Online Proceedings

SESSION 2E

UNDERGRADUATE RESEARCH IN ECONOMICS

Session Moderator: Levis Kochin, Economics
234 MGH
3:45 PM to 5:15 PM

* Note: Titles in order of presentation.

Underreported Inflation Rates in Argentina: Using the Right Numbers to Study the Effects
Jianyu (Willy) Lu, Senior, Economics, Mathematics, Spanish
Mary Gates Scholar
Mentor: Philip Brock, Economics

Governments can manipulate reports of the inflation rate to hide economic problems, and to generate revenues from the hidden depreciation of their liabilities valued in domestic currency. However, such practices are unpopular and generally short-lived because citizens soon recognize the loss in their purchasing power. Previously, I constructed an alternative price index for 2006 to 2008 and found that the National Statistics and Censuses Institute underreported the official inflation rate since February 2007. My data, used in conjunction with other alternative indexes, showed that the reported Consumer Price Index (CPI) only accounted for between a half and a third of the real inflation rate. This project explores effects of underreporting inflation in Argentina, and provides further evidence to support the existence of manipulation in the official statistics reports. Using the alternative price indexes, I estimated government gains from domestic bonds and the social security system due to the misreported inflation rates since the manipulation began. By reporting a CPI that is lower than the real one, the government was able to finance its expenditures at a decreasing real cost, at the expense of private investors and citizens. My preliminary results show that the Argentinian government profited in real terms from issuing bonds, and maintained a moderately low budget deficit despite increasing the number of social security beneficiaries. I also studied the national accounts and central bank publications of the last decade and observed a surprisingly high rate of nominal growth beginning in 2007. I will demonstrate that this unexpected rise can be explained by the discrepancy between the reported and the real inflation rate. Since 2009, the Argentinian government has actively censored independent domestic studies on the official CPI, so for the time being, it is essential for foreign scholars to research and keep track of Argentina's deteriorating statistics.

POSTER SESSION 3

MGH 241, Easel 138
2:30 PM to 4:00 PM

Statistical Analysis of the Efficacy of Online Learning in General Chemistry at the University of Washington
Jacob Jay (Jacob) Parikh, Senior, Biochemistry
Mentor: Colleen Craig, Chemistry
Mentor: Philip Reid, Chemistry

We present the results of a linear regression of exam scores for students in general chemistry versus performance in two online learning systems: WebAssign, which presents problems in a traditional manner, and ALEKS (Assessment and LEarning in Knowledge Spaces), which is an adaptive, tutorial-based system. Comparisons are made for students taking the same general chemistry course, taught by the same instructor, in the same quarter in subsequent years, where WebAssign was used one year, and ALEKS the next. We find that in WebAssign, a 1 point difference in homework score corresponded, on average, to a 0.46 point difference in final exam score (95% C I: 0.36, 0.56). In ALEKS, a 1 point difference in homework score corresponded, on average, to a 1.06 point difference in final exam score (95% C I: 0.98, 1.15). Controlling for gender and SAT scores did not change the overall conclusion. For a student, ALEKS homework scores provide a better predictor of exam performance, allowing them to focus their efforts where they are needed. For an educator, earlier signs of knowledge gaps arise in the lower homework scores, which can be addressed well before an assessment.

POSTER SESSION 3

Balcony, Easel 124
2:30 PM to 4:00 PM

The Effect of Neurally-Fated Induced Pluripotent Stem (iPS) Cells on the Recovery of Forelimb Function After Spinal Cord Injury

Nicole Kwan, Senior, Biochemistry, Neurobiology
Mentor: Aiva Ievins, Neurobiology & Behavior
Mentor: Philip Horner, Neurological Surgery

Spinal cord injury accounts for 29% of paralysis patients in the US, and the recovery of hand and arm function is the highest treatment priority in individuals with tetraplegia. Induced pluripotent stem (iPS) cells can be directed toward specific cell fates, such as functioning neurons or astrocytes, making them an exciting new tool in regenerative medicine for those that suffer from spinal cord injury paralysis. We investigated the effect of neurally-fated iPS cells on recovery of forelimb function after a cervical spinal cord contusion injury in a rat model. Neurally-fated iPS cells were injected above and below the lesion in an attempt to replace cells lost to injury. We transplanted cells four weeks after injury to mimic a chronic spinal cord injury model. Forelimb function was quantified before and after the injury for 15 weeks using three forelimb behavior tasks. Tasks included a forelimb reaching task (FRT), a cylinder-rearing task, and a cereal-eating task (IBB). Results from these tasks will be analyzed to quantify any improvement in the experimental animals that received iPS cells versus the controls. If treatment provides a significant difference in recovery rate, then the introduction of iPS cells in damaged spinal cords could provide a possible regenerative treatment for paralysis patients.

POSTER SESSION 3

Balcony, Easel 123

2:30 PM to 4:00 PM

Assessment of Structural Changes of Myelin Sheaths via Double Reporter System in Injured Mouse Spinal Cord

Christina Manuela (Christina) Tull, Senior, Neurobiology
Mary Gates Scholar
Mentor: Philip Horner, Neurological Surgery

Spinal Cord Injury (SCI) currently affects more than 250,000 people in the US alone, and approximately 11,000 new injuries are reported annually. SCI is most commonly caused by trauma, such as vehicular accidents, and often results in devastating paraplegia or tetraplegia. Among many points of interest in treating SCI is what happens to myelin post injury. In terms of electrical conduction, myelin sheaths are the insulation to the wire that is the neuron's axon, and proper myelination is crucial for effective signaling in the nervous system. Previous findings in SCI research show abnormally thin and short myelin near injury site, supporting the current research dogma that oligodendrocytes (OLs), the glial cells that myelinate the central nervous system, undergo complete cell death following initial injury. Due to lack of methodology, little research has been done to support the idea of partial myelin degeneration. My current study seeks to shed light on the question of where the abnormally thin myelin is derived, if it is indeed newly developed, and explores the possibility that thin myelin found by previous researchers is intact degenerating myelin. Pre-labeled myelin in transgenic mice was injected with a Green Fluorescent Protein (GFP)-labeled virus vector, allowing clear visualization of which myelin sheaths are mature and which are newly generated. By histology and confocal microscopy, I will analyze morphology of neural processes and characteristics of myelinating OLs, such as distances between axon internodes and the axon g-ratio (the relationship of axonal diameter to total fiber diameter, a common measure of myelin thickness). If the prevailing research dogma is supported, I expect to find shortened internode lengths and smaller g-ratios in the green myelin. The findings help determine the significance of myelin change post-SCI and is hoped to contribute more effective therapies to improve axon conduction via pharmacological or cell-based approaches.

POSTER SESSION 3

MGH 241, Easel 173

2:30 PM to 4:00 PM

Comparison of Organic Photochromic Compounds' Properties and BSA Interaction

Courtney Holland, Senior, Nursing, Cell Biology Neuroscience, Montana State University
McNair Scholar
Mentor: Philip Sullivan, Chemistry and Biochemistry, Montana State University

Organic photochromic compounds (OPC) undergo reversible chemical and physical changes when irradiated with the appropriate wavelength of light. These changes are manifested both at the molecular and bulk material level and include photo-induced shifts in color, refractive index, molecular length, and polarity. Such photo-controllable properties are of interest for bio-orthogonal control of biological processes, as well as in the fields of optical computing and data storage. A thorough understanding of molecular and material level structure-property relationships is imperative to enable effective design and optimization of organic photochrome structures for each specific application. Our lab is trying to create a azobenzene dye that isomerizes at about 120 hrz, within milliseconds, in the visual range of wavelength, and can be tethered to proteins. The focus was placed on physical and photophysical properties, such as isomerization wavelength, quantum yield, and decay rate to create such an azobenzene. If a usable azobenzene were created, it could be tethered to the sodium or potassium channels in the eye to initiate an action potential similar to the innate response in the eye's photoreceptors that causes a release of neurotransmitters that, in

turn, affect sodium and potassium channels causing an action potential. Used in this fashion, it can help treat the most common eye disease causing blindness, retinitis pigmentosa. In lab, I used time-resolved laser spectroscopy, fluorescence, and fluorescence lifetime analysis to analyze the three photochromic Azobenzene dyes: PheNAQ, TVI, TVI acid, and MeNAQ created by my mentor, Phillip Sullivan.

POSTER SESSION 3

Commons West, Easel 21

2:30 PM to 4:00 PM

University of Washington Mobile Planetarium: Bringing HST Science to Seattle Public Schools

Justin D (Justin) Gailey, Senior, Astronomy, Physics
Undergraduate Research Conference Travel Awardee
Mentor: Oliver Fraser, Astronomy
Mentor: Philip Rosenfield, Astronomy

Digital planetariums and their software are revolutionizing what can be visualized and hence raising the educational impact to K-12 students and the general public. The ability planetariums offer to present and visualize cutting-edge research of star, planet, and galaxy formation and evolution, in 3-dimensions, has unlocked new discovery space in educators' ability to communicate and teach science. In order to improve the UW Astronomy department's public outreach programs as well as lay out a model for other Universities and astronomy outreach groups to follow, we assembled a mobile planetarium using new cost-saving methods and have begun designing an innovative curriculum to best implement digital planetariums in high school classrooms. To accomplish this, we used an HST education and public outreach grant (EO-12512) to build the planetarium as well as offset transportation costs to the UW planetarium. The UW mobile Planetarium was developed for less than $18,000, and allows us to increase the number of underserved elementary and high school students the UW Astronomy department reaches. We are beginning to test and evaluate the efficacy of teaching using the mobile planetarium in a high school setting. The mobile nature of the planetarium allows us to develop interesting inquiry-based lessons that incorporate WWT tours.

POSTER SESSION 4

Balcony, Easel 89

4:15 PM to 5:45 PM

Impact of Black Holes in Cosmological Simulations of Galaxy Clusters

Taylor Montana (Taylor) Posey, Junior, Extended Pre-Major
Brianna Louise Diaz, Sophomore, Pre-Sciences
Mentor: John Ruan, Astronomy
Mentor: Breanna Binder, Astronomy
Mentor: Philip Rosenfield, Astronomy
Mentor: Eric Agol, Astronomy

Observations suggest that the intracluster medium in galaxy clusters is strongly influenced by supermassive black holes residing in cluster centers. We investigate the consequences a black hole can have on the thermodynamics of the gas in galaxy clusters by comparing the properties of a simulated galaxy cluster without black holes to X-ray observations of real clusters, which have black holes. For our data we used Python to manipulate a cosmological simulation made with ChaNGa, a code capable of simulating gravity, thermodynamics, and other things. Our cluster simulation includes gravity, hydrodynamics, gas cooling, star formation, and stellar feedback in a fully cosmological setting. However, this simulation lacks black hole formation, growth, and feedback, allowing us to pinpoint the effects of these processes on the cluster by comparing to observations. In our investigation, we found only minor differences in the density, temperature, and pressures of the gas between the observed and simulated galaxy clusters in the cluster outskirts. However, we found significant deviations between the simulation and observations near the cluster centers, where a large spike in star formation is present in the simulated cluster, not seen in the observations. Our results suggest that black hole formation and feedback in galaxy clusters most strongly affect the cluster in the central regions, where it can significantly decrease star formation by heating the gas.

POSTER SESSION 4

MGH 241, Easel 147

4:15 PM to 5:45 PM

Re-Programming Tumor-Specific T Cells for Cancer Immunotherapy

Varintra Edlyn (Varintra) Krisnawan, Senior, Neurobiology, Biochemistry
Mary Gates Scholar
Mentor: Andrea Schietinger, Immunology
Mentor: Philip Greenberg, Medicine and Immunology

The immune system has evolved to achieve a fine balance between recognizing and attacking foreign pathogens and preserving unresponsiveness to self-antigens. T cells that are unresponsive to self-antigens are called self-tolerant T cells and a hallmark of such tolerant T cells is their inability to attack cells expressing self-antigens in order to prevent autoimmunity. However, tolerance to these proteins impedes anti-tumor

T cell immune responses because many cancer antigens that are targeted in immunotherapy are in fact self-antigens. Thus, a critical challenge in tumor immunology is to develop strategies that break T cell tolerance to tumor antigens without causing unacceptable autoimmune injury. It has been shown that tolerant T cells lack important proteins normally required for T cell effector functions, including two master transcription factors, Tbet and Eomes, which have been found to be critical for T cell function by repressing the expression of inhibitory molecules and mediating the expression of effector molecules. Therefore, the decreased expression of Tbet and Eomes in tolerant T cells might cause their functional unresponsiveness. Using a transgenic tumor mouse model, my research project investigates if enforced over-expression of Tbet and/or Eomes in tolerant tumor-specific T cells can re-program such tolerant T cells and restore effector functions, allowing re-programmed T cells to recognize and attack cancer cells. Tolerant T cells will be isolated from spleens of transgenic mice, retrovirally transduced *in vitro* to over-express Tbet and Eomes, and subsequently transferred into tumor-bearing mice. The main focus of my research will then be to analyze Tbet-, Eomes-, and/or control-transduced donor T cells for anti-tumor effector function *in vivo* to understand if and by what mechanism(s) T cells can be re-programmed via the over-expression of the master transcription factors and whether such re-programming could possibly become an effective strategy for the treatment of cancers in humans.