

Abstracts by McNair Scholars at the University of Oregon

Spindle Orientation in MDCK Cells

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During development, cells organize into complicated structures such as organs and other tissues. Cellular organization requires precisely oriented divisions so that tissues grow into particular shapes. For example, Madin-Darby Canine Kidney (MDCK) cells are epithelial cells that use protein polarity coupled with mitotic spindle orientation to expand outward in a flat sheet. When grown on gel-like media, normal MDCK cells use the same process to form cysts with a single lumen at the center. If mitotic spindle positioning is disrupted, MDCK cells grow in random directions and form cysts with multiple lumens. My research characterizes one protein responsible for positioning the mitotic spindle and focuses on the mechanism during mitosis of 14-3-3 zeta, an adaptor protein that links together Dynein and KIF13B, two opposing motor proteins. Results show that 14-3-3 zeta aids in anchoring microtubules during cell division for the precise placement of daughter cells. These results were confirmed by analyzing cystogenesis in a MDCK 14-3-3 zeta RNAi system.

Parenting in Poverty: The Experiences of Fathers Who are Homeless

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Fathers who are homeless face unique barriers in parenting. This qualitative study used semi-structured interviews to explore the experiences of fathers who are homeless in a Pacific Northwest city. Data were collected through in-depth interviews with four homeless fathers and staff members from a family shelter. Themes raised through the interviews included: (a) changes to the fathers' relationships with children and others; (b) stress related to a lack of resources available to homeless fathers; and (c) the impact on the experience of parenting while homeless arising from external perceptions of fathers as primary caregivers and providers. By giving voice to this underrepresented segment of the population, this study provides information that may improve the delivery of services to homeless families.

Leafcutter Ants Cut Six Times More Inside the Nest than Outside

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Leafcutter ants collect leaf disks, carry them into underground chambers, then process and inoculate them with a fungus (Leucocoprineae) that serves as a key source of food for the colony. When processing leaf disks, ants use mandibular teeth to slice the disks into small fragments. The quantity of cutting that occurs during leaf processing has not been calculated or compared with cutting during foraging. This study estimates this ratio and provides video documentation of leaf disks being processed into fungus. Field samples of *Atta cephalotes* and *Atta colombica* were collected in Minca, Colombia, and Tiputini, Ecuador, respectively. Collections include whole leaf disks and leaf fragments that serve as the medium in fungal gardens. Measurements of leaf disk perimeters and surface areas were compared to corresponding leaf fragment dimensions. The resulting ratios indicate that roughly 6 times more cutting takes place during subterranean leaf processing than above ground foraging. This ratio may be used to calculate the net energy gained from a given mass of fresh leaves, and where the tipping point in profitability lies. The results of this study deepen our understanding of the leafcutters' behavioral ecology, as well as their limitations with regard to energy acquisition.

Mixed-Status Families: Legal Status and Access to Social Capital, Employment, Housing, and Education

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As of July 2011, fifty-two million people in the United States (or 16.7%) were Latino/a, making them the largest ethnic minority in the country. By 2050, the Latino/a population is expected to reach 30% of the total population. Also, the number of mixed-status Latino/a families has expanded rapidly in recent years. Latinos/as constitute about three-quarters of the nation's unauthorized immigrant population, but approximately three-quarters of the children in those families are U.S. citizens by birth. The shifting Latino/a demographic in the United States has major implications for a variety of areas, including politics, economics, and education. This study focuses on mixed-status families and compares the differences in access to social capital, employment, housing, and education because of legal status. By conducting informational interviews and analyzing quantitative data, this study: 1) expands the understanding of the complexities of the Latino/a community, specifically mixed citizenship families; 2) provides the costs and benefits of being authorized or unauthorized within a mixed status family; and 3) explores implications for mixed-status families within the United States.

Synthesis and Controlled Oxidation of Tungsten Oxide Nanostructures via Thermal Vapor Transport

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Ambipolar host materials have been shown to increase efficiency and stability in organic light emitting diodes (OLEDs) by balancing negative and positive (electron and hole) charge transport. These materials are key components in long-lived blue OLEDs, the development of which remains the key obstacle to creating organic solid-state white lighting. We present the synthesis and photophysical characterization of a series of 1,2-azaborine-containing potential ambipolar hosts. We also demonstrate how the inherent asymmetry of the 1,2-azaborine core can create chemical diversity within structurally identical molecules. Additionally, we discuss theoretical calculations demonstrating the electronic charge distribution and relative HOMO/LUMO energies of these molecules.

Gender Differences in Family Environment in the US, 1850-2010

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Yamaguchi, in his paper, “A Formal Theory for Male-Preferring Stopping Rules of Childbearing: Sex Difference in Birth Order and in the Number of Siblings” (1989), shows that male-preferring stopping rules result in girls having more siblings. This paper examines whether certain characteristics other than size and the male-preferring stopping rule differ between families with girls and families with boys. Although scholars have not yet examined how these differences have changed over time, data from the US Census and American Community Surveys, collected from the Integrated Public Use Microdata Series (IPUMS) USA, allow an examination of changes over time and differences across family size, family income, and parental education levels. We expect to see that girls tend to live in households that have larger family sizes and smaller incomes, and that the sex of the children in the household does not affect the parents’ income. Parents’ preferences about gender may allow us to better understand how these preferences affect children and their outcomes in life.

Evaluating and Predicting Neural Recruitment in the Developing Social Brain

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In a previous study, we investigated the developmental trajectory of neural correlates underlying trait evaluations of a close other (i.e., a same-gendered best friend). Twenty-four Chinese participants (twelve adults, twelve children) underwent functional magnetic resonance imaging (fMRI) while making trait evaluations in the social and academic domains. The present study investigates behavioral data, such as reaction time and self-evaluation agreement scores, to gain a better understanding of the brain imaging data and the extent to which individual behavior predicts neural activity. Additional analysis will reveal the relation between brain and behavior from a developmental approach. These findings will clarify how different patterns of behavior may be associated with different patterns of brain activity. Consequently, the findings from this study will expand the body of research on the developing social brain.

Bipyridine Receptors as Metal Ligands

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Copper is ubiquitous in the natural environment and performs vital functions in the body. The creation of a synthetic receptor capable of determining copper concentrations may have far-reaching biomedical applications, including testing for Wilson's disease and studying Alzheimer's. Previous studies have demonstrated the environmentally relevant aptitude of chemosensors built on a 2,6-bis(anilinoethynyl) pyridine core to sense anions such as chloride and cyanide. Although this class of anion sensors makes use of known metal coordinating moieties in their design, there has been little exploration into their ability to function as cation sensors. Preliminary studies on a bipyridyl adaptation of these molecules, bis(methoxy urea), have been successful at binding coppersalts over other biologically relevant materials such as iron and zinc.

Fathers: Social Stigma, Demographic Variables, and Childhood Development

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Many social changes, notably the significant increase of women in the workforce and the diversification of family structures, have modified the landscape of American families. Historically, fathers have been seen only as instrumental providers and protectors of children. With the ever-changing social landscape, perceptions of men as nurturers, however, have started to shift. A review of recent literature supports the need for further research into patterns of fatherhood and factors that support or prohibit fathers' active involvement with their children. Additional research would also enhance our general understanding of the impact of paternal involvement on children's development. This study specifically focuses on fathers who receive services at the Relief Nursery, a non-profit child abuse and neglect prevention agency in Eugene, Oregon. This exploratory study offers insight into the challenges and joys that fathers experience while raising their children, and may also serve as a base from which to implement services.

Diversity of Microbial Traits in the Zebrafish-Gut Microbiota

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Microbial communities assemble in the gastrointestinal-tract of vertebrate organisms benefiting the host. However, the ecology, that is the processes that determine the spatial and temporal structures of these communities, is unclear. I use the model vertebrate, zebrafish (*Danio rerio*), to measure the diversity of various ecological traits in 19 unique bacterial strains derived from conventionally-raised zebrafish to reveal the diversity in these traits within the zebrafish-gut microbial community.

Ascetic Practices as Forms of Counter-Conduct: Michel Foucault and the Christian Pastorate

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Philosophy

While much of the scholarship on Foucault's archeological and genealogical studies has focused on his analytics of power relations and disciplinary practices, the subject of resistance and counter-conduct in his research has received less attention. Following Foucault, I argue that the idea of a critical ontology of ourselves involves both a genealogical component, or a method for investigating the historically contingent conditions of our subjectivity, and an experimental component that allows us to transgress those conditions. The aim of my research is to situate the notion of a critical ontology of ourselves within the context of Foucault's studies on pastoral power and governmentality, especially those found in his 1977-78 course lectures *Security, Territory, Population*. I focus on certain techniques and practices of conduct exercised within the medieval Christian pastorate, namely the direction of one's conscience, confession as a mode of truth telling, and the pastoral teaching of truth. The implication of this analysis centers on the notion of ascetic and mystic practices as forms of counter-conduct and critique exercised within the Christian pastorate.

**Foods that Nourish Us:
Climate Change Impacts on Indigenous
Culture in the Pacific Northwest**

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In the Pacific Northwest, the potential and ongoing impacts of climate change on tribes and First Nations are mounting. In response, tribal communities, academics and others are researching the effects of climate change. Much of existing climate change research focuses on analyzing impacts on natural resources, i.e. on quantifiable impacts. This paper argues that understanding the cultural impacts of climate change on indigenous people provides a more complete picture of what is at stake for native people today. Climate change has significant implications for traditional food use. This paper details impacts on culture, family, and sovereignty in order to show how climate change, by impacting traditional food use and species health, also impacts native culture and wellbeing in the Pacific Northwest. Furthermore, this paper demonstrates similarities between climate change and colonization and their effects on traditional food use as well as family and sovereignty in native communities.

A Synthesis of 1,2,3,5-tetrasubstituted-1,2-azaborines

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Tetrasubstituted arenes are important building blocks in many bioactive compounds. The development of 1,2-dihydro-1,2-azaborine, a surrogate of quintessential benzene that substitutes a C=C bond with an isoelectronic and isostructural B–N bond, extends the chemical space of the compounds relevant to biomedical research and materials science. To further investigate the potential applications of 1,2-dihydro-1,2-azaborines, we explore the synthesis of 1,2,3,5-tetrasubstituted-1,2-azaborines. The arene *N*-TBS-*B*-Cl-1,2-azaborine, which the Liu group developed in 2009, was halogenated at the C3 and C5 positions and underwent transitionmetal-catalyzed cross-coupling reactions to yield 1,2,3,5-tetrasubstituted-1,2-azaborines. The 1, 2, 3, and 5 positions of 1,2,3,5-tetrasubstituted-1,2-azaborines could be selectively functionalized by a variety of groups. The preparation of 1,2,3,5-tetrasubstituted-1,2-azaborines opens the possibility of incorporating 1,2-azaborines in biologically active molecules, a process that may provide new opportunities in drug design.