STETSON UNIVERSITY

Willa Dean Lowery Grant Awards to Support Research in the Natural Sciences

Year	Recipient Program	Project Title
2019	Heather Evans-Anderson Health Sciences	**Gene editing using CRISPR in *Ciona intestinalis* to examine heart development** **Abstract:** Gene editing via CRISPR has garnered global attention due to the recent actions of a Chinese scientist who used it to genetically modify a set of twin girls. This egregious act brought the world's attention to the powerful technology. I see great potential to use CRISPR as an educational tool. Previously I successfully used CRISPR in a semester long project conducted by undergraduates in a Cell Biology course. Here I intend to harness the power of CRISPR technology to genetically modify an invertebrate organism (*Ciona intestinalis*) to investigate the regulatory mechanisms of heart development. This proposal describes a set of specific research aims that will be conducted by undergraduate students at Stetson through an advanced genetics course in collaboration with Dr. Lynn Kee as well as several spin off senior research projects. The proposed project will bring cutting edge technology in an innovative application to Stetson. Funding provided by the Willa D Lowery grant would support several student projects that would lead to presentations at national level meetings and high impact peer reviewed publications.
2018	Lynn Kee Biology	**Gene Editing of Microorganisms Tradigrades and *Caenorhabditis elegans*** **Abstract:** The project will integrate novel gene editing tool design and construction of genetically modified genetic model microorganisms into research and within the Genetics BIOL302 lab curriculum. Recent advances in biotechnology enable scientists to quickly design and construct gene editing tools to manipulate genes of interest. The goal of the project is to work with undergraduates to study tardigrade and *Caenorhabditis elegans* biological processes. Using gene editing tools, we will incorporate fluorescent molecular markers into the genome of tardigrades and *C. elegans*. Experiments will provide novel insight and visualization of the dynamics of molecular machinery and sub-cellular structures in live animals during development and during treatment of extreme conditions. Engaging students in an authentic research experience in senior projects and Genetics lab will promote continued participation of students in the Natural Sciences and future careers in science or medicine. The project described here will further my development as a teacher-scholar at Stetson University.

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2017	Roslyn Crowder Biology	**Examination of Genistein-induced Oxidative Stress and Apoptosis in Lung Cancer Cells** **Abstract:** Lung cancer is the leading cause of cancer-related death for both men and women in the United States. Genistein, a naturally occurring substance found in soy products, possesses anticancer properties. Scientific research demonstrates that Genistein causes cytotoxicity and cell death in human ovarian cancer cells. In 2013, my undergraduate students and I investigated the ability of Genistein to cause cell death in human lung cancer cells. Our preliminary results show that Genistein causes cell death in human lung cancer cells. Follow-up experiments performed in the lab show that Genistein induces regulated cell death in and time-and dose-dependent manner. This proposal seeks to continue the work outlined in the 2016 Willa Dean Lowery Fund proposal to further characterize the observed Genistein- mediated lung cancer cell death. Specifically, students will investigate the role of oxidative stress in Genistein-mediated human lung cancer cell death. We believe this research may lead to a new innovative lung cancer treatment.
2017	Ben Tanner/ Jason Evans Environmental Science and Studies	**Determination of Past Shifts of the Salt Marsh/Mangrove Ecotone** **Abstract:**
2016	Roslyn Crowder Biology	**Examination of Genistein-mediated Lung Cancer Cell Death** **Abstract:** Lung cancer is the leading cause of cancer-related death for both men and women in the United States. Genistein, a naturally occurring substance found in soy products, possesses anticancer properties. Scientific research demonstrates that Genistein causes cytotoxicity and cell death in human ovarian cancer cells. In 2013, Dr. Crowder and her undergraduate research students investigated the ability of Genistein to cause cell death in human lung cancer cells. Their preliminary results show that Genistein causes cell death in human lung cancer cells. This proposal seeks to obtain funding to acquire a sophisticated fluorescent and bioluminescent plate reader to characterize the observed Genitesin-mediated lung cancer cell death. Students will investigate reduction in cell growth, protease activity and protein expression of cell death-associated proteins after cancer cell Genistein treatment. We believe this research may lead to a new innovative lung cancer treatment.

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Willa Dean Lowery Grant Awards to Support Research in the Natural Sciences

Year	Recipient Program	Project Title
2015	Asal Johnson Public Health	Socio-Spatial Analysis of Florida Suicide Mortality **Abstract:** In the United States suicide was the 10th leading cause of death accounting for more than 40,000 deaths in 2010 (1). In Florida suicide was the 9th leading cause of death in 2013 where the number of suicides from 2011-2013 exceeded 8000 deaths (2). The purpose of this study is to determine social and spatial patterns of suicide deaths in the state of Florida. The project will merge the aggregated number of suicide deaths files from the Florida Department of Health, census data 2000 and rural urban continuum codes to obtain neighborhood level constructs contributing to the existence of possible suicide clusters. Census 2000 is chosen because those who died due to suicide from 2000 to 2010 were not counted in census 2010. We anticipate suicide clusters will be associated with neighborhood characteristics. The results of this proposed study will guide interventions that have the potential to build more cohesive, healthy and supportive networks for residents of areas that encounter higher rates of suicide. This project is in alignment with Stetson University's commitment to social and environmental responsibility and achieving faculty and student learning through community impact.
2014	Cindy Bennington Biology	3 Separate Project Informing the Volusia Sandhill Ecosystem Restoration Project **Abstract:** Stetson University's Volusia Sandhill Teaching Landscape is an outdoor environmental education site, adjacent to the Gillespie Museum and Rinker Environmental Learning Center. Initiated in 2011 by Dr. Karen Cole, Director of the Gillespie Museum, and me, the site recreates a piece of the historic longleaf pine community that once dominated the sandy ridges of DeLand. Since 2011 we have planted over 100 trees, shrubs, and perennials and have used the landscape extensively in community outreach and as a component of class projects (see Appendix A). We now seek to expand our use of the site for undergraduate research projects. The objectives of the proposed research are to: 1) quantify current plant, insect and bird diversity in the site, 2) measure height and diameter of all trees planted, from which growth rates can be calculated in the future, and 3) determine conditions for germination and establishment of herbaceous species that dominate the understory of sandhills. Estimates of floral and faunal diversity will be compared to estimates from local, intact sandhill communities. Data on tree growth rates as well as the germination and establishment of understory sandhill species will inform our own restoration efforts and will contribute to a growing literature on restoration of rapidly declining longleaf pine communities.

Willa Dean Lowery Grant Awards to Support Research in the Natural Sciences

Year	Recipient Program	Project Title
2014	Roslyn Crowder Biology	**Developing a Transfection Protocol to Improve Jurkat T Cell Transfection Efficiency** **Abstract:** TNF-related apoptosis-inducing ligand (TRAIL), a member of the TNF family, has become an exciting cancer therapeutic target due to its toxic effect on various cancer cells while leaving normal cells unharmed. Loss of initiator caspase-8 activity has been identified as one mechanism of resistance to TRAIL. Ubiquitination of caspase- 8 has been shown to control caspase-8 activity and regulate cell death. Caspase-8 sumoylation has also been previously described. The role of caspase-8 sumoylation in caspase-8 activity and subsequent TRAIL-sensitivity has not been explored. My research project will examine the role of caspase-8 sumoylation in TRAIL-mediated cell death. I previously made a caspase-8 mutant expression plasmid in which caspase-8 cannot be sumoylated. The protein expression plasmid will be placed into cancer cells that lack caspase-8 protein expression. I will use transfection, a technique to deliver DNA into eukaryotic cells, to introduce the mutant expression plasmid into caspase-8 deficient Jurkat T leukemia cells. Normal Jurkat cells are sensitive to TRAIL-induced cell death. Yet, caspase-8 null Jurkat cells are resistant to TRAIL. Introducing the mutant caspase-8 into caspase-8 null Jurkat cells will allow me to investigate whether caspase-8 sumoylation is needed for TRAIL- induced cell death.
2013	Matthew Schrager Integrative Health Science	**Sage Hall Expansion of the Biomechanics Laboratory: Linear Gait Kinematic Characteristics of across the Age Span Using GAITRite System** **Abstract:** The equipment required for kinematic studies in both the aging and pediatric populations that I am currently working with consists of a series of pressure sensors that allow for measurement of linear kinematic variables such as gait (e.g. walking) velocity, step length, stepwidth, stride length, stride time variability (a measure of stability and risk for falls). The expansion of 2 studies — a large-scale antioxidant/blueberry supplementation and aging study and the minimalist shoe studies—will be significantly enhanced by this equipment. We now are using equipment not designed to measure linear kinematic parameters of gait, including velocity, which is a key indicator of function and functional independence in older persons that is sensitive to changes in health status. With a GAITRite System as an integrated component added to the current system and its kinematic (i.e. joint position measurement) capabilities, the enhanced Biomechanics Lab will possess significantly greater capacity for undergraduate research of publishable quality (Schrager MA *et al*, 2008; Kelly VE, Schrager MA, et al, 2008) (1, 3). Validity testing indicates that GAITRite systems are appropriate for peer-reviewed research (2, 4), and having worked previously with this equipment I am confident it will help in furthering my research agenda.

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2013	Alicia (Schultheis) Slater Biology	Multilocus Phylogeography of a Montane Great Basin Stonefly **Abstract:** Hesperoperla pacifica is a montane stonefly found throughout the Great Basin and western US. The area is known for its mountaintop habitat patches hospitable to stoneflies and other water--- associated species, separated from each other by desert. In cooler, wetter periods during the Pleistocene these wet habitats should have been connected and biota would be later separated n different mountaintops during warm, dry periods. Thus, we hypothesize that H. pacifica populations on separate mountain ranges will have high levels of genetic differentiation and have diverged during the late Pleistocence (2.5 million to 12 thousand years ago). Schultheis et al. (2012) found high genetic differentiation among populations of another stonefly (Doroneuria baumanni) and divergence times that predated the late Pleistocene. However, their conclusions were based on data from a single genetic locus which resulted in very wide confidence intervals on divergence time estimates. They also identified three major Great Basin clades but were not able to elucidate relationships among them. In H. pacifica, we will test our hypotheses using four loci: the mitochondrial cytochrome b gene and 3 anonymous nuclear loci that we have already identified. This is a collaborative project between Nick Davis, a Master's student at Brigham Young University, Dr. Allyson Fenwick (Brown Visiting Scholar), and Dr. Alicia Schultheis.
2012	Anthony Abbott Environmental Science	Analysis of College Sustainability initiatives at Stetson, Furman and Warren Wilson
2012	Hala ElAarag Computer Science	HatterHealth Connect: Body Sensor Networks and Social Networks for Health Awareness
2012	Chelsea Embry Integrative Health Science	Gene expression with real-time Quantitative PCR
2012	Danielle Morel Physics	Linear Synaptic Integration under Levels of Bombardment and Time Constants