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Summer Thesis Mentors
Dr. Kristen Comfort, Dr. Anne Crecelius, Dr. Corinne Daprano, Prof. Sean Falkowski, Susan Ferguson, Dr. Karolyn Hansen, Dr. Matthew Lopper, Dr. Madhuri Kango-Singh, Dr. Caroline Merithew, Dr. Timothy Reissman, Dr. Yvonne Sun and Dr. Thomas Williams

Dayton Community Partners in Servant Leadership
Adventure Central, Center for Catholic Education, Homefull, Miami Valley Hospital HELP Program, Mission of Mary Farm and Reach Out of Montgomery County

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and the University Honors Berry Summer Thesis Institute Review Committee

University Honors Program Staff

email: honorsinfo@udayton.edu / website: www.udayton.edu/honors
Opening Remarks
12:30 p.m.

Sarah V. Miller
Major: Electrical Engineering
Mentor: Timothy Reissman, Ph.D.
Department: Mechanical Engineering

Thesis Title
Wearable Cardiac Monitoring

Description
My research entails looking into the functionality of existing wearable cardiac monitoring devices to see their effectiveness in gathering usable EKG/ECG material. If the devices currently on the market provide a clear signal, I will move forward and work on analyzing how well the device determines if the signal provided by the wearable is that of a normal heartbeat or that of one with an arrhythmia. However, if the current wearables are not able to provide a clear enough signal to be analyzed, I will modify a wearable to provide a clear signal.

Maggie E. Jewett
Major: Chemical Engineering
Mentor: Kristen Comfort, Ph.D.
Department: Chemical Engineering

Thesis Title
Design of an Enhanced Cellular Model for the Assessment and Tracking of Nanomaterials

Description
Due to their unique physicochemical properties, nanomaterial (NM)-based technologies are growing exponentially in scope and economic importance. This surge is resulting in significant degrees of NM waste and increased rates of human exposure. This has created a vital need to fully understand the potential biological consequences of NM exposure, characterize resulting NM-biological interfaces and determine subsequent toxicological effects. The long-term goal of this project is to design, optimize and implement an enhanced microenvironment model (EMM) to bridge this in vitro – in vivo gap and evaluate NM characteristics, pharmacokinetic/deposition profiles and induced biological responses under physiologically relevant conditions.

Emily M. Jones
Major: Biochemistry
Mentor: Matthew Lopper, Ph.D.
Department: Chemistry

Thesis Title
Combating Antibiotic Resistance Using Plant Derived Compounds

Description
My goal is to discover compounds from natural sources that can block bacterial efflux pumps. These pumps, which are over-expressed in antibiotic-resistant bacteria, have been shown to indiscriminately vacuum out cell waste, including antibiotics, and this allows the bacteria to survive in the presence of the antibiotics. To find compounds that can block bacterial efflux pumps, thus restoring the bacteria's susceptibility to antibiotics, I prepared extracts from 15 edible plants and have tested them in live E. coli cells and antibiotic well-diffusion plates to show whether the extracts are able to block the pumps.

This year the University Honors Program offered eight rising juniors the opportunity to participate in the Berry Summer Thesis Institute. First initiated in the summer of 2012 thanks to a gift from the Berry Family Foundation and the Berry family, the institute introduces students with a proven record of academic success and interest in research to experience intensive research, scholarship opportunities, academic Honors credits and professional development workshops. Each student pursued a 12-week summer thesis research project under the guidance of a UD faculty mentor and also participated in civic engagement and servant leadership with local community partners.

The Clare Boothe Luce Undergraduate Research Grant Program, through the University Honors Program, is supporting four women in STEM fields who are undertaking undergraduate research projects. Faculty mentors advise, motivate and prepare recipients to apply for graduate study and pursue careers in academia and/or research during the three years of participation. The program grants provide significant support for research during sophomore and junior years.
Anna K. Benton  
**Major:** Chemical Engineering  
**Mentor:** Karolyn Hansen, Ph.D.  
**Department:** Biology  

**Thesis Title**  
*Characterization of Organic Matrix Proteins in the Eastern Oyster, Crassostrea virginica*  

**Description**  
The project focuses on materials properties of oyster shell, a natural ceramic material assembled under aqueous conditions at ambient temperature and pressure. Specifically, we will characterize the organic matrix proteins in shell; these proteins contain the unique amino acid Dopa (3,4-dihydroxyphenylalanine) which will be used as a biomarker to track and identify the precursor proteins in oyster tissues. Research tasks focus on extraction and characterization of Dopa-containing proteins using biochemical techniques (extraction, column chromatography, gel electrophoresis, lyophilization, HPLC, amino acid analysis). Once obtained, purified proteins will be sent out for sequencing; sequences will be modeled using ChemDraw/Chem3D, and Gaussian-9 software.

Chad M. Jaenke  
**Major:** Biology  
**Mentor:** Thomas Williams, Ph.D.  
**Department:** Biology  

**Thesis Title**  
*Finding the Switches that Activate Animal Genes through a Combined in silico and in vivo Approach*  

**Description**  
The DNA sequences of species encode the recipes for making proteins and the instructions for protein use. While the code for protein recipes is known, a similar code for usage is lacking. This obstructs understanding the genetic basis of life as usage instructions (called CREs) may outnumber protein-coding genes by 20-50 fold. My research aims to identify CREs-controlling genes for a fruit fly trait by merging *in silico* (computational) and *in vivo* (experiments in organisms) approaches. CREs are a universal feature of life so these results are relevant to life at every level, including the betterment of the human condition.

Jenna N. Sorensen  
**Major:** Exercise Physiology  
**Mentor:** Anne Crecelius, Ph.D.  
**Department:** Health and Sport Science  

**Thesis Title**  
*The Effect of Remote Ischemic Preconditioning on Hypoxic (Low-Oxygen) Cognitive Function and Exercise Performance*  

**Description**  
Impairments in neurological and physical function occur in conditions of decreased oxygen delivery to tissue cells. We are determining the effects of reducing blood flow in the legs for four brief periods of time on how a subject performs on cognitive tests and during handgrip exercises in normal air conditions and when breathing air with less oxygen in it. The reduction in blood flow will occur in a procedure prior to the tests that are performed in normal and hypoxic, or low-oxygen, conditions.

Break  
2:45 p.m.

Cordell J. Stover  
**Major:** Exercise Science  
**Mentor:** Corinne Daprano, Ph.D.  
**Department:** Health and Sport Science  

**Thesis Title**  
*Youth Sport Concussion Management*  

**Description**  
As knowledge about concussions increases and more is being discovered regarding the lasting effects of concussions, youth sport coaches need to be better informed and educated on the signs and symptoms of concussions and the management of concussions and return-to-play procedures. This research examines what coaches of youth athletes (5-12 years of age) know about concussions and concussion management. Semi-structured interviews with coaches were conducted and will be analyzed in order to develop recommendations for effective training tools to help coaches identify and properly manage youth sport concussions.

Jordan M. Terschluse  
**Major:** Biology  
**Mentor:** Madhuri Kango-Singh, Ph.D.  
**Department:** Biology  

**Thesis Title**  
*Discovering Glioma inhibitors via chemical-genetic screens in Drosophila cancer models*  

**Description**  
Today, there are over 250 drugs being used to cure over 100 different types of cancer. We hypothesize that one of the drugs already being used in cancer treatment will either show positive or negative growth when applied specifically to glioblastoma, a type of brain tumor with poor prognosis. Using the fruit fly, *Drosophila melanogaster*, and 150 tyrosine kinase inhibitors, we can induce tumors and track their growth in response to the drugs. This would open the doors to researching similarities between drugs present in hundreds of chemical libraries. Additionally, the drugs that prove successful through the screenings could start being used in mammalian and clinical trials in the future.

Katrina A. Coleman  
**Major:** Industrial Engineering Technology  
**Mentor:** Sean Falkowski, M.S.  
**Department:** Engineering Management, Systems and Technology  

**Thesis Title**  
*Industry 4.0 in the Retail Sector: Sustainability of Food Retail Industries*  

**Description**  
With the advent of Industry 4.0, the fourth wave of the industrial revolution, the food retail industry has been revolutionizing at an unprecedented rate. Stores have become stocked with a large variety and quantity of goods, leading to an increase in waste accumulation. Although there have been advancements in large scale agriculture, not as many advancements have been made in efficiently distributing produce and minimizing waste. Therefore, I am researching how to create methods for grocery stores to become more sustainable considering the advancements of Industry 4.0.
Ashton N. Dix 4:00 p.m.

Major: Pre-medicine
Mentor: Yvonne Sun, Ph.D.
Department: Biology

Thesis Title
Development of an Analytical Method for SCFA Analysis

Description
The purpose of this research is to establish an analytical method for the analysis of short chain fatty acids (SCFAs). SCFAs are byproducts of fermentation in the gut. Previously established methods include gas chromatography (GC) and gas chromatography - mass spectrometry (GCMS). These methods are being tested for their viability through close cooperation with the chemical engineering and chemistry departments. The two main research questions being pursued are the SCFAs produced by *Listeria monocytogenes* and those produced in the fecal samples of mice. Mice are being used to determine how alcohol and aging impact SCFA concentrations.

Samantha L. Neanover 4:20 p.m.

Major: Pre-medicine/Medicinal-Pharmaceutical Chemistry
Mentor: Yvonne Sun, Ph.D.
Department: Biology

Thesis Title
Effect of Bacterial Membrane Composition on Antibiotic Susceptibility

Description
The bacterial membrane of *Listeria monocytogenes* was altered by increasing the concentration of short chain fatty acids with and without oxygen. Then ampicillin, an antibiotic, was applied to discs in different concentrations to study the inhibited growth of bacteria. The inhibition was measured by the zones of clearing that surrounded each disc. The larger zones were associated with greater bacterial death and an increase in antibiotic efficacy. Further knowledge on the effect of bacterial membrane composition on antibiotic susceptibility will provide the tools to combat antibiotic resistance and develop more effective antibiotics.

Lindsey M. Bronder 4:40 p.m.

Major: Secondary Catholic Religious Education/Adolescent to Young Adult Education
Mentor: Caroline Merithew, Ph.D.; Susan Ferguson, Executive Director at the Center for Catholic Education
Department: History and Education

Thesis Title
Capes and Catechesis: Using Comic Books to Catechize Catholic Youths

Description
This original archival research seeks to analyze the extent to which comic books can serve as an effective means to catechize, or teach the Catholic faith, American Catholic youth. Using George Pflaum’s comic series “Treasure Chest of Fun and Fact” (1946-1972) as an example of a Catholic comic book, I will then create my own comics that may serve as a teaching aid that can be tested in a high school classroom.