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## TABLE OF CONTENTS:

## Welcome

Welcome to the 16th Annual University of Florida Undergraduate Research Symposium. Undergraduate research is one of the five areas of opportunity, (along with internships, service, leadership, and international experience), which students are encouraged to participate in during their undergraduate career.

UF Undergraduate Researchers at the Fifth Annual Florida Undergraduate Research Conference, Embry-Riddle Aeronautical University, Feb. 27-28, 2015.

This has been a busy year for undergraduate researchers presenting their research efforts. Brandon Krishna Lam has been selected to represent UF at the 20th Annual Posters on the Hill event, sponsored by the National Council on Undergraduate Research, April 22-23, 2015 in D.C. His poster will be one of 60 that were selected from close to 500 applications. His poster title is: *SOCS1 critically regulates lupus like skin pathology; implications for a SOCS1 like peptide intervention*. Congratulations to both Brandon and his research mentor Dr. Joseph Larkin, Assistant Professor, Department of Microbiology and Cell Science.

CUR has provided travel awards to 26 undergraduates who have made research presentations at professional conferences across the country, and 61 students presented their work at the 6th Annual Florida Undergraduate Research Conference (FURC) in Daytona Beach. Additionally, over 1600 students have taken advantage of the opportunity to earn credit for their researcher efforts by registering for research credit in the fall semester.

The symposium is organized to showcase this year's undergraduate research efforts from across campus and is hosted by the Center for Undergraduate Research. This year 260 posters and original performance pieces are highlighted. Students representing over 100 departments will present their work.

Each of these students has benefitted from mentoring provided by exceptional faculty and graduate student researchers. We thank them for their efforts on behalf of these students. Faculty mentors are listed following the abstracts.

We encourage you to share in this project as you visit the presentations and read the collection of abstracts.

Enjoy,

Anne E. Donnelly

Director, Center for Undergraduate Research

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# Undergraduate Research Symposium
# March 18, 2015
# Reitz Union Grand Ballroom
# Program in Brief

| | |
|---|---|
| 9:00am – 9:15am | Group 1 Poster Set Up |
| 9:15am - 9:30am | Welcome<br>Dr. Bernard Mair, Associate Provost for Undergraduate Affairs |
| 9:30am – 10:30 | Poster Session 1 (even numbers) |
| 10:30am -11:30am | Poster Session 2 (odd numbers) |
| 11:30pm -11:45pm | Group 1 Poster Breakdown |
| 12:30pm – 12:45pm | Group 2 Poster Set Up |
| 12:45pm – 1:00pm | Best Research Paper Contest Winners Presented, Dr. Creed Greer, III, Program Director, University Writing Program |
| 1:00pm – 2:00pm | Poster session 1 (even numbers) |
| 2:00pm - 3:00pm | Poster Session 2 (odd numbers) |
| 3:00pm | Poster Session B ends, Breakdown |

**Undergraduate Research 2015 Best Paper Contest Award Winners**

**1. *Predictive Processing in Semantically Constraining Sentences*, Nicholas Feroce and Dr. Edith Kaan , Associate Professor, Department of Linguistics, College of Liberal Arts and Sciences, University of Florida**

The idea that people are actively predicting upcoming words as they read or listen to sentences is one that has gained an increasing amount of attention in recent years (Van Petten & Luka, 2012; Kaan, 2014). In this experiment, the topic of semantic prediction was explored via event-related potentials and examination of the N400 effect (a pronounced negative wave that has been found to reflect anticipatory processing in language) in sentences of varying semantic constraint. 21 native English speakers silently read sentences as brainwaves were recorded from electrodes atop their scalps. Sentences were either designated high-cloze (highly constraining, such as "The barber cut my ___ hair") or low-cloze (lowly constraining, such as "I don't like my ___ hair") and were presented to participants one word at a time. To further investigate if there is evidence of semantic prediction, a delay paradigm was employed, whereby the presentation of a word was sometimes delayed by 300ms. In both the delay and no-delay conditions, there was a larger N400 for low-cloze sentences than for high-cloze sentences. This was interpreted as there being a lack of any specific prediction in the low-cloze condition. Additionally, the N400 appeared to be unaffected for low-cloze sentences between delay and no-delay conditions, but in high-cloze sentences the N400 was smaller in the delay than in the no-delay condition. This smaller N400 in the high-cloze delay condition suggests that the presentation delay may strengthen a reader's prediction.

**2. *Phenotypic Analysis of Gene Loci Identified as Risk Factors for Type 1* Diabetes, Serena Martin. Research Mentor Clive Wasserfall, Assitant in Pathology, UF Department of Pathology, Immunology and Laboratory Medicine, College of Medicine, University of Florida**

Type 1 diabetes (T1D) is an autoimmune disorder linked to the degradation of pancreatic β cells. These cells are responsible for producing insulin, a hormone that regulates blood sugar. Genome wide association studies have linked multiple loci as risk factors for the development of T1D. This study analyzed single nucleotide polymorphisms (SNPs) representative of loci that are immune specific (IL-2 receptor α (CD25)) as well as metabolism and pancreas related (insulin/insulin-like growth factor 2 (INS/IGF-2) and Cathepsin H (CTSH)). While prior research identified T1D risk loci, there was limited evidence available on the phenotypic consequences of these genotypes. The hypothesis of this study is SNPs within CD25 and INS/IGF-2 loci will stratify serum levels of soluble CD25 (sCD25) and IGF-2, respectively. A secondary hypothesis is SNPs within the CTSH locus will stratify serum levels of sCD25 and CTSH. To test these hypotheses, genotyping assays were used to determine the SNPs and enzyme-linked immunosorbent assays (ELISA) were used to measure the serum levels. Results included data from 309 samples of the following cohorts: controls (n=68), subjects with T1D (n=126), subjects with new onset of T1D (n=27), first degree relatives of those with T1D (n=87) and subjects with type 2 diabetes (n=1). This study analyzed healthy control versus T1D effects as well as genotype versus phenotype effects. This study has revealed a trend for lower IGF-2 levels at onset of disease in those with the AA INS/IGF-2 SNP. Higher circulating levels of sCD25 were associated with the TT SNP for the CD25 allele irrespective of disease status. Future work includes using alternative methods to measure CTSH levels in serum and utilizing larger cohorts to increase the statistical power. Understanding mechanistic pathways is critical to understand progression and ultimately intervention for T1D and other chronic conditions, which place undue burdens on affected individuals, their families, and society in general.

**3. *Effects of Leaf Mass on Plant Competitive Ability,* Brandon Peterson[1], Jessica Langebrake[2], Scott McKinley[1], and Jeremy Lichstein[2] ([1]Department of Mathematics, University of Florida, [2]Department of Biology) College of Liberal Arts and Sciences University of Florida**

An important question in ecology and plant physiology is how leaf functional traits, such as leaf mass per area (LMA), relate to plant life-history strategies. LMA, a trait that depends on the thickness and density of leaf tissues, is correlated with other plant functional traits, including a negative correlation with photosynthesis per-unit leaf mass and a positive correlation with leaf lifespan (LL) (Wright et al., 2004 [2]). However, there is limited understanding of the mechanisms that relate LMA to the life-history strategies of plants, such as whether a species is fast-growing and short-lived (deemed "early-successional") or slow-growing and long-lived ("late- successional").

One way to gain a clearer understanding of how LMA relates to plant successional strategies is to recognize that LMA is a composite trait, reflecting the mass per area of multiple types of tissue (Poorter et al. 2009 [1]). We focus on two separate components of LMA: photosynthetic tissue, which contributes solely to photosynthesis, and structural tissue, which contributes to the longevity of leaves (LL). We analyze a mathematical model of competition between plant species that differ in their investments to these two components to determine the optimal LMA components of early-successional and late-successional plants. We hypothesize that (i) the LMA of the most competitive late-successional species will be dominated by structural rather than photosynthetic tissue, and (ii) the LMA of the most competitive early-successional species will be dominated by photosynthetic rather than structural tissue.

**4. *Pulmonary Vascular Pruning in Response to Radiation,* Matt Wilhelm[1], Dustin Begosh-Mayne[2], Walter O'Dell[3], College of Liberal Arts and Sciences, Department of Biology[1] College of Medicine[2], Department of Radiation Oncology[3] , University of Florida**

The lungs are highly sensitive to radiation. Following irradiation, acute endothelial cell damage and inflammation leads to blockage of the lumen of small arterioles. Prolonged occlusion leads to resorption (pruning) of these microvessels can lead to downstream radiation pneumonitis and long-term fibrosis. This cascade of events is hypothesized to occur in patients receiving radiation therapy (RT) for lung cancer. Quantification of vascular pruning due to the loss of small arterioles is important in evaluating current and future treatment plans for the estimated 221,200 new cases of lung cancer in 2015. Using in-house software, extraction of the vascular structure from three-dimensional (3D) X-ray computed tomography (CT) scans and quantification of the morphological features of the vascular tree can be used to compute the changes over time in the total vascular structure post-RT. After scanning and analyzing several representative patient data sets of 3D CT scans, a trend was discovered in the pruning of the vascular tree post-RT beginning 2-3 months post exposure that progressed through 7-8 months, followed by a partial recovery shortly starting from 9-10 months. These results demonstrate for the first time the ability to measure changes in vascular anatomy non-invasively in humans following radiation exposure. This new information can be applied to further research and development of treatment planning, in addition to an increase of quality-of-care for lung cancer patients receiving RT.