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April 29, 2015

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School of Graduate Studies
While all graduating Rackham students produce excellent dissertations, some students write dissertations that are truly exceptional for the high quality of their scholarship and for the significance and interest of their findings. We recognize these exceptional dissertations with the ProQuest Distinguished Dissertation Award.

Dissertations are nominated for the award by University faculty who have served as chairs of dissertation committees of outstanding students. The nominations are then read by a review panel composed of members of the Michigan Society of Fellows.

The awards are co-sponsored by ProQuest, which publishes nearly 90,000 dissertations and theses annually, including more than 800 by University of Michigan authors. We are delighted to have them join us in celebrating the remarkable intellectual achievements of these promising young scholars.

The Rackham Graduate School takes great pleasure in honoring these outstanding members of the community of scholars.

Janet A. Weiss
Dean and Vice Provost for Academic Affairs
Near Infrared View of Stellar Surfaces and Circumstellar Disks with an Upgraded Optical Interferometer

Xiao Che
Astronomy and Astrophysics

B.S., Engineering Physics, Tsinghua University, 2005
M.S., Engineering Physics, Tsinghua University, 2007
Ph.D., Astronomy and Astrophysics, University of Michigan, 2014

Xiao Che’s dissertation is a compelling body of work that is well-motivated, comprehensive and innovative. Dr. Che is both an instrumentalist, who has greatly improved infrared telescope technology, and an observer, who has developed deep insight into the evolution of young stellar objects. As such, he deserves recognition on multiple fronts.

Dr. Che’s instrumental work has focused on two timely projects: 1) he expanded the Michigan Infrared Combiner (MIRC) from a 4-beam combiner to a 6-beam combiner, and 2) he developed the Wavefront Sensor of the CHARA Adaptive Optics project. These instrumental developments increased the sensitivity of the telescope array, resulting in the most powerful infrared imager in the world.

With the aid of MIRC at CHARA, Dr. Che was then able to resolve the surface of a variety of stars. Of particular interest is his work with rapidly rotating F & B stars; Dr. Che was able to image and model these stars in unprecedented detail, testing and discarding theories of stellar structure in the process. Dr. Che also revised understanding of the evolution of disks and star-disk interaction through imaging and rigorous study of innermost regions of B star circumstellar disks.

Dr. Che’s dissertation is presented thoughtfully with meaningful discussion of technological and scientific advancements. Dr. Che’s hard work deserves recognition and appreciation by our community as a whole.

- Comments by Sarah Loebmen

Dissertation Committee:
  - John D. Monnier, Chair
  - Lennard A. Fisk, Cognate
  - Nuria Pilar Calvet
  - Charles R. Cowley
  - Mario L. Mateo
Microengineered Biomaterials and Biosystems for Systems Immunology, Cancer Biology, and Stem Cell-based Regenerative Medicine

Weiqiang Chen
Mechanical Engineering

B.S., Physics, Nanjing University, 2005
M.S., Microelectronics and Solid State Physics, Shanghai Jiao Tong University, 2008
M.S., Electrical and Computer Engineering, Purdue University, 2009
Ph.D., Mechanical Engineering, University of Michigan, 2014

Dr. Chen's dissertation presents several breakthroughs in his research on applying nanofabrication tools to create functional platforms for biomedical applications. These innovative applications of micro/nanofabrication techniques utilize the nanotopographic sensing properties of cells to create two types of nanorough surfaces: one that efficiently captures tumor cells, and a second that controls the differentiation of human embryonic stem cells. Dr. Chen also developed a microfluidic platform that allows for purification, culture and functional evaluation of immune cell subpopulations in human blood. This technology is being translated into clinical use for infection screening and has the potential to change the way clinicians perform disease screening. In all three of these projects, Dr. Chen demonstrated tremendous creativity in developing breakthroughs which have significant potential for real impacts in treatments and diagnostics of patients, both in developed and developing countries.

- Comments by Lawrence Cathles

Dissertation Committee:
  Jianping Fu, Chair
  Shuichi Takayama, Cognate
  Katsuo Kurabayashi
  Sofia D. Merajver
  Thomas P. Shanley
The Archaeology of Achaemenid Rule in Egypt

Henry Colburn
Interdepartmental Program in Classical Art and Archaeology

B.A., Classics, St. Andrews University, 2005
M.A., Classics, University of Colorado, Boulder, 2007
Ph.D., Classical Art and Archaeology, University of Michigan, 2014

Dr. Colburn’s dissertation makes critical contributions to scholars’ understanding of ancient Egypt and to the broader archaeological study of colonial situations. The 27th Dynasty (525-404 BCE) has suffered from a lack of attention due to the perceived absence of material culture from the period. During this time Egypt was under Achaemenid rule; until now the details of Egyptian experience of Persian occupation have not been explored. Colburn addresses this bias and performs a careful, thorough examination of material culture from the 27th Dynasty. His work is remarkable not only for its clear prose, but for the number of different sources integrated into the analysis. Architecture, art, ceramics, and currency are used to construct a nuanced picture of the various ways in which individual Egyptians used material culture to navigate a society ruled by foreigners. Through these sources Colburn discovers varying responses to colonization, including resistance, apathy, and full acceptance. Colburn’s work emphasizes the expression of individual identity through objects, a welcome counterpoint to the study of political regimes. This dissertation successfully illuminates an overlooked period of Egyptian history and in the process adds significantly to the theoretical foundations of colonial archaeology.

- Comments by Carrie Brezine

Dissertation Committee:
   Margaret C. Root, Chair
   Ian S. Moyer, Cognate
   Elspeth R.M. Dusinberre
   Sharon C. Herbert
   Janet E. Richards
   Terry G. Wilfong
There is an old problem in mathematics called the four color theorem which states that any map of political territories can be colored with just four colors so that no two adjacent territories are colored identically. For use in proving this claim, American mathematician George Birkhoff defined a polynomial function $P(k)$ that gives the number of ways that a map can be so colored with no more than $k$ colors. It turns out that $P(k)$, called the chromatic polynomial, is useful for much more than coloring maps. Its definition can be extended to a graph of nodes and edges (where the colors are now applied to the nodes, and the edges represent adjacency), and many of the useful properties of the graph can then be reviewed as special cases of this intriguing polynomial function. In 1968, the graph theorist Ronald Read conjectured that the coefficients of any chromatic polynomial exhibit a mathematically useful property called log-concavity. In 2012, June Huh made the extraordinary contribution of proving this conjecture.

Soon after Read’s conjecture was proposed in 1968, the question was raised whether it might also apply to a much larger universe of mathematical objects called matroids. In his dissertation, Dr. Huh examines whether his method of proof of Read’s conjecture can be used to prove this larger conjecture, and he discovers that it cannot. Important, his mathematical work to demonstrate this makes numerous connections with deep significance for algebraic graph theory. These have drawn the attention of the best theorists in the field and may have a lasting impact on how certain properties of graphs and matroids are computed.

- Comments by Seth Marvel

Dissertation Committee:
- Mircea I. Mustață, Chair
- James P. Tappenden, Cognate
- Sergey Fomin
- William Fulton
- David E. Speyer
Microfluidic Reduction of Osmotic Stress in Oocyte and Zygote Vitrification

David Lai
Biomedical Engineering

B.S., Engineering, University of California, Irvine, 2008
M.S., Biomedical Engineering, University of Michigan, 2011
Ph.D., Biomedical Engineering, University of Michigan, 2014

In this dissertation, David Lai explains his use of microfluidics to address a number of problems faced in assisted reproductive technologies (ART). ART involves the isolation and evaluation of two different cell types (sperm and oocytes) that exist in different fluid mediums, as well as the preservation of these cells and their combination. Each of these steps involves its own challenges as the cell types and reasons for infertility differ substantially, and the methods of preservation and fertilization affect embryo viability and quality. The dissertation presents a number of studies that intervene at multiple steps in the ART cycle, from the transmission of fluids, to cell delivery. It outlines the development and utility of fluid dynamic technologies in cancer cell identification as applied to fertility issues. Each of these studies improves ART, but also indicates broader applications for microfluidics in biology.

- Comments by Eric Plemons

Dissertation Committee:
   Shuichi Takayama, Chair
   Katsuo Kurabayashi, Cognate
   Joseph L. Bull
   Gary D. Smith
Molecular Mechanisms of Autophagy Induction and Mitochondrial Degradation in the Yeast *Saccharomyces cerevisiae*

Kai Mao
Molecular, Cellular, and Developmental Biology

B.S., Biology, Peking University, 2007
Ph.D., Molecular, Cellular, and Developmental Biology, University of Michigan, 2014

The selective degradation of excess or damaged organelles is essential for cell health and successful division. Defects in this process are associated with serious human diseases, such as Parkinson's. In this impressive dissertation, Mao describes the mechanisms underlying selective autophagy, primarily of the mitochondria (mitophagy), in baker's yeast, a prominent model organism. Using a broad range of experiments and approaches, Mao identified upstream signaling pathways in the cell that regulate mitophagy, demonstrated that mitochondrial fission is necessary to initiate mitophagy, and that phosphorylation is necessary for one of the autophagy-related proteins that lacks a fixed order to function properly. Mao also completed a follow-up study on peroxisome degradation and played key roles in other projects in his doctoral laboratory and in extending the methods of the lab toward protein biochemistry and structure-function analysis. The thesis is written in clear, strong prose, and the last chapter indicates great insight and creative promise in suggesting implications and future directions of the work.

- Comments by Elizabeth G. Pringle

Dissertation Committee:
Daniel J. Klionsky, Chair
Lois S. Weisman, Cognate
Laura J. Olsen
Haoxing Xu
The Stranger’s Voice: Integrated Literary Cultures in Anatolia and the Premodern World

Michael Pifer
Comparative Literature

B.A., Near Eastern Studies and Creative Writing, University of Michigan, 2007
Ph.D., Comparative Literature, University of Michigan, 2014

This dissertation, “The Stranger’s Voice: Integrated Literary Cultures in Anatolia and the Premodern World,” is distinctive for its combination of close literary analysis of a broad swath of literature (written in Persian, Turkish, Armenian, Arabic, Latin, and Greek) in Anatolia in the 13th-15th c., with compelling engagement with contemporary theoretical debates in comparative and world literature. The explicit aim of the dissertation is to trace the peregrinations of the notion of the gharīb, or stranger, across these languages and across Islamic, Christian, and Jewish teachings. The research into primary materials in a dizzying number of languages includes much original translation and is meticulous, clear, and organized, with a heightened attention to language that seems to have been inspired and cultivated through earlier training in creative writing. It was a pleasure to read. The dissertation convincingly uses the figure of the gharīb to argue that early literary texts emphasize connectivity, rather than difference, among languages and traditions. It does so by imagining “interpretive communities” of texts more broadly than previous scholarship had. Its intervention in the field of comparative literature is to suggest a model of intersecting literary languages as an alternative to the models of volgarizzamento (Europe) or literarization of local languages (South Asia). The figure of the gharīb, its centrality to so many contemporary teachings, its ability to be simultaneously other and human, and as such to invite hospitality, allows for a new conceptualization of difference in this period, figured at base as a new model for understanding interaction and interconnection among literary languages. This dissertation is also important and timely for its attention to early interactions between Islamic, Christian, and Jewish teachings. It intervenes in several fields in which scholars have been influenced by nationalism or religious chauvinism to such an extent that they will not consider these simultaneously occurring and mutually influencing literatures and religious teachings together.

- Comments by Sarah Kile

Dissertation Committee:
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Karla Mallette
The Tahrir Effect: History, Space, and Protest in the Egyptian Revolution of 2011

Atef Said
Sociology

B.A., School of Law, Ein Shams University, 1991
M.A., Sociology and Anthropology, American University, Cairo, 2004
M.A., Sociology, University of Michigan, 2013
Ph.D., Sociology, University of Michigan, 2014

The Tahrir Effect: History, Space and Protest in the Egyptian Revolution of 2011 pivots around two interrelated questions: Why did Tahrir Square emerge as iconic of the 2011 revolution in Egypt and with what consequences for an unfolding revolutionary process? Atef Said answers these questions with great insight and clarity through positing what he calls the “Tahrir Effect” – namely, the enormous symbolic power of Tahrir as a site of protest in Egypt since the colonial period worked at once to make the revolution legible to a broad swath of ordinary Egyptians even as the conflation of the revolution with the occupation of this square undermined a broader mobilization of the population around the revolution’s more radical promise of socio-economic transformation in favor of limited political reform. In other words, Tahrir’s actuality undermined its potentiality. This is an original argument that marshals thickly-textured data gathered through an interdisciplinary toolkit that draws on ethnography, sociology and history. It makes an important, empirically-grounded intervention in an influential body of literature within political sociology concerned with social movements and contentious politics. It zooms in on historicizing and problematizing two important aspects of both – the spatiality and repertoires of protest. As such, this dissertation makes an incisive and much-needed contribution to understanding one of the most extraordinary mass mobilizations in recent times.

- Comments by Yasmin Moll

Dissertation Committee:
  George P. Steinmetz, Chair
  Juan R. Cole, Cognate
  Fatma Müge Göçek
  Howard A. Kimeldorf
  Sandra R. Levitsky
God, War, and Politics: The American Military Chaplaincy and the Making of a Multireligious Nation

Ronit Stahl
History

B.A., English, Williams College, 2002
M.A., Social Sciences in Education, Stanford University, 2005
Ph.D., History, University of Michigan, 2014

Stahl's remarkable dissertation narrates a history of war, the state, and religion through the lens of the American military chaplaincy between World War I and the Vietnam War. Stahl shows the importance of these heretofore overlooked actors in US history. Chaplains are significant not only on the battlefield, performing funerals and providing solace to fellow soldiers and families back home, but also to permeating and performing the constitutional separation of church and state. Different faiths, of course, ask different questions about living and dying, and Stahl traces the expansion of the chaplaincy beyond dominant Protestant and Catholic groups. Drawing from an array of archival material—including the making and display of dog tags (which use abbreviations like “C” for Catholic and “J” for Jewish)—she tells a story of decades-long attempts for religious recognition in the US. She describes the tensions between the inclusion of numerous religious groups over this time period and the consolidation of what she terms a “moral monotheism” (which had roots in the interwar years, particularly in New Deal programs like the Civilian Conservation Corps). This is a painstakingly researched, meticulously detailed, and beautifully written work that will no doubt make exciting interventions across multiple fields.

- Comments by Sarah Besky

Dissertation Committee:
  Deborah Dash Moore, Chair
  William J. Novak, Cognate
  Susan M. Juster
  Matthew D. Lassiter
Dr. Wu's dissertation addresses security and privacy issues in the context of networked computer systems, specifically in the case of users interacting with cloud computing infrastructure. Dr. Wu's work focuses on a particular class of network security properties, that of opacity. Opacity pertains to the ability to hide a “secret” in computer communications. Dr. Wu has developed a mathematical framework to determine whether opacity can or cannot be enforced by inserting fake events or information. She further developed an algorithm to minimize the cost of creating ambiguity, when possible, by determining the least number of fake insertions required. Dr. Wu developed both an elegant formulation of the problem and an elegant solution, with many potential applications. In her dissertation, Dr. Wu successfully demonstrates an implementation of her method that maintains location privacy when using location-based services on smartphones. Dr. Wu's technique of opacity enforcement by event insertion is truly innovative and has the potential for significant impact in network cyber security.

- Comments by Lawrence Cathles

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Comparative Literature

Lesley Everett  
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Cellular and Molecular Biology

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Atmospheric, Oceanic and Space Sciences

Dianyun Zhang
Aerospace Engineering
The Graduate School wished to acknowledge the special contributions of Professor Donald Lopez and the readers from the Michigan Society of Fellows who devoted a significant amount of time and energy to the review and selection process. By making these awards possible they have contributed in a meaningful way to the University’s intellectual life.

Readers from the Michigan Society of Fellows:

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