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Mike Solomon
Dean and Vice Provost for Academic Affairs

Investigating the Roles of Wnt Signaling in Mature Adipocyte Function

Devika Bagchi

Ph.D., Molecular and Integrative Physiology, University of Michigan, 2020
B.A., Biology: Neuroscience, Washington University, 2011

Wnt signaling is important during development to direct stem cell differentiation. However, Wnt signaling is also active in mature adipocytes and the reasons remain poorly understood. Devika Bagchi uses both cell culture and mouse model systems to study the effects of Wnt secretion from two adipocyte populations to define its roles in a mammalian system, paving the way for improved understanding of adipocyte-related (dys)function. The novel findings include the discovery of important regulation of transcription factors *Srebf1* and *Mlxipl* by Wnt/β-catenin signaling that controls *de novo* lipogenesis and fatty acid desaturation. Intriguingly, this regulation was protected in animals without intact Wnt/β-catenin signaling in adipocytes by stromal cells in close proximity, highlighting the biological importance of keeping this pathway operative. Finally, Bagchi presents evidence that this pathway is dysregulated by long-term overnutrition, leading to adverse health effects in mice. This work helps to combine the Wnt signaling and obesity research fields, creating new opportunities to understand the mechanisms of adipose tissue metabolism and maintenance. Excellent, thoughtfully-produced, figures highlight both the breadth and depth of the experimental data and the underlying story presented.

- Comments by Ellen Quarles

Dissertation Committee:

Ormond A. MacDougald, Chair
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Christin Carter-Su
Jiandie Lin
Carey N. Lumeng

Watching the Girls Go By: Sexual Harassment in the American Street, 1850-1980

Molly Brookfield

Ph.D., History and Women's and Gender Studies, University of Michigan, 2020
M.A., Cultural Heritage Studies, University College London, 2011
B.A., History, Macalester College, 2009

Molly Brookfield, in "Watching the Girls Go By," presents a lucid, detailed exploration of street harassment in American urban spaces of the nineteenth and twentieth centuries. Brookfield draws upon extensive archival evidence to show that street harassment, initially decried in newspapers and pamphlets of the 1850s, was accepted as a normal, even genteel, aspect of white heteronormative masculinity up through the late twentieth century. She argues that street harassment practiced by white men tangibly restricted the physical and social mobility of women in American cities. Further, policies enforcing the punishment of street harassment disproportionately endangered Black men and women, for whom the consequences of being harassed, or accused of harassment, were very harsh indeed. Brookfield identifies "the central tension of women's experiences of men's stranger intrusions" as a sense that street harassment was both hateful and natural. She acknowledges that "trivializing rhetoric" about such harassment "persists to this day," and ends with a powerful discussion of current events, pointing to the ways in which white supremacy and sexual violence remain intertwined as modes of oppression.

- Comments by Amy Clark

Dissertation Committee:
James W. Cook, Co-Chair
LaKisha M. Simmons, Co-Chair
Nadine Hubbs
Matthew D. Lassiter

Study of Thermal and Magnetic Properties in Strongly Correlated Materials

Lu Chen

Ph.D., Physics, University of Michigan, 2020
Data Science Certificate, University of Michigan, 2018
B.S., Physics, Peking University, 2014

Some materials can quickly and dramatically change properties, for example going from a conductor to an insulator, without any change to the arrangement of atoms in a crystal. Understanding these switching properties is useful in designing sensors, memory storage, and other electronic devices. This thesis investigates the details of these transitions in several materials, and even develops a new measurement technique that cleverly employs the quartz oscillator from a wristwatch to measure the subtle magnetic and electrical properties of exotic crystals, combining techniques from magnetometry and atomic force microscopy. The thesis artfully spans the theoretical and the applied, describing both how these materials fit (and don't) theories of condensed matter physics and how to construct these tiny measurement devices. It has already resulted in three publications in top applied physics journals with over a dozen citations since 2018.

- Comments by Mitchell Newberry

Dissertation Committee:

Lu Li, Chair
John Heron
Çağliyan Kurdak
Kai Sun
Liuyan Zhao

End of the Line: State Infrastructure, Material Ruin, and Precarious Labor Along Romanian Railroads

Adrian Deoancă

Ph.D., Anthropology, University of Michigan, 2020
M.A., Social and Cultural Anthropology, National School of Governance, 2011
M.A., Nationalism Studies, Central European University, 2008
B.A., Journalism, Babeș-Bolyai University, 2007
LL.B., Law, Babeș-Bolyai University, 2007

This thoughtful and beautifully written dissertation considers the long history and consequences of "the breaking of the rails" in post-1989 Romania. Intervening in the understanding of infrastructure in multiple academic fields, with particular attention placed on the experience of "brokenness," Adrian Deoancă provides an account of the almost paradoxical dynamic of state divestment combined with a continued state encompassment in post-Communist Romania. Through fieldwork and archival research, Deoancă attends to issues of state governance and material infrastructures but does this with careful attention to the lived-experiences of Romanian people. Attending to both frontstage users and backstage maintainers of the Romanian rail system, this dissertation brings to life the starts and stops, the delays, and the dirt and grime of large-scale infrastructures. Particularly notable is Deoancă's careful and compassionate discussion of the often-overlooked maintainers of these vital urban systems. In this account of the transformation of an infrastructure focused on universal mobility to one focused on a patchwork of differentiated mobility rights, Deoancă adeptly shows how an Eastern European perspective can aid our understanding of "the state of increasing disrepair of infrastructures in the West and the plight of the manual workers on whose workmanship hinges the ultimate survival of such amenities of collective life."

- Comments by Bryan Norwood

Dissertation Committee:

Krisztina E. Fehérváry, Chair
Dario Gaggio
Professor Matthew Hull
Stuart Kirsch
Alaina Lemon

Discovering the Missing Population of AGN Pairs with Chandra

Adi Foord

Ph.D., Astronomy and Astrophysics, University of Michigan, 2020
M.S., Astronomy and Astrophysics, University of Michigan, 2017
B.A., Astronomy & Physics, Boston University, 2014

Adi Foord has produced a dissertation of superlative quantity and quality. This dissertation aims to push the limits of our current understanding of supermassive black holes: something that has been recognized as theoretically possible for over a century, but was only documented within the last five years. This study does an exceptional job of contextualizing this reality, but demonstrating to the readers the very impossibility of studying something that cannot be directly observed, before masterfully revealing the tools and tricks employed to persist beyond such limitations. This extensive work culminates in a novel tool that analyses active galactic nuclei X-Rays to measure whether they are single or dual. In doing so, Foord advances our understanding of our very universe, and lays the foundation for dozens of future studies expanding beyond.

- Comments by Carlos Peredo

Dissertation Committee:

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Elena Gallo
Edmund Hodges-Kluck
Timothy McKay
Jon Miller

Staging the Hygienic Subject: Anatomy, Bodies, and the Public Health Exhibition in Germany, 1911-1931

Kathryn Holihan

Ph.D., Germanic Languages and Literatures, University of Michigan, 2020
B.A., German, History, Art History, Oberlin College, 2011

Kathryn Holihan's "Staging the Hygenic Subject: Anatomy, Bodies, and the Public Health Exhibition in Germany, 1911-1931" makes a meaningful contribution to several fields outside of her own, including the medical humanities and museum/exhibition studies. Holihan historicizes urgent questions, such as how knowledge of public health is framed and disseminated. Her clearly delineated research focus, the articulation of hygiene through public health exhibitions in early twentieth-century Germany, is expressed through well-defined case studies, including the 1911 International Hygiene Exhibition in Dresden, plans for a permanent museum, mobile exhibits targeted at women, and exhibits of "Jewish hygiene." Holihan begins the dissertation with a look at the German Hygiene Museum's reopening during the coronavirus pandemic, which introduces an important thread: the museum's discomfort with both its theme and history. As Holihan makes clear, this uneasiness is rooted in German hygiene's entanglement with eugenics and the rise of Nazism, but she also cautions against an overdetermined reading of exhibits from the Wilhelmine and Weimar periods. This dissertation fits within a growing exhibition studies trend to reevaluate stereotyping displays in order to recover previously dismissed agency. Though a challenging task, Holihan accomplishes it through impressive archival research, sharp visual analysis, and engaging prose.

- Comments by Michaela Rife

Dissertation Committee:

Kathleen Canning, Rice University, Co-Chair
Peter McIsaac, Co-Chair
Kerstin Barndt
Helmut Puff

Variational and Time-Distributed Methods for Real-time Model Predictive Control

Dominic Liao-McPherson

Ph.D., Aerospace Engineering and Scientific Computing, University of Michigan, 2020
BASc., Engineering Science, University of Toronto, 2015

Model Predictive Control (MPC) techniques constitute one of the most important recent advances for automation and decision systems. Ubiquitous in many complex technologies including robotics, manufacturing, automotive, and aerospace applications, MPC allows these systems to be operated near their physical limits. Implementation requires significant computational resources, and it is only recently that such resources have been realistic. This dissertation innovates a new technique that greatly enhances the computational efficiency of MPC, while also providing rigorous guarantees for the satisfaction of safety criteria. It significantly broadens the set of real-world applications where MPC is practical. The level of scholarship is outstanding—indeed what makes the work powerful is that the MPC design problem has been mathematically framed in a manner that is precise in its assumptions and as general as possible in its scope. The central contributions are framed in the context of theorems which rigorously prove properties such as convergence, stability, and constraint satisfaction hold generally. At the same time, the dissertation demonstrates the experimental implementation of the ideas, for the purpose of reducing NOx emission in road vehicles through the application of MPC to engine control. As such, the dissertation constitutes the full flowering of a useful idea, from its solid analytical foundation to its practical application.

- Comments by Jeffrey Scruggs

Dissertation Committee:

Ilya Kolmanovsky, Chair
Ken Butts, Toyota Motor North America
Professor Alex Gorodetsky
Jing Sun

How Sweet It Is: The Role of Taste Perception in Diet-Induced Obesity

Christina May

Ph.D., Neuroscience, University of Michigan, 2020
B.S., Neuroscience, Univeristy of Texas at Dallas, 2012

In Christina May's dissertation, she tackles a consequential question in neurobiology—how does taste perception impact an organism's relationship to what it eats? Specifically, how do dietary sugars impact sweet taste sensation, and is there an association between sweet taste perception and overeating and satiation? May leverages a series of experiments and the power of the fruit fly model system to reveal mechanisms through which impairment of sweet taste sensitivity has downstream consequences on overeating in flies, with implications for understanding the associations between sweet taste perception and diet-induced obesity. May first shows how sweet taste sensation is reshaped through the intake of dietary sugars, which alter neural activity and feeding behavior. She then defines the neural mechanisms through which this occurs. In her fourth chapter, May develops a new methodology for monitoring feeding behavior in flies, expanding the experimental possibilities for future studies. May displays impressive perspective on critical questions in the field, and as a whole, May's dissertation will serve as an indispensable example of how to approach questions in biology through elegant experimentation and method development.

- Comments by Shane DuBay

Dissertation Committee:

Monica Dus, Chair
Carol Elias
Carrie Ferrario
Shelly Flagel
Scott Pletcher

Carbon Mineralization in Fractured Basalt

Anne Menefee

Ph.D., Environmental Engineering, University of Michigan, 2020
M.S.E., Environmental Engineering, University of Michigan, 2016
B.S., Civil & Environmental Engineering, University of Virginia, 2015

Climate change is one of the major challenges we face today, and likely for several generations to come, but Anne Menefee's outstanding dissertation brings us one step closer toward reducing CO2 emissions. This work focuses on the promising, yet underdeveloped, technology of CO2 storage in basalts where CO2 can get trapped as solid carbonate minerals. Menefee presents well-designed experiments to study the geologic conditions that favor this mineral carbonation process in natural basalts and combines these results with numerical modeling to make crucial predictions beyond timescales measurable in the lab. This eloquent work does not only grapple with the science behind the complicated process of CO2 mineralization, but provides clear recommendations that will inform the selection of storage sites and injection schemes that maximize the CO2 trapping potential. In short, Menefee's dissertation lays the foundation for the future development of effective CO2 storage techniques.

- Comments by Merel van't Hoff

Dissertation Committee:

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J. William Carey, Los Alamos National Laboratory
Daniel Giammar, Washington University
Kim Hayes
Steven Skerlos

“Whose City? Our City!”: Asian American and Multiracial Movements Against Police Violence in New York

Vivian Truong

Ph.D., American Culture, University of Michigan, 2020
M.A. American Culture, University of Michigan, 2016
B.A., Ethnic Studies, Brown University, 2012

Vivian Truong’s dissertation sits at the intersection of Asian American studies and carceral studies, two fields rarely in conversation with one another, to convincingly demonstrate that Asian Americans were also targeted by increased policing in the late twentieth century. Working at the intersection of these fields lets Truong think about “removal” differently, as she shows that state-sanctioned removal of Asian people in Rudy Giuliani and Michael Bloomberg’s New York City did not just mean exclusion and deportation, but also policing, incarceration, and eviction. Truong shows that resistance was alive and well in Asian American communities during this period usually painted as an era of social movement decline. Through rich oral history interviews and extensive archival records, Truong’s deep dive into the Coalition Against Anti-Asian Violence (an organization Truong herself worked for) shows that the women at the forefront of the movement explicitly sought to build coalitions with others who experienced police brutality in New York City, including Black and Puerto Rican organizations. So, while narratives of the “model minority” have highlighted the distance between Asian American and Black and Latinx communities, Truong shifts our understanding, showing that the Asian American movement in New York City was deeply coalitional.

- Comments by Alvita Akiboh

Dissertation Committee:

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Matthew Countryman, Co-Chair
Manan Desai
Mary Lui, Yale University
Heather A. Thompson

Honorable Mention

Geoffrey Burns
Kinesiology

Jessica Gillooly
Public Policy and Sociology

Yuqi Gu
Statistics

Ka Ip
Psychology

Kwangnam Kim
Mechanical Engineering

Kayti Lausch
Film, Television, and Media

Charles Lu
Biomedical Engineering

Eduardo Martinez
Philosophy

Stephen Taller
Nuclear Engineering and Radiological Sciences

Sara Wong
Cellular and Molecular Biology

Distinguished Dissertation Award Nominees

Alexandra Bouza
Pharmacology

William Clark
Mathematics

Michael Grundler
Ecology and Evolutionary Biology

Valentina Igenegbai
Chemical Engineering

Grace Kanzawa-Lee
Nursing

Harshvardhan Ketkar
Business Administration

Stephanie Kim
Immunology

Dana Kornberg
Sociology

Daniel Kremer
Chemical Biology

Alyssa Kruger
Human Genetics

Albert Liu
Applied Physics

Cecilia Morales
English Language and Literature

Peter Orchard
Bioinformatics

Peter Pellitier
Environment and Sustainability

Amanda Reid
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Public Policy

Zhengtian Xu
Civil Engineering

Han Zhang
Education and Psychology

Qi Zhang
Computer Science and Engineering

Luowei Zhou
Robotics

Milad Zolfagharloo Koohi
Electrical and Computer Engineering

The Graduate School acknowledges the special contributions of Professor Susan Scott Parrish 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

Alvita Akiboh
Aaron Blanchard
Amy Clark
Shane DuBay
Joseph Feldblum
Neil Gong
Ben Green
Mihaela Mihailova
Mitchell Newberry
Bryan Norwood
Carlos Peredo
Ellen Quarles
Michaela Rife
Jeffrey Scruggs
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