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AWARDS

2021

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Michael J. Solomon
Dean and Vice Provost for Academic Affairs

Mechanistic Insights into Regulation of Vesicular SOCS3 Secretion by Alveolar Macrophages: Interplay Between Cell Stress and Metabolic Remodeling

Mikel Haggadone

Ph.D., Immunology, University of Michigan, 2021

B.S., Cellular and Molecular Biology, University of Michigan, 2014

Mikel Haggadone's dissertation distinguishes itself as a comprehensive, informative, and readable investigation into an inflammation-regulating mechanism in the gas-exchange surface of lungs. Lungs need to carefully suppress inflammation for efficient gas exchange, yet remain responsive to pathogens, invasion, and injury. Haggadone beautifully describes how alveolar macrophages—immune cells in the tiny air sacs of the lungs—are a key component in a complex signaling network that keeps the lung surface in an immunologically quiescent state. Haggadone's experiments probed these macrophages with nutrients and cigarette smoke extract and reveal much about how these conditions affect the molecular “cargo” packaged into vesicles secreted from macrophages. Haggadone's investigation unravels regulatory mechanisms involved in this key component of lung inflammation. These findings have implications for treating lung cancer and asthma, as well as understanding the basic biology of lungs, immunity, and intracellular signaling. The dissertation will have contributed to at least three published papers, as well as providing a concise, coherent account of this important biological system.

- Comments by Mitchell Newberry

Dissertation Committee:

Marc Peters-Golden, Chair

Jeffrey Curtis

Costas Lyssiotis

Bethany Moore

Mary O'Riordan

Joel Swanson

High-Dimensional Statistical Inference: Phase Transition, Power Enhancement, and Sampling

Yinqiu He

Ph.D., Statistics, University of Michigan, 2021

B.Sc., Statistics, University of Science and Technology of China, 2016

Motivated by the enormous influx of high-dimensional datasets generated in the last decade or so (i.e., the Big Data era), this dissertation set out to investigate and improve the properties and applications of traditional statistical approaches when dealing with highly multidimensional data. The main body of the thesis focused on tackling three problems: 1. Understanding the degree of dimensionality at which the traditional implementation of the likelihood-ratio test (a commonly used hypothesis-testing approach) becomes unreliable, 2. Devising a new family of test statistics to analyze multidimensional data with better statistical power than traditional approaches, and 3. Accurately computing the very low probabilities associated with the large number of hypotheses that are often needed to analyze highly multidimensional data. In all cases the approaches put forward constitute important advances towards a body of statistical tools adequate for the massive and complex datasets currently being produced across fields. It is especially meritorious that the author sought to address the above problems using rigorous theoretical and analytical approaches rather than through the use of increasingly powerful computers to apply traditional approaches. These advances have clearly been received by the author's field with enthusiasm, as illustrated by the fact that five peer-reviewed papers have been published or accepted for publication based on this dissertation. Overall, He's dissertation is a prime example of the rigorous, innovative, and impactful work worthy of the ProQuest Distinguished Dissertation Award.

- Comments by Roberto Marquez

Dissertation Committee:

Gongjun Xu, Co-Chair

Xuming He, Co-Chair

Yuekai Sun

Peter Xuekun Song

Engineering Tumor Distribution of Antibody-Drug Conjugates

Eshita Khera

Ph.D., Chemical Engineering, University of Michigan, 2021

M.S., Chemical Engineering, University of Michigan, 2020

M.S., Biomedical Engineering, University of Michigan, 2015

B.E., Biotechnology, Visvesvaraya Technological University, India, 2013

Eshita Khera's dissertation is an impressive amalgam of an innovative combination of methodologies, thoughtful experimental design, and crystal clear communication. In this work, Khera describes the problem of designing effective antibody-drug conjugates (ADCs) for the targeted treatment of solid tumors. The dissertation covers a wide range of methods, both *in vitro* and *in silico*, to investigate ADC tumor penetration, potency, and receptor occupancy. Khera's excellent scientific approach is matched by the presentation of the concepts and findings. Clear figures make the complicated biology of ADCs and ADC-based therapies immediately understandable—and emphasize the magnitude of the problem of designing these therapies while balancing many interdependent factors. The tools and general principles presented in this work can make a substantial impact on the field and will hopefully lead to improved development processes for ADCs and a greater chance for their success in patients.

- Comments by Ellen Quarles

Dissertation Committee:

Greg M. Thurber, Chair

Mark Burns

Gary Luker

Geetha Mehta

Sunitha Nagrath

Afterlives of Authority: An Ethnography of Fire Prediction, Social Order, and Technocracy in Indonesia

Cindy Lin Kaiying

Ph.D, Information, University of Michigan, 2021

B.A., Southeast Asian Studies, National University of Singapore, 2015

Leveraging a specific case, peatland fire sensors and predictions systems in Indonesia, Cindy Lin Kaiying shows how data-driven technology in one system becomes internalized and reproduced in other structures as part of governance through the cooperation between police and military technologies, to perpetuate forms of authority in other areas of the postcolonial state. In this case, she shows an illustrative caveat: how scientists, using predictive technologies, were still biased by humanistic cultural stereotypes of indigenous farmers, reinforcing racial, class, and gender inequalities but with the added authority of technology. It is a highly unique and innovative argument that adds to our existing literatures of algorithms and data science as spaces of discrimination, contributing to multiple disciplines including anthropology, STS, information, communication, sociology, and feminist studies. A strength of the work is its adept use of theory building, using specific examples from ethnography and participant observation to generate grounded theories that are well situated in the literatures. The prose is incredibly well written and easily accessible to any reader, regardless of background, and will be a frequently cited addition to many fields when published into a book.

- Comments by Jeff Sheng

Dissertation Committee:

Silvia Margot Lindtner, Chair

Matthew Hull

Lisa Nakamura

Juno Salazar Parreñas

Christian Sandvig

From Talkers to Readers: Neural and Behavioral Foundations of Emerging Literacy

Rebecca Marks

Ph.D., Psychology and Education, University of Michigan, 2021

M.S., Psychology, University of Michigan, 2017

B.A., Philosophy-Neuroscience-Psychology, Washington University in St. Louis, 2013

In Rebecca Marks' dissertation, she addresses a fundamental question in education and childhood development: How does spoken language processing support reading development? Marks leverages a series of brain and behavior studies to understand how children build associations between sounds, what they see, and meaning. Marks first shows how spoken language proficiency is associated with reading proficiency. While this association has been known among adult readers, Marks reveals how these connections emerge in the early stages of reading acquisition. She then shows how morphological awareness—the sensitivity to units of meaning in language—contributes to literacy, and how the impacts of morphological awareness differ among learners of various bilingual backgrounds. In her last chapter, Marks reveals how morphological awareness engages parts of the brain that are associated with processing both sound and meaning, and that reading comprehension engages brain regions that integrate sound, print, and meaning. These associations and integration are not found in impaired readers. Throughout her dissertation, Marks displays impressive perspective that is grounded in theory. Marks' dissertation will serve as an indispensable example of how to develop an elegant series of complementary studies that push our understanding forward.

- Comments by Shane DuBay

Dissertation Committee:

Ioulia Kovelman, Chair

Fumiko Hoeft

Frederick J. Morrison

Twila Tardif

Scenes from the Cutting Room Floor: Black Womanhood and the Visual Politics of Mixed Race Family Albums, 1918 to 2020

Michelle A. May-Curry

Ph.D., American Culture, University of Michigan, 2021

M.A., American Culture, University of Michigan, 2017

B.A., English and Political Science, Williams College, 2015

This dissertation thinks through the complicated politics of interracial family and its photographic representations in private and public outlets. The author argues that Black women have employed curatorial approaches toward images of interracial kinship to shape, reshape, and disrupt the visual icon of the mixed-race family over time. The dissertation's four chapters take readers on a close reading of family archives and public representations throughout the twentieth and twenty-first centuries. Using images, it asks broader questions about how Black studies contributes to our understanding of visual culture; how visual culture has been used to construct racialized American domesticity and citizenship; and how cultural studies scholars might approach thinking about the politics of the archive. The dissertation also contextualizes the images within the broader history of race science, the civil rights movement, the Black Aesthetics Movement, and contemporary politics. The author's writing style is scholarly yet accessible, introducing historical and contemporary scholars and theorists from Black studies and visual culture. A key contribution of the project is a thoughtful demonstration of how cultural studies scholars might engage with private archives of family photographs to discuss the broader history and politics of race.

- Comments by Vyta Pivo

Dissertation Committee:

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Tiya Miles, Co-Chair

Kristin Hass

Jessica Kenyatta Walker

Enabling Hyperscale Web Services

Akshitha Sriraman

Ph.D., Computer Science and Engineering, University of Michigan, 2021

M.S., Embedded Systems, University of Pennsylvania, 2015

B.E., Electronics and Communication, Visvesvaraya Technological University, 2012

Akshitha Sriraman produced an exemplary computer science dissertation marrying path-breaking work on hardware and software development to facilitate modern web traffic. The dissertation responds to two trends straining modern web infrastructure: a growth in users, data, and software complexity that is leading to massive increases in web computing requirements (i.e., hyperscale services); and the slowing pace of hardware improvements, which together are leading to a pending mismatch in computing requirements and hardware capabilities. The dissertation presents solutions to stave off the mismatch. One important insight of the dissertation is that, instead of developing software and hardware independently, computer scientists must develop them in concert to facilitate modern hyperscale web services. In addition, the dissertation responds to recent changes in web design, finding that the modern “microservices” architecture experiences inefficiencies with certain threading approaches that weren’t present in the older, non-modular architecture. The dissertation presents novel software tools to diagnose and optimize hyperscale software threading, and to optimize cheap existing hardware to efficiently support new hyperscale software paradigms. It is impressive in both breadth and applicability; Sriraman’s software is already in use in both academia and the corporate sector. And crucially, Sriraman’s contributions promise to reduce the carbon footprint of the web.

- Comments by Joseph Feldblum

Dissertation Committee:

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Jean-Baptiste Jeannin

Baris Kasikci

Margo I. Seltzer

Nomadic Trails for Chamber Orchestra

Mei Ling Meilina Tsui

D.M.A., Music Composition, University of Michigan, 2021

M.Mus., Music Composition, King's College London, 2016

B.A., Music, The Chinese University of Hong Kong, 2015

Mei Ling Meilina Tsui's dissertation is a fourteen-minute symphonic work in two movements. The thematic material of the piece draws upon the oral tradition of Kazakh music composed for the Dombra, quoting or reinterpreting pieces known as *küis*. The two contrasting movements reflect the dualism associated with Tengriism, an ancient religion of Central Asia; the first movement, "The Great Steppe," is meant to suggest an untamed wilderness, while the second, "Scenes at the Uralsk Fair," evokes an urban environment. This piece integrates the composer's Kazakhstani heritage with her deep immersion in Western contemporary composition to create a powerful and imaginative work of art.

The orchestration of this piece is extraordinarily rich and effective; the beginning of the first movement, for example, has a striking effect, immediately immersing the listener in a unique sound world, with strings playing *sul ponticello* and *glissando*, along with an arsenal of percussion instruments. The traditional *küis* invoked here have a memorable quality that allows the composer to delineate the structure of the piece with exceptional clarity. Mei Ling Meilina Tsui has already developed a distinctive personal voice as a composer and stands at the beginning of an important career.

- *Comments by Kevin Korsyn*

Dissertation Committee:

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Bright Sheng

Optimizing Post-Stroke Functioning: Using Mixed Methods to Understand the Role of Built and Social Environments for Physical Activity, Quality of Life, and Lived Experience

Erica Twardzik

Ph.D., Epidemiology and Kinesiology, University of Michigan, 2021

M.S., Kinesiology, Oregon State University, 2016

B.S., Movement Science, University of Michigan, 2013

This dissertation aims to enhance our scientific understanding of how stroke survivors recover and how their environment affects their overall success. In doing so, Erica Twardzik examines both the macro and the micro environmental factors that come together to influence how well a stroke survivor recovers. Strokes affect as many as 6.6 million Americans, making Twardzik's work particularly valuable to our community at large. This dissertation is broadly applicable to a wide range of readers as it is written to be both thorough and accessible. I am particularly impressed by the overall vision and clarity regarding the scope of the project as it is presented, start to finish.

- Comments by Carlos Peredo

Dissertation Committee:

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Natalie Colabianchi, Co-Chair

Susan Brown

Lynda D. Lisabeth

The Warm-Hot Circumgalactic Medium and Its Co-Evolution with the Galaxy Disk

Zhijie Qu

Ph.D., Astronomy and Astrophysics, University of Michigan, 2021

M.S., Astronomy and Astrophysics, University of Michigan, 2017

B.S., Astronomy (Graduate with Honors), Peking University, 2015

The tenuous gaseous medium surrounding a galaxy, the circumgalactic medium or CGM, is involved in many processes that govern the evolution of that galaxy. However, the structure of the CGM and how it interacts with the enclosed galaxy remain unclear, in part because the CGM is notoriously hard to observe with current instruments. Zhijie Qu's thesis contributes to our understanding of the CGM in multiple ways. To start, Qu has developed new observational techniques, one of them cleverly drawing upon a technique used in a different field of astronomy, which allowed for two new discoveries from already existing observations. Qu then continues to develop a model to convert the observed 2D quantities into 3D physical quantities. This reveals the structure of the CGM and shows that the two heretofore leading, but seemingly contradictory, models are actually in agreement with each other. Finally, Qu developed a semi-analytic model to study the relationship between the GCM and the galaxy. This allowed Qu to study important physical processes in a way that is better than state-of-the-art large cosmological simulations. All together, Qu's dissertation is very clearly written and well-rounded, covering both an observational as well as theoretical aspect of the study of the CGM. Moreover, it provides a strong basis for future missions, such as the later this year to be commissioned James Webb Space Telescope.

- Comments by Merel van 't Hoff

Dissertation Committee:

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Christopher J. Miller

Honorable Mention

Sangmin Choi

Physics

Zehra Hashmi

Anthropology and History

Mary Hennessy

Germanic Languages and Literatures

Yael Kenan

Comparative Literature

Rohith Mittapally

Mechanical Engineering

Abhijit Parolia

Molecular and Cellular Pathology

Nicole Rockey

Environmental Engineering

Niloufar Salehi

Chemical Engineering and Pharmaceutical Sciences

Matthew Villeneuve

History

Xin Zhang

Mathematics

Distinguished Dissertation Award Nominees

Ahmed Abdelhady
Civil Engineering

Jeremy Castagno
Robotics

Darwin Cordovilla Leon
Applied Physics

Sasha De Vogel
Political Science

Abhishek Dhyan
Macromolecular Science and
Engineering

Na Du
Industrial and Operations Engineering

Catherine Fairfield
English Language and Literature

Amelia Frank-Vitale
Anthropology

Leigh Goetschius
Psychology

**Maha Said Ahmed Abdeltawab
Hanafi**
Medicinal Chemistry

Tugce Kayaal
Middle East Studies

Vishal Khandelwal
History of Art

Lisa Larance
Sociology

Joyce Lee
Social Work and Psychology

Cha Li
Business Administration

Nan Li
Aerospace Engineering

Edward Nolan
Classical Studies

Charles Park
Biomedical Engineering

Marlon Ramos
Earth and Environmental Sciences

Anita Ravishankar
Public Policy and Political Science

Rishi Sonthalia
Applied and Interdisciplinary
Mathematics

Kristin Vaneyk
English and Education

Nguyen Vo
Bioinformatics

Katelyn Webster
Nursing

Yichao Yan
Chemistry

Xueru Zhang
Electrical and Computer Engineering

The Rackham Graduate School acknowledges the special contributions of Professor Susan Scott Parish 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

Amy Clark
Shane DuBay
Joseph Feldblum
Ben Green
Kevin Korsyn
Roberto Marquez
Mitchell Newberry
Carlos Peredo
Vyta Pivo
Ellen Quarles
Michaela Rife
Jessica Ruffin
Jeff Sheng
Anish Tuteja
Merel van 't Hoff

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