Garratt

Dissertation Committee:
Trisha Wittkopp, Chair
Michael Boehnke
Timothy James
George Zhang

Life in the Nuclear Archipelago: Cold War Technopolitics and the U.S. Nuclear Submarines in Italy

Davide Orsini

Ph.D., Anthropology and History, University of Michigan, 2015
M.S.C., Comparative and European Politics, University of Siena, 2004
B.A., Political Science, University of Siena, 2002

This dissertation by Davide Orsini is an original contribution to our understanding of the intersections of the Cold War, science and technology, and environmental risk. This historical ethnography of a U.S. nuclear submarine base in La Maddalena, a small Italian island, moves beyond institutional and top-down histories of nuclear politics in Europe to chart the intricate ways in which techno-political regimes were constituted, interpreted, maintained and contested by a variety of stakeholders, whether military personnel, politicians, scientists, activists or ordinary residents. Traversing multiple scales and spaces, Life in the Nuclear Archipelago is an innovative and sensitive perspective on geopolitics and technology in the twentieth century.

- Comments by Yasmin Moll

Dissertation Committee:

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Paul Edwards
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First-principles and Continuum Modeling of Charge Transport in Li-O_2 Batteries

Maxwell Radin

Ph.D., Physics, University of Michigan, 2014
B.S., Physics, University of California, Irvine, 2009

Dr. Radin's compelling thesis focuses on first-principles modeling of energy storage materials, primarily for applications in lithium (Li)-air batteries. It is well known that the Li ion battery has been revolutionary in computing and transportation; however, electrically driven cars of the future will require increased battery capacity and shorter charging times than Li ion batteries can provide. The so-called "Li-air" battery (based on oxides of Li) is the most promising improvement, but understanding and characterizing its charge transport has been an open question. Dr. Radin's thesis comprehensively dealt with the theory of charge transfer in Li_2O_2 and addresses "real world" battery issues such as poor crystallinity, dopants, surface effects, and space charge. In particular, Dr. Radin developed a continuum-scale model to illustrate how polaron transport can rationalize the observed current-potential relationships during the growth of compact Li_2O_2 thin films. This new model transcends the particulars of lithium peroxide and will likely serve as a template for descriptions of a wide range of electrochemical processes involving thin insulating films. By all measures, Dr. Radin is an exceptional scientist -- his work goes beyond modeling the mathematical complexity to extract the essential physical interpretation, and his thesis presents it in a comprehensible manner that is a gold standard template for what a thesis should be.

- Comments by Sara Loebman

Dissertation Committee:

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David Gidley
Sharon C. Glotzer

Locating Oneself in a Quantum World

Charles Sebens

Ph.D., Philosophy, University of Michigan, 2015
M.S., Physics, University of Michigan, 2013
M.St., Philosophy of Physics, University of Oxford, 2010
B.S., Philosophy, Massachusetts Institute of Technology, 2009
B.S., Physics, Massachusetts Institute of Technology, 2009

The weird world of quantum mechanics continues to stymie the understanding of both physicists and philosophers. At scales much smaller than the medium-sized dry goods we're most familiar with, scientists are driven to strange interpretations of what physics is actually about. Electrons sometimes seem to act like particles, for example, but also sometimes act like waves. Objects may exist in multiple states simultaneously, explaining their statistical behavior in physicists' measurements, or there may be many universes running in tandem and our measurements cause the universes to collapse into a single one. There are multiple, internally coherent interpretations of the ontology of quantum mechanics, but the choice between interpretations has been persistently underdetermined by empirical evidence. In his dissertation, Charles Sebens advances our ability to make sense of quantum mechanics in two key ways: first, he presents a new interpretation of quantum mechanics, and second, he uses formal epistemology to argue that our experiences of continuous existence provide previously unrecognized empirical evidence for the debate between interpretations. Dr. Sebens' new account is an impressive and exciting achievement for philosophers of physics. He has pushed the field forward in several major, constructive ways that showcase how philosophy can make a positive contribution to science. Dr. Sebens' dissertation is also a model of clarity. It provides the reader with a strong sense of context and direction, and it uses mathematics only where it makes a distinctive contribution to precision and understanding rather than burying the reader in fruitless technicalities.

- Comments by Beckett Sterner

Dissertation Committee:
David Baker, Co-Chair
Laura Ruetsche, Co-Chair
Ratindranath Akhoury
Gordon Belot

Krieger's Finite Generator Theorem for Ergodic Actions of Countable Groups

Brandon Seward

Ph.D., Mathematics, University of Michigan, 2015
M.A., Mathematics, University of North Texas, 2009
B.S., Mathematics, University of North Texas, 2008

In his thesis, Brandon Seward obtains a vast generalization of a fundamental result of Krieger. Krieger's Theorem gave a general characterization of entropy for actions of amenable groups, a rather small sub-class of the class of all countable groups, while Dr. Seward's generalization holds for all countable groups. This result has already had important applications in the Ergodic Theory and it promises to be a major tool in the field in the future. The study of group actions is central to mathematics. Ergodic Theory studies group actions which preserve a "measure" on the space, which gives a notion of size for subsets of the space. The notion of the entropy of a group action, which measures the complexity of the group action is a measure of how chaotic the system is under iteration by the symmetries in the group action. In his thesis, Dr. Seward obtains a major breakthrough by showing that the entropy of the action of any countable group is the infimum of the Shannon entropy of a (generating) partition of the space into finitely many sets. In order to do so, he introduces a new notion of entropy, which he calls Rokhlin entropy, which agrees with the classical notions of entropy in the setting of amenable group actions. In his thesis, Dr. Seward also obtains generalizations of Ornstein's Theorem and he continues to improve on these results. These proofs involve the development and management of clever and intricate coding strategies. The proofs are detailed but concise and have been thoroughly checked by experts in the fields. This is a technically demanding tour de force which had eluded experts in the field for almost 50 years.

- Comments by Richard Canary

Dissertation Committee:
Ralf J. Spatzier, Chair
Robert M. Ziff
Timothy Austin
Andreas R. Blass
Sarah C. Koch

Probing Radiative Thermal Transport at the Nanoscale

Bai Song

Ph.D., Mechanical Engineering, 2015
M.S., Power Engineering and Engineering Thermophysics, Tsinghua University, 2010
B.E., Thermal Energy and Power Engineering, Tsinghua University, 2007

Bai Song's dissertation titled "Probing Radiative Thermal Transport at the Nanoscale" represents the development of novel experimental techniques and advanced theoretical analysis to establish a comprehensive framework for nanoscale radiative heat transport in polar and dielectric thin films. This is the first systematic study that experimentally elucidated the dramatic enhancement in heat transfer that can be achieved at the nanoscale. Findings in this dissertation have been published in leading scientific journals, including Nature and Nature Nanotechnology. This dissertation has made fundamental contributions to the fields of heat transfer and quantum physics, and also has potential major impacts on future technological applications, such as information storage, nanolithography and energy conversion. Overall, the quality of this dissertation is outstanding. The science is solid and groundbreaking.

- Comments by Ying-Hsuan Lin

Dissertation Committee:
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Edgar Meyhofer, Co-Chair
Vikram Gavini, Chair
Roberto Merlin

Honorable Mention

Rabia Belt
American Culture

Ewa Czyz
Psychology

Pablo Damasceno Souza
Applied Physics

Alex Holtz
Cellular and Molecular Biology

Geoffrey Hughes
Anthropology

Elizabeth Kamali
History

Carl Pfeiffer
Electrical Engineering

Richard Pierre
Comparative Literature

Yubing Sun
Mechanical Engineering

Shaosui Xu
Climate and Space Sciences and Engineering

Distinguished Dissertation Award Nominees

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Neuroscience

Dylan Bayerl
Materials Science and Engineering

Timm Betz
Political Science

David Collins
Microbiology and Immunology

Yao Cui
Business Administration

Dahvid Davda
Chemical Biology

Daniel DeWoskin
Mathematics

Vanessa Diaz
Anthropology

Chen Feng
Civil and Environmental Engineering

Anne Fitzpatrick
Economics and Public Policy

Nicholas Geller
Classical Studies

Felicia Gray
Chemical Biology

Olga Greco
Comparative Literature

Jaclynn Hawkins
Social Work and Sociology

Jun-Young Hong
Molecular and Integrative Physiology

Emily Johnston
Women's Studies and English

Leanne Kang
Educational Studies

Kamin Kim
Psychology

Adam Kriesberg
Information

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Cameron Moore
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Noah Neidlinger
Education and Psychology

Alyub Palmer
Near Eastern Studies

Jared Rawlings
Music Education

Hao Sun
Electrical Engineering - Systems

Stephanie Temme
Neuroscience

Eli Vlaisavljevich
Biomedical Engineering

Evan Ware
Composition and Music Theory

Robert Yuen
Statistics

Jessica Zychowicz
Slavic Languages and Literatures

The Graduate School acknowledges the special contributions of Professor Donald Lopez and the readers from the Michigan Society of Fellows who devoted a significant amount of thoughtful time to review and recommend the nominations.

Readers from the Michigan Society of Fellows

Amanda Alexander
Amanda Armstrong
Michael Garratt
Ying-Hsuan Lin
Sarah Loebman
Yasmin Moll
Beckett Sterner
Benjamin Winger

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