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- Minority Access to Research Careers
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Dear Posters on the Hill Participants:

I wish to congratulate you on your selection to participate in the 2011 Posters on the Hill. Your research project was selected from over 700 applications. The Council on Undergraduate Research is impressed by your accomplishments and is pleased that you have been able to come to Washington, D.C. to participate in this prestigious event. We are proud of our members who serve as advisors and mentor undergraduate researchers and believe you and your students are stellar examples of the best in higher education.

This is our 15th annual Posters on the Hill event and we are excited to announce it is taking place during the first ever Undergraduate Research Week, deemed so by the U.S. House of Representatives. This year we have expanded the Posters on the Hill event to include a special luncheon honoring our Humanities participants and an evening session for the Sciences.

We know that your undergraduate research experience has contributed positively to the value of your undergraduate education and that you will be better prepared as a result for graduate school, your career, and the future. You have had the opportunity to develop skills in analysis, critical thinking, problem-solving and innovation through your research project, all of which are important for future success, whichever path you may choose

We wish you success as you continue your research and your studies. Perhaps someday you will be a member of the Council on Undergraduate Research and come to Washington, D. C. when one of your students presents his or her research at Posters on the Hill. Or maybe you will be a Member of Congress and attend Posters on the Hill!

Best Wishes.

A handwritten signature in black ink that reads "Nancy Hensel". The signature is written in a cursive, flowing style.

Nancy Hensel
Executive Officer

CUR Arts and Humanities Posters

**The following posters will be presented April 13, 2011
12:00-1:30pm – Rayburn House Office Building, 339-B**

Poster display location is shown below in parentheses, abstract is shown on page to right.

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CUR Science and Social Science Posters

**The following posters will be presented April 13, 2011
5:30-7:30pm – Rayburn House Office Building, 338-B, 339-B, 340-B**

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Simpson College
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Student Poster Abstracts – Arts and Humanities

Arkansas

STUDENT: Anitra Noel Van Prooyen

INSTITUTION: University of Arkansas at Little Rock

FACULTY ADVISOR: Thomas Kaiser

POSTER TITLE: Why Did the Trains Stop? The Suspension of Jewish Deportations From Slovakia During the Holocaust.

DISPLAY AREA: 1

FUNDING: University of Arkansas at Little Rock

ABSTRACT: In 1942, the bloodiest year of the Holocaust, Nazi Germany sent almost three million people to the death camps of the East in its effort to exterminate all the Jews of Europe. Yet amidst this carnage—when deportations from other countries were accelerating--Slovakia resisted German pressure and suddenly halted all Jewish deportations for two years. What accounts for this anomaly, one of the Holocaust's greatest mysteries? Historians have yet to provide a satisfactory answer. Most have focused on the work of individual organizations and groups working in isolation. Research indicates that none of these groups relying on its own resources had the power to stop the wheels of death from turning. The Slovakian anomaly remains unresolved. A paradox is invoked to explain this anomaly: the only way Slovaks could interrupt Germany's Final Solution was to co-opt the Slovak regime installed by the Germans themselves. This strategy was deployed by three groups attempting to stop the slaughter: Jewish organizations bribed German officials to thwart the plans of Berlin; local churches rallied public opposition to the deportations by capitalizing upon the Nazi publicity campaign to demonstrate the autonomy of its conquered territories; and Slovak politicians, having acquired oversight of the deportees, sabotaged the Final Solution by manipulating German bureaucrats put there to execute it. In these ingenious ways, various elements of the Slovak nation, working independently but in parallel, suspended the death sentence Hitler had decreed against a major Jewish population. For two years, tyranny had subverted itself.

California

STUDENT: Laura LaPlaca

INSTITUTION: Pepperdine University

FACULTY ADVISOR: Cynthia Colburn

POSTER TITLE: High Art in Prime Time : Televisual Depictions of Art and Artistic Depictions of Television

DISPLAY AREA: 2

ABSTRACT: Immediately upon inception, television usurped conventional image-making systems as the nation's most pervasive disseminator of visual information. As television's broad appeal normalized exposure to "high" and "low" imageries among diverse audiences, a merger of elite and popular cultures appeared increasingly inevitable. However, rather than exploit possibilities for collaboration, the television and fine arts industries denied acknowledgment of their closely related functions and symbolis For seventy years, the art world has been lampooned, vilified and trivialized with daily, if not hourly, regularity on mainstream television progra Meanwhile, artists have asserted that television travesties the emotional, heroic and uniquely human aspects of the fine arts tradition. As such, the relationship between television and art has evolved as a system of volatile oppositions – ephemeral v. permanent, reproducible v. singular, ubiquitous v. rarefied – that is not only an inadequate distillation of complex dialogues, but a major hindrance to the study of postindustrial visual culture. The researcher cites the most acerbic confrontations from 1948 to the present, with examples culled from hundreds of series like *Batman*, *I Love Lucy*, *Sesame Street*, *CSI* and *Seinfeld*, as well as the work of seminal artists including Nam June Paik, Bill Viola and Wolf Vostell. Refusal to reconcile the stratification of visual culture appears increasingly irresponsible in a society defined by simultaneity, interchange and collaboration. Television merits extended and intelligent discussion as a generative force in contemporary culture – a culture whose diverse "artifacts" subsist not only on museum walls, but as collective mass memories.

California continued

STUDENT: Ilona Gerbakher

INSTITUTION: University of California, Los Angeles

FACULTY ADVISOR: Micahel Morony

POSTER TITLE: A Historiography of Female Intellectual Inferiority in Islamic Legal Scholarship

DISPLAY AREA: 3

ABSTRACT: In Islamic historical scholarship, a debate has arisen as to whether a woman's intelligence is half that of a man. The roots of this debate lie in varying interpretations of the Surat al-Baqarah (Quran, 2:282), which states that when a plaintiff brings a case involving debt, business contracts, or financial obligations to the Shari'a courts, he should bring two female witnesses to stand in for one male witness. When interpreted literally, this Surah suggests that a woman's testimony in financial matters is worth half that of a man. However, various Islamic jurists have expanded this Surah's significance; in fact, it has come down in modern scholarship as the ultimate Qur'anic condemnation of a woman's intelligence. The historiographical and legal debate about this Surah's interpretation is an important determining factor and gauge of women's place in modern Islam, and its implications affect women well beyond the boundaries of Shari'a courts. This study examines the treatment of female intellectual equality in 20th-century historical scholarship, and breaks down the historical treatment of the Surah into four distinct schools of thought: the Islamic Orientalists; the Christian Orientalists; the Sub-Continental Revisionists; and the Westen-Educated Scholars of Women in Islam. The study analyzes the conceptual frameworks that bind each school of thought to a particular treatment of the concept of female intelligence in Islamic law.

Kentucky

STUDENT: Ashlee Cobb

INSTITUTION: Murray State University

FACULTY ADVISOR: John F. Mateja

POSTER TITLE: Family Systems Theory Observed in the Bennet and March Families

DISPLAY AREA: 4

FUNDING: McNair Scholars Program

ABSTRACT: This study applies Baumrind's parenting style classifications (neglectful, authoritarian, permissive, and authoritative) and family systems theory studies as they pertain to adolescent and child development to two literary family systems, each comprised of four or more sisters. Research on family systems theory, parenting styles, and child development indicate authoritative parenting affects child development positively while authoritarian, permissive, and neglectful styles affect the child in negative ways, such as lower self-esteem and depression. Research has also confirmed the spillover hypothesis, which shows that marital conflict is positively correlated with negative parenting styles and lack of parental warmth toward the children. These results explain and predict the literary adolescents' behavior and actions in Jane Austen's *Pride and Prejudice* and Louisa May Alcott's *Little Women*. In *Pride and Prejudice*, neglectful and permissive parenting styles affect the heroines negatively. The younger Bennet sisters disgrace and embarrass the eldest sisters and the family in general by being flirtatious, attention-seeking, and foolish. In *Little Women*, the parents' unified authoritative parenting style affects the heroines positively, despite the father's absence at war and the precarious financial situation. Because of the positive parenting style of the March parents, each surviving daughter becomes an upstanding, moral woman with a husband who loves her.

Massachusetts

STUDENT: Mary Kathleen Caulfield

INSTITUTION: College of the Holy Cross

FACULTY ADVISOR: Mary Ebbott | Thomas Martin

POSTER TITLE: The Emergent Edition of Josephus: A New Approach to Ancient Textual Criticism

DISPLAY AREA: 5

FUNDING: The Mellon Foundation

ABSTRACT: The Josephus Emergent Edition Project ("JEEP") has made accessible, for the first time, three Latin texts of the most pivotal chapter in Flavius Josephus' Jewish War, based on printed editions from the 15th and 16th centuries – a time at which Josephus' works were second in popularity only to the Bible. These works hold a special interest for textual critics in that they were originally written in Aramaic, later in ancient Greek, and finally translated into Latin. Textual criticism, the critical analysis of the transion of texts, holds immense significance for cultural fundamentals such as Shakespeare and the Christian Bible, as well as the Hebrew Bible, the Qur'an, and the Dead Sea Scrolls. The discipline aims to determine what the ancient originals of these works "really" said, in their source language, and to identify and account for the alterations and mutations that occur over time. For JEEP, working from scanned images and high-quality photographs, we transcribed the texts and digitally tagged special components in Extensible Markup Language (XML) for content-specific display. With this data we were able to compare editions and isolate differences for use in tracing back to the "truest" representation of the Latin Josephus. The Josephus Emergent Edition Project takes its name from the new editorial technique devised during and for the project, a full-disclosure comparative approach in the spirit of the open source humanities movement. This "emergent edition" technique eliminates redundant revision, fosters efficient collaboration, and allows for unlimited expansion of the scope of sources.

STUDENT: Sarah Fuller

INSTITUTION: Bridgewater State University

FACULTY ADVISOR: Margaret Lowe

POSTER TITLE: A Slip of Paper in a Black Walnut Box: An Examination of the Suffrage Debate in Beverly, Massachusetts, 1913-1915

DISPLAY AREA: 6

FUNDING: Adrian Tinsley Undergraduate Research Program

ABSTRACT: It was not until 1920, 72 years after the birth of the suffrage movement that Massachusetts women gained the right to vote. While other state suffrage associations succeeded in persuading their governments to pass laws securing the vote for women, Massachusetts reformers were met with overwhelming resistance. Historians of the pro and anti women's suffrage movements often focus on the national and sometimes individual state stories, paying particular attention to such elements as class and race, as well as the changing gender relations that were present in the early twentieth century. While this focus is important, it ignores a critical aspect of the history of women's suffrage: the local, town-by-town campaigns. By presenting never before analyzed primary source documents recently discovered in the archives of the Beverly Historical Society in Beverly, MA, this study shines light on the local narrative. Beverly, Massachusetts provides much more than simply a window into one local, isolated suffrage debate. It offers an avenue through which historians may start to fill in a significant ing piece to the national story. The documents found in Beverly paint a picture of the women who fought for, and particularly against, suffrage. The Beverly story also reveals the depth of the anti-suffrage movement. Not just conservative, stodgy, holdouts, they were actually strong champions of women's role as local activists and reformers. Anti-suffragists did, however, also hold deeply felt and reasoned concerns about the impact of the granting of the vote to women on the American family, society, and government.

Massachusetts continued

STUDENT: T'Sey-Haye M Preaster

INSTITUTION: Smith College

FACULTY ADVISOR: Riche J. D. Barnes

POSTER TITLE: Defining Black Women in Philanthropy: A Historical Case Study

DISPLAY AREA: 7

FUNDING: Andrew W. Mellon Foundation

ABSTRACT: This research examines Black women's philanthropy in the U.S. (~1896-1950). History shows that Black women have worked for the uplift of their sex and race, but the meaning and impact of their philanthropic labor has not been fully examined or articulated. Black women organized and gave their time and resources in unprecedented fashion during the turn of the 20th century. Their philanthropy set the stage for the modern Civil Rights and women's rights movements, prompting new discourse on the culture and traditions of Black women's philanthropy today. My research focuses on the early history and leadership of the National Association of Colored Women (NACW) and its first president, Mary Church Terrell. Through archival research at the Sophia Smith Collection at Smith and Moorland-Spingarn Archives, a case study has been prepared which expands the prevailing definition of philanthropy (e.g. wealthy, white, male, institutional). The findings reveal a new picture of philanthropy amongst Black women, which encompassed gifts of time, talent, and resources beyond large cash donations. At age ninety, Mrs. Terrell established a fund to end segregation in D.C. and the early work of the NACW revealed a strategic and large-scale philanthropic agenda as the Association successfully administered a \$15,000 campaign to preserve Frederick Douglass' home in Anacostia. This project is salient in that it seeks to broaden the definition of American philanthropy to include Black women as effective socio-political change-agents, and improves our understanding of how and why communities of color give for the public good today.

Nebraska

STUDENT: Sada Marie Hotovy

INSTITUTION: University of Nebraska-Kearney

FACULTY ADVISOR: Kathryn N Benzel

POSTER TITLE: Discovering Character with Carl Sandburg: New Territory in an Annotated Transcription'

DISPLAY AREA: 8

FUNDING: Office of Sponsored Programs

ABSTRACT: Carl Sandburg's personal handwritten notebooks (1904-1907) give insight into his early of life when he was exploring the workings of human character and seeking to understand himself as a writer. These notebooks are currently housed at the Rare Book & Manuscript Library at the University of Illinois at Urbana-Champaign, and are in fragile condition. Consequently in their current condition, they have been generally unavailable to researchers. This project transcribes and annotates one of these early notebooks written in approximately 1904. One hundred and thirty-eight pages of a handwritten text were transcribed and then thirty pages have been annotated. The transcription and annotations reveal the experiences and literature that influenced Sandburg in his formative years, after he left Lombard College (1904-1906) and before he published his well known "Chicago Poems" (1916). This first notebook also gives insight into the creation of Sandburg's earliest published works, especially the little known poetry and prose of "In Reckless Ecstasy" (1904) and "Incidentals" (1906). This poster demonstrates the transcription/annotation process and draws conclusions about Sandburg's literary background. By transcribing and annotating Sandburg's recorded notes, especially quotations from other works or authors, Sandburg's interests and his commentary on authors and American cultural history is revealed. Contextualizing the transcription with annotations explores Sandburg's personal and literary backgrounds and ways that they inform his development as writer, making him "The Poet of the People".

New York

STUDENT: David L. O'Donnell

INSTITUTION: State University of New York at Geneseo

FACULTY ADVISOR: Emilye J. Crosby

POSTER TITLE: Black Power in Rochester, New York, from 1965 to 1967

DISPLAY AREA: 9

FUNDING: Geneseo Foundation

ABSTRACT: This project focuses on the development of the FIGHT (Freedom, Integration, God, Honor, Today), founded in Rochester, NY after a race riot in 1964. Community groups within the African American community in Rochester, NY, with the assistance of organizer Saul Alinsky and the Industrial Areas Foundation, established FIGHT to use the black community's numerical strength to overcome structural barriers to racial inequality. Although FIGHT did not initially use the term "Black Power," by 1967, the organization had demonstrated key themes of Black Power organizing – self-determination and racial pride in a number of organizing efforts—as it tackled issues like job and housing discrimination and established community development organizations. FIGHT was able to organize for community representation on Rochester's anti-poverty board, and to have black communities included in the process of urban renewal. FIGHT also fought to have major employers in Rochester change hiring practices. This approach was influenced by recent scholarship on the Black Power Movement that approaches the topic through a local perspective, emphasizing that at the grassroots, Black Power ideology was focused on organizing for community power to overcome structural inequality in employment, housing, education, and other areas. This view contrasts with normative overviews that consider Black Power the violent and racist antithesis of the core values of the Civil Rights Movement. Applying this research to Rochester helps clarify FIGHT's activism in the mid-1960s and helps refine an often overly simplified view of Black Power. Furthermore, it helps reexamine structural and racial inequality, which remain important issues today.

North Carolina

STUDENT: Patrick Cash

INSTITUTION: Mars Hill College

FACULTY ADVISOR: Kathryn Newfont | John Gripentrog

POSTER TITLE: Jim Crow's Lawyer: Senator Samuel J. Ervin, Jr. and his opposition of the African American Civil Rights Movement

DISPLAY AREA: 10

FUNDING: Title III

ABSTRACT: Senator Sam J. Ervin, Jr. became an American hero in 1974 as the chair of the Watergate Committee, but few people know of his pivotal role as a leader against civil rights. The North Carolina Democrat played a crucial part in two of the most important events in postwar American history. Yet only one is well publicized. This project contributes to the limited scholarly literature available on Ervin's anti-civil rights stance. By examining Ervin's central role in southern segregationists' opposition to civil rights legislation. It brings to light an important part of his political career that has been overshadowed by his Watergate mystique. Ervin entered the Senate in the 1950s just as *Brown v. Board of Education of Topeka* sparked national debates on school desegregation and civil rights. Like his fellow segregationist senators, Ervin took a fierce stand against civil rights. He became one of the leading voices of the south's opposition. According to fellow senators Strom Thurmond of South Carolina and Harry Byrd of Virginia, Ervin served as the unofficial leader of the southern opposition. Unlike many of his colleagues, however, Ervin argued against civil rights legislation based on his idea of constitutional "originalism" rather than white supremacy. He claimed that the proposed bills and acts violated the Constitution on the basis of "states' rights." It is important for historians to understand why Ervin, a recognized "champion" of civil liberties and self-proclaimed protector of the Constitution, so fiercely opposed civil rights for African Americans.

South Dakota

STUDENT: Kendra Sue Van Nyhuis

INSTITUTION: University of South Dakota

FACULTY ADVISOR: Deborah Check Reeves

POSTER TITLE: Identification Guide for Eastern Asian Bamboo Flutes

DISPLAY AREA: 11

ABSTRACT: The National Music Museum at the University of South Dakota is home to more than eighty bamboo flutes from Eastern Asia. Since most of them simply had cursory labels like "bamboo flute", the opportunity presented itself to develop a method that could be used to produce accurate and detailed labels quickly and efficiently for any flute from Eastern Asia whose instrument name was unknown. A review of literature was used to gather information on what characteristics defined the instrument types and helped determine what labels the instruments should be given. As the flutes were cataloged, additional labels were further refined based on features I observed on the actual objects. These labels continued to be tested as more flutes were studied affirming most of the names and types. Through this process a system was developed whereby a person untrained in Eastern Asian flutes could, with certainty, tell instrument types apart. At the end of this research a simple flow chart identification guide was created based on the defining characteristics of these bamboo flutes. The chart contains eighteen common flutes originating in the countries of Japan, China, and Korea. An included supplement to the identification chart is a packet containing descriptions of each instrument along with its uses and cultural ties in its country of origin. This research and the resulting flow chart can be used to help simplify the cataloguing process of Eastern Asian bamboo flutes at other museums and private collections.

Texas

STUDENT: Joshua Glenn Alkire

INSTITUTION: Abilene Christian University

FACULTY ADVISOR: William Myles Carroll

POSTER TITLE: Literally Speaking: The Language of Truth

DISPLAY AREA: 12

ABSTRACT: For at least a hundred years, prescriptive grammarians such as H.W. Folwer and E.B. White have criticized sloppy speakers who "literally" throw the English language to the dogs by misusing a common adverb when they supposedly intend to say "figuratively." More recently, several members of the general population have begun to archive humorous examples of the adverb's misuse, and a popular grammar blog now records two notorious examples in which a senator and a vice president misuse the word "literally" four and eight times, respectively, within a single speech. Nevertheless, current research demonstrates that audience assumptions about what entails correct usage may be unfounded. Corpus-based linguistic research shows that the alleged misuse of "literally" accounts for more occurrences of "literally" than any other usage, and Jesse Sheidlower of the Oxford English Dictionary points out that "literally" was used as an intensifier for nearly two hundred years before grammarians began to raise significant objections. This research shows that similar linguistic phenomena also occur in French, Italian, and Russian, suggesting that a process larger than any single country or language is at work. For centuries, modernism has convinced many Westerners that something cannot be true at all unless it is literally true, as is still evident today when evangelical Christians insist on exclusively literal readings of scripture. Thus, politicians and other careful speakers of English should exercise great caution when using the word "literally," for its effects on Western audiences are both powerful and somewhat unpredictable.

Virginia

STUDENT: Analicia Crystal Carpio

INSTITUTION: George Mason University

FACULTY ADVISOR: John N Paden

POSTER TITLE: Music and the Taiwanese Identity

DISPLAY AREA: 13

FUNDING: Center for Asia Pacific Economic Cooperation

ABSTRACT: Can music be utilized as a tool of soft power? This project seeks to explore the ways in which music can be used to shape, cultivate, and assert national identity. Based on original ethnomusicology fieldwork conducted in Taipei, Orchid Island, and the classrooms of the Washington D.C. Taiwanese School, it has been concluded that Taiwan offers a compelling case study. As its Council for Cultural Affairs prepares to become a Ministry of Culture and seeks to start "making Taiwan's culture known to the world" through the creation and exportation of its own musical and artistic repertoire, Taiwan is demonstrating the use of "soft power" in the context of mainland China's increasing political and economic power. Back in the greater Washington D.C. area, the Washington D.C. Taiwanese School is using traditional Taiwanese folk songs and music to help its students learn the Taiwanese language and cultivate a unique Taiwanese identity. Though it remains to be seen if these attempts to construct and assert national identity will ultimately be successful, they are significant in light of the importance of Taiwan's cross-strait relations with mainland China to peace and stability in this region of the world. In this global context, Taiwan offers a significant window into the critical but often overlooked relationship between music, the arts, and the internal and external identity formation and potential conflict dynamics of our international community.

Wisconsin

STUDENT: Melanie Rockwell

INSTITUTION: University of Wisconsin - Stevens Point

FACULTY ADVISOR: Michael Estanich

POSTER TITLE: Something Old, Something Borrowed, Something New: The Influence of Native American Philosophies on Early Modern Dance Artists

DISPLAY AREA: 14

ABSTRACT: The "quest for the ideal" is a deeply ingrained principle of dance. From early romantic ballets to post modern artists, this desire has inspired radical change and developments in the field. Searching for a uniquely American identity, the pioneers of modern dance drew inspiration from many sources – most significant among them are the Native American cultures and their traditional practices. In this paper, early modern dance artists whose work reflects the direct movement and thematic influences of Native American culture are discussed. The consequences of extracting these ideas from their original contexts are also discussed. Notable figures such as Ted Shawn, Martha Graham, Erick Hawkins and Lester Horton were attracted to the Native American's desire to be connected with each other and with the world around them through body movement and the alliance of mind, spirit and body. These great artists were interested in how spiritual and philosophical ideas could be utilized as inspiration for aesthetic practice. Principles of Native American thinking continue to inform current dance practices. To be progressive in today's culture, we must first consider our origins and how they still reverberate today. Through rehearsals with peers and choreographic explorations, the importance of ritual practice and the power of memory and ancestral preservation were discovered – key concepts in Native American philosophies.

Student Poster Abstracts – Science and Social Science

Alabama

STUDENT: Jose Andres Roman

INSTITUTION: University of Alabama at Birmingham

FACULTY ADVISOR: Candace Floyd

POSTER TITLE: Delayed Administration of Single-Walled Carbon Nanotubes Chemically-Functionalized with Polyethylene Glycol Promote Tissue Repair in a Rat Model of Spinal Cord Injury.

DIVISION: Biology

DISPLAY AREA: 1A

ABSTRACT: Traumatic spinal cord injury (SCI) induces tissue damage and results in the formation of a cavity that inhibits axonal regrowth. Filling this cavity with a growth-perive substrate would likely promote regeneration and repair. Single walled carbon nanotubes grafted with polyethylene glycol (SWNT-PEG) have been shown to increase the length of neuronal processes in vitro and promote growth of neurons in vivo. It was hypothesized that an administration of SWNT-PEG administered after an SCI transection injury will promote regeneration of axons into the lesion cavity and functional recovery of the hind limbs. To evaluate this hypothesis, complete transection spinal cord injury was induced 3-4 days later at the T9 vertebrae. One week after transection, the epicenter of the lesion was injected with 25 μ L of either vehicle (saline), 1.0 μ g/mL, 10.0 μ g/mL, or 100.0 μ g/mL of SWNT-PEG. Behavior analysis was conducted before injury, before treatment, and weekly for twenty-eight days after treatment. At 28-days post-treatment the rats were euthanized and tissue at the epicenter of the lesion was extracted. Immunohistochemical techniques were used to detect the area of the cyst, the thickness of the glial scar, and axonal morphology. It was found that post-SCI administration of SWNT-PEG increases neurofilament-positive fibers in the lesion and does not increase reactive gliosis. Also, post-SCI administration of SWNT-PEG decreases the lesion volume and results in slightly improved hind limb locomotor recovery without inducing allodynia or hyperalgesia. These data suggest that SWNT-PEG may be an effective substrate to promote axonal repair and regeneration after SCI.

Alaska

STUDENT: Mallory Givens

INSTITUTION: University of Alaska Anchorage

FACULTY ADVISOR: Jennifer Burns

POSTER TITLE: Developmental Changes in the Myosin Heavy Chain (MHC) Expression in Harp Seals.

DIVISION: Biology

DISPLAY AREA: 1B

FUNDING: University of Alaska Anchorage

ABSTRACT: In marine mammals, developmental changes are most evident in biochemistry related to oxygen stores and fuel use pathways. However, the connection between these biochemical properties and the structural components of muscle such as myosin heavy chains (MHC) are not as well studied, particularly in cardiac tissue. At the structural level, heart muscle fibers consist primarily of two types of MHC's, α and β . The MHC's ratchet along the actin framework of the muscle; therefore, shortening the muscle fiber and driving contraction. The two isoforms differ in their rate of contraction, and efficiency of O₂ use, with α -MHC driving faster contractions, but with lower efficiency (ATP/O₂). As a result of age-related declines in metabolic rate, and age-related increases in body mass, there is frequently a shift from α - to β -MHC with age. In larger marine mammals where O₂ conservation is critical due to their underwater foraging activities, the post-natal increase in α -MHC expression may be much smaller or even absent. Therefore, the aim of this study was to determine the MHC expression within the heart ventricles of harp seals during development. To address this, the relative proportion of MHC fiber types in samples from the heart ventricles of 42 harp seals ranging in age from fetal to late weaned was measured. MHC isoforms were separated using SDS-PAGE, and quantified by densitometry. It was found that the seal hearts expressed β -MHC regardless of age. This indicates that postnatal cardiac development is not due to shifts in MHC but to maturation of existing myofibers.

Arizona

STUDENT: Gabriel L Zilnik

INSTITUTION: Arizona State University

FACULTY ADVISOR: James R Hagler

POSTER TITLE: Deciphering Scavenging Propensity among Arthropod Predators

DIVISION: Biology

DISPLAY AREA: 1C

FUNDING: School of Life Sciences Undergraduate Research Program

ABSTRACT: Scavenging is a well documented feeding behavior among many arthropod predators. However, quantifying scavenging feeding activity is not well understood because many predators are small and elusive. This makes directly observing predation events in nature almost impossible. If predators prefer dead prey (carrion) to live prey, this would diminish their impact as biological control agents. As such, determining the rate of feeding activity by predators on live prey or carrion is of great importance. The objective of this study was to develop a method to indirectly study predator feeding activity on the sweetpotato whitefly, a major agronomic pest. To do this, we marked cohorts of living and dead whiteflies, each with a unique protein. Then, the two whitefly cohorts were exposed to three insect predator species: *Chrysoperla rufilabris*, *Collops vittatus*, and *Hippodamia convergens* for a period of time. In turn, the predator's gut contents were analyzed for the presence of the two unique protein marks using protein-specific enzyme-linked immunosorbent assays (ELISA). The ELISAs provide a method to indirectly measure the feeding choice exhibited by these predators in nature. Ultimately, this method of predator assessment will be used to determine the role of scavenging in the field.

STUDENT: Lujendra Ojha

INSTITUTION: University of Arizona

FACULTY ADVISOR: Alfred McEwen

POSTER TITLE: Discovery, orientation, distribution and formation of a mass wasting process on Mars: Transient Slope Lineae.

DIVISION: Geosciences

DISPLAY AREA: 1D

ABSTRACT: High resolution images of Mars acquired with the High Resolution Imaging Science Experiment (HiRISE) camera onboard the Mars Reconnaissance Orbiter (MRO) have allowed us to carry out detailed analyses of surface processes on Mars. A new method of change detection was developed to characterize temporal changes on Mars due to currently active geologic processes. The method uses high resolution (1 m/post) Digital Elevation Models (DEMs) and their associated orthorectified images. Orthorectified images helps eliminate any distortion on the images created by different viewing geometry of camera. Through this process, flow-like features were discovered, which were named "Transient Slope Lineae", or TSL. They form on southern-mid latitudes of Mars during southern summer. At southern mid-latitudes the surface temperature can exceed the sublimation and in some extreme cases the melting point of water during this time. Temperature higher than 300K is needed to melt water ice, however, water ice with impurities like perchlorate, have lower melting point. TSLs forming only during times when surface temperature is high enough to melt or sublimate ice. Based on the seasonality, geographical and orientation distribution of these features, they form due to either sublimation/melting of water/brine ice. If these features are formed due to liquid water, it has a significant implication towards search for extraterrestrial life.

California

STUDENT: Joselyn Del Cid | Steven Poynter

INSTITUTION: California State University, Long Beach

FACULTY ADVISOR: Roger Acey

POSTER TITLE: Aryl Di-Alkyl Phosphates: Potential Therapeutic for the Treatment of Alzheimer's Disease

DIVISION: Chemistry

DISPLAY AREA: 1E

ABSTRACT: The progression of Alzheimer's disease (AD) is characterized by a decrease in the level of the neurotransmitter acetylcholine and loss of cognitive function. An increase in brain butyrylcholinesterase (BuChE) activity appears to be responsible for the decrease in acetylcholine. Current drugs used for the treatment of AD are cholinesterase inhibitors. Unfortunately, many patients do not respond or there are serious side effects from the drug. We have shown that aryl di-alkyl phosphates are potent inhibitors of BuChE, and have potential as AD therapeutics. Incubation of rat brain extracts with each inhibitor demonstrated the same relative degree of inhibition of BuChE activity as was seen with purified BuChE. Compounds were also tested for their inhibitory activity against a series of cellular enzymes to evaluate their potential side effects, including acetylcholinesterase (AChE), trypsin, chymotrypsin, hexokinase, and protein kinase A (PKA). The activity of AChE and chymotrypsin is not affected after short-term exposure to the inhibitors. However, the compounds showed varying degrees of inhibition with AChE and chymotrypsin when incubated with enzyme for 48 hrs. In contrast, none of the compounds affected the activity of hexokinase and trypsin after a 48 hr exposure. PKA activity was not affected after exposure to the inhibitors. The results suggest that the aryl di-alkyl phosphates may be a more specific and efficient therapeutic for the treatment of AD than compounds currently used. Animal studies are being developed to evaluate the ability of these compounds to pass the blood brain barrier.

STUDENT: Kevin Aaron Castellanos

INSTITUTION: California State University, San Bernardino

FACULTY ADVISOR: Donna Garcia

POSTER TITLE: Losing the balance: When individualism dominates, citizen participation dissipates.

DIVISION: Psychology

DISPLAY AREA: 1F

FUNDING: Minority Access to Research Careers

ABSTRACT: A successful government recognizes the natural rights of individuals and demands citizen participation in public policies and choice of representatives. We argue that when these two fundamental conditions are in balance, together they ensure democratic republican processes, which are essential to effective government. However, if one condition becomes ideologically dominant then these processes can be impaired. In this paper, it is argued that Western individualism, which emphasizes the rights and power of the individual, is currently hegemonic in American understanding of democratic republicanism. It is proposed that this dominance of ideological individualism can interfere with citizen participation in policy and representative elections. Drawing on research in political science and social psychology, the potentially aversive effects of disproportionate individualism on various psychological mechanisms, including an increase in isolation of self from the community and a reduction in awareness of social issues, communal efficacy, and collective consciousness are discussed. In turn, these psychological mechanisms can increase people's acceptance of the status quo and reduce their interest and willingness to engage in citizen participation. In this paper, research concerning the unitary pathways between psychological processes is integrated with both individualism and citizen participation. From this amalgamation of research a comprehensive model is proposed to explain the hindering effects of individualism on citizen participation. A program of research to test the proposed model and the empirical support have been developed. In addition to discussing this model, strategies will also be suggested to restore the balance between individual rights and citizen participation.

California continued

STUDENT: Neal B Shah | Carlo Nick Paredes

INSTITUTION: University of California, Los Angeles

FACULTY ADVISOR: Robert N Candler

POSTER TITLE: Microfluidic Interconnection for Lab-on-a-Chip Device

DIVISION: Health Sciences

DISPLAY AREA: 1G

FUNDING: National Science Foundation

ABSTRACT: There exists a growing need for innovative platforms that provide rapid medical diagnosis to developing countries. This need is beginning to be met by Lab-on-a-Chip devices, which integrate laboratory functions on a single chip of only millimeters in size. Alongside this growing technology, current demands call for miniature interconnect devices which can reliably deliver fluids into the chips from the macro scale to the micro scale. This project introduces a "Microfluidic Interconnection" that consists of a rigid material which clamps directly onto Lab-on-a-Chip devices, while a small flexible polymer portion creates an o-ring seal. Rapid fabrication has been achieved through the use of commercial 3D printing technology. Furthermore, this disposable device creates a fluid-tight seal for pressures greater than 400 kPa and provides inexpensive means for third world clinicians to insert blood samples into Lab-on-a-Chip devices. Previously developed methods used to insert specimen include attaching tubing via epoxies or injection by hypodermic needle. These processes are costly, time consuming, inconvenient, and inefficient. In contrast, this device offers an easy-to-use design, does not pose a "sharps" hazard, and readily adapts to the changing demands of users. Thus, the "Microfluidic Interconnection" provides a rapid, cost effective means to interface with Lab-on-a-Chip devices. Future work includes arrayed designs for simultaneous testing and integrating standard tubing features into fabrication to increase convenience in medical applications. The greater international implications of this device will serve to offer individuals living in third-world countries an opportunity to obtain rapid diagnosis, and thus receive faster treatment options.

STUDENT: Dara Tawahara | Dianna Synder | Joey Gullikson

INSTITUTION: University of the Pacific

FACULTY ADVISOR: Lara Killick

POSTER TITLE: "Beyond our Gates": Mobilizing community partnerships to improve physical activity opportunities for at-risk youth.

DIVISION: Health Sciences

DISPLAY AREA: 1H

ABSTRACT: Discussions around the health climate of the US have reached unparalleled levels of concern (Time, 2004). Research suggests that while physical activity rates are in decline, obesity and associated health problems such as diabetes, asthma and heart disease are rapidly increasing (WHO, 2000, 2004, 2008a). These observations have led the Surgeon General (2010) to conclude that we are in the midst of an obesity epidemic, which threatens the long-term health of our nation. However, studies suggest that the burden of this epidemic is being borne more heavily by particular groups in society, most notably our youth, low income and ethnic minority populations (WHO, 2008b). This research project contributes to efforts to reverse these trends. Community partnerships were mobilized to implement an 8 week after-school physical activity program at a high-need school in Stockton, CA. The program was designed to improve the attendees' physical activity levels, their cognitive understanding of the importance of leading physically active lives and enjoyment of physical activities. This poster will summarize the key findings and call for the initiation of similar interventions in areas where cultural disparities in health are evident.

Colorado

STUDENT: Travis Justin Garoutte

INSTITUTION: Colorado College

FACULTY ADVISOR: Neena Grover

POSTER TITLE: Examination of Kink-Turn and Related Motifs

DIVISION: Chemistry

DISPLAY AREA: 1I

ABSTRACT: The kink-turn motif is a secondary structural element found in many different RNA. It is an important protein recognition element that interacts with magnesium ions to form a bent ("kinked") structure. It is comprised of a trinucleotide bulge, RNN (R = purine; N = any nucleotide), flanked by both a canonical and non-canonical stem. The canonical stem is closed by two G-C base pairs and the non-canonical stem by two mismatched G•A base pairs. We are examining the thermodynamic properties of constructs displaying this motif in 1 M KCl and in varying concentrations of divalent metal ions. Two of the examined constructs display greater stability in the presence of calcium ions than in the presence of magnesium ions. In contrast, other constructs tested display an increased stability in the presence of magnesium ions than in the presence of calcium ions. Further examination of the kink-turn motif will help in understanding the molecular interactions between RNA and divalent metal ions. This knowledge will then assist in comprehending the role of the kink-turn motif in RNA structure and larger complexes. A complete understanding of these interactions is key to approaching and solving larger problems associated with RNA.

Connecticut

STUDENT: Connor Halem Gustave Patros

INSTITUTION: Eastern Connecticut State University

FACULTY ADVISOR: James Diller

POSTER TITLE: Temporal Discounting & Cardiovascular Reactivity

DIVISION: Psychology

DISPLAY AREA: 1J

ABSTRACT: Impulsive choice has been defined as the selection of a small, immediate reward, to the exclusion of a larger, delayed reward. Various factors, including drugs of abuse, have been shown to modify levels of impulsive choice. Because drugs have physiological effects and can alter impulsivity, there may be a cardiovascular correlate of impulsive choice. Additionally, the spontaneously hypertensive rat, an animal model of attention-deficit hyperactivity disorder, was originally bred for its cardiovascular profile which includes high blood pressure and heart rate. The present study explores the relation between impulsivity (measured using a computerized delay discounting task) and cardiovascular reactivity (change in heart rate during a serial subtraction task) in a college-based sample. Data were collected from 48 participants (27 female). Results of this study found higher levels of heart rate change were associated with higher rates of discounting (i.e. more impulsive responding). When participants were divided by gender, the effect was observed for females, but not for males. This finding suggests that cardiovascular traits can influence impulsive behavior and supports findings related to gender differences in cardiovascular reactivity. Evaluating the influence of cardiovascular factors on impulsivity may provide additional information about its genesis, possibly leading to improved screening methods for the behavioral and health-related problems associated with this type of maladaptive choice. This finding can be used to inform individuals about the importance of controlling heart rate reactivity as a precaution to maintain cardiovascular health.

Delaware

STUDENT: Brian P. Mahon | Matthew McAneny

INSTITUTION: Wesley College

FACULTY ADVISOR: Malcolm J. D'Souza

POSTER TITLE: Analysis of Sulfur Containing Intermediates for Potential Drug-Candidates to Treat Many Diseases.

DIVISION: Chemistry

DISPLAY AREA: 2A

FUNDING: National Institutes of Health - IDeA Networks of Biomedical Research

ABSTRACT: Many sulfur-containing organic compounds, specifically thio- and thionocarbonyl esters, have been successfully used as precursors to prepare low molecular weight protease inhibitors that can be effective anti-HIV agents. This inhibition can therefore be useful in the treatment of AIDS. These compounds have also proven to be effective as pro-drugs against the microbial infection, pneumocystis carinii pneumonia and have other potential for their anti-Hepatitis B virus activity. The specific rates of solvolysis of methyl, isopropyl, isobutyl, and t-butyl chlorothioformate, along with 4-fluorophenyl chlorothionoformate have been analyzed and compared using the extended Grunwald-Winstein equation. Previous research from our laboratories has shown that solvolysis occurs at the C=O or C=S group via a stepwise addition-elimination pathway in the more nucleophilic solvents.

District of Columbia

STUDENT: Anne Cotter

INSTITUTION: Georgetown University

FACULTY ADVISOR: Janet Mann

POSTER TITLE: Predation Risk and Birth Seasonality in Indo-Pacific Bottlenose Dolphins

DIVISION: Biology

DISPLAY AREA: 2B

ABSTRACT: Shark predation on dolphins could be an important selective force shaping dolphin behavior, habitat use, and social structure. This study investigates seasonal patterns in tiger shark predation on bottlenose dolphins in Shark Bay, Australia in relation to birth seasonality. Previous research suggests that marked birth seasons are more common in gregarious than non-gregarious animals as a way to reduce predation risk. By gathering information about sightings for every dolphin observed and organizing them by month, each dolphin sighting was coded according to whether the dolphin was observed with a fresh shark bite, a healed bite, neither, or not sighted at all. Although there was greater researcher effort during the winter months, 18 of the 25 years of sampling have data for other times of the year. We used sighting per dolphin per month to control for a seasonal bias and show that most shark attacks on dolphins occur between December and May. This immediately follows the birth season which peaks from September to December. Previously, it was assumed that predation risk was equal from September-May because sharks were present during that period. This analysis suggests a more complex picture, with females giving birth when the water is warm, but not peak temperature, possibly to reduce predation. We also examined group size for newborn calves (0-3 months) to determine if group sizes were larger from December-May (high predation) than June-November (low predation). This study provides insights on bottlenose dolphin sociality, seasonal breeding, and predation.

Florida

STUDENT: Marissa Rae Lovvorn

INSTITUTION: University of North Florida

FACULTY ADVISOR: Dominik Güss

POSTER TITLE: Cultural influences on risky business decision making

DIVISION: Psychology

DISPLAY AREA: 2C

FUNDING: Alexander von Humboldt Foundation

ABSTRACT: Risky decisions in the business world and banking industry have led to financial meltdown and to the global recession the world faces today. Previous research has focused on individual differences in risky decisions and only recent research has shown cross-cultural differences in dynamic decision making (e.g. Güss, Tuason, & Gerhard, 2010; Strohschneider, 2002) and in cultural values such as uncertainty avoidance (e.g. Hofstede, 2001). U.S. Americans, for example, tend to be more open to ambiguity and uncertainty than Germans. The current research investigates the influence of cultural values of uncertainty avoidance and reduction of ambiguities on dynamic and risky decision making. 110 students in colleges of business from Germany and the United States acted as managers of a computer-simulated chocolate-producing company for two hours making business decisions. It was expected that: U.S. American participants would take more risks while managing this unfamiliar chocolate business than German participants; and in both samples, those with high uncertainty and ambiguity avoidance would show less risky decision making. Risky decisions were defined by large investments, making drastic changes to production including product innovation, and by showing a more changing/fluctuating strategy overall. Results supported the expected cross-cultural and within-cultural differences, showing the influence of cultural values on decision making. Results also offer information that may predict success of different businesses in the United States and Germany. Currently, the results are validated in a sample of novices (students in the social sciences) and experts (business owners from the community).

Georgia

STUDENT: Shabnam Gupta

INSTITUTION: Georgia Institute of Technology

FACULTY ADVISOR: Ajit Yoganathan

POSTER TITLE: Assessment of Bicuspid Aortic Valve blood flow as a Clinical Diagnostic Tool

DIVISION: Health Sciences

DISPLAY AREA: 2D

ABSTRACT: The role of the aortic valve is to direct oxygen-rich blood from the heart to the rest of the body. Bicuspid Aortic Valves (BAV) interest clinicians because they are the most common cardiac defect occurring in approximately 1-2% of the newborn population in the USA. This defect results from a distortion of valve geometry consisting of two unequal-sized cusps, rather than the normal three equally-sized cusps. A BAV poses significant complications for the afflicted patient, including calcification and blockage of the valve, and backflow of blood through the valve. There is need for a clinical diagnostic tool for predicting future complications in patients since many BAV patients are asymptomatic for years and diagnosed late in life. Current clinical approaches to assess complications, using 3D-Echocardiography, are limited by their spatial resolution. A study of the blood movement patterns, or hemodynamics, associated with BAVs can identify and assess complications arising from this disease. The focus of my project uses an engineering approach to quantify hemodynamics of various BAV geometries made from pig heart valves. The BAV geometries are modeled from existing patient data and placed in a flow loop with water-glycerin solution the same viscosity as blood. 3D-Echocardiography machines and high-speed imaging will be used to obtain hemodynamic characteristics with greater accuracy than possible in clinical environments. The obtained data will be compared to that of normal aortic valves, establishing a diagnostic tool. This enables application of similar procedures on new patients to understand future complications for their unique valve geometry.

Georgia continued

STUDENT: Corina Iulia Oltean | Heather Nicole Ivester

INSTITUTION: North Georgia College and State University

FACULTY ADVISOR: Steven A. Lloyd | Ryan A Shanks

POSTER TITLE: Prenatal Methamphetamine Exposure Alters Executive Functions in Adult Mice

DIVISION: Psychology

DISPLAY AREA: 2E

ABSTRACT: Methamphetamine (METH) is a commonly abused stimulant used by ~5% of the population 12 years of age or older, including women of childbearing age. The number of pregnant women seeking treatment for METH use tripled between 1994 and 2006, but the long-term effects of these prenatal exposures are still unclear. METH affects fetal and maternal neurotransmitter levels, especially dopamine, which are involved in the division, migration and patterning of neurons during development. It was hypothesized that prenatal METH exposure will alter frontal brain development resulting in developmental defects in cognitive functioning. Mice were exposed to METH or saline from embryonic day 8.5 until birth. The exposed offspring were assessed at 3 months of age (adulthood) for subtle cognitive deficits using a learning paradigm to measure working memory, attention and inhibitory control (executive functions). A significant treatment effect was found for various measures of executive functioning in adult mice prenatally exposed to METH. However, no gender effects were noted. The data suggest that prenatal methamphetamine exposure results in long-term alterations of frontal brain executive functions in mice, including a decrease in inhibitory control. Low levels of inhibitory control are associated with psychiatric disorders, such as attention deficit hyperactivity disorder. Therefore, prenatal psychostimulant exposures may be a risk factor for this growing social, educational and medical concern. In addition, this data has important implications for the understanding of and treatment for the effects of prenatal stimulant exposures.

STUDENT: Sandra Jones, Donyeil Hoy

INSTITUTION: Spelman College

FACULTY ADVISOR: Leyte Winfield

POSTER TITLE: The Synthesis of Benzimidazole-based Iridium Complexes as Organic Light Emitting Diodes

DIVISION: Chemistry

DISPLAY AREA: 2F

ABSTRACT: Light emitting diodes (LEDs) are devices that have a variety of uses including LCD monitors, lighting systems for homes, and even Christmas lights. Recently, there has been an increased interest in the use of organic light emitting diodes (OLEDs) due to their low cost, lightweight, flexibility, and ease of chemical manipulation allowing for color tuning. There are broad uses for the future of OLEDs from the regulation of the circadian rhythm in mammals, improving ocular disease screening, and optogenetics to electronic paper and advanced communications technology. The aim of our research is the synthesis of a novel benzimidazole-based iridium complex that may prove to have improved flexibility and be useful as an OLED. The benzimidazole derivative has been synthesized using both microwave and traditional methods in three major steps, an amination, reduction, and condensation. The current goal is to complex this compound with Iridium to obtain a compound that is expected to fluoresce blue. Characterization of our compound will be made using IR, NMR, and elemental analysis. The synthesis and photoluminescent properties of the transition metal complexes will be presented.

Idaho

STUDENT: Neda Shefa

INSTITUTION: Boise State University

FACULTY ADVISOR: Julia Thom Oxford

POSTER TITLE: Role of minor fibrillar collagens in the progression of arthritis

DIVISION: Biology

DISPLAY AREA: 2G

ABSTRACT: The Center of Disease Control and Prevention reports 27 million adults affected by osteoarthritis (OA) in the United States. It is the most common form of arthritis, characterized by degeneration of cartilage and subsequent painful joint damage. Chondrocytes, the resident cells of cartilage secrete the extracellular matrix (ECM), which is constructed of primarily collagens. A unique and extensive network of fibrillar collagens gives healthy cartilage the ability to withstand forces and provide pain-free movement of articular joints. In OA, however, this collagen network is disrupted by destructive enzymes and a change in collagens that are expressed. Collagen type II is the major fibrillar collagen found in cartilage, and the organization of Collagen type II fibrils is regulated by minor regulatory fibrillar collagens. This study uses immortalized rat chondrocytes (IRC) as a model system to better understand the regulatory mechanism used by the cells to create a well organized ECM. The expression of minor fibrillar collagens was detected by Polymerase Chain Reaction (PCR), a widely-used technique that relies on the amplification of specific gene sequences to show gene expression. Understanding the role of minor fibrillar collagens in cartilage may lead to early diagnosis, treatment, and better ways to prevent OA, which will improve the quality of life of millions of individuals from all demographics.

Illinois

STUDENT: Derreck Langwith

INSTITUTION: Southern Illinois University Carbondale

FACULTY ADVISOR: William H. Freivogel

POSTER TITLE: Computer Mediated Discourse: Applying Defamation Laws of Slander and Libel in the 21st Century.

DIVISION: Social Sciences

DISPLAY AREA: 2H

ABSTRACT: With the integration of technology into society, and the resulting increase in online activity, computer mediated discourse (CMD) has become a standard form of communication. E-mail, instant messaging, chat rooms, and social networking websites are used every day to discuss a variety of both informal and formal topics. In some cases this has led to defamatory comments and legal action on behalf of the defamed seeking damages. Traditional law has separated defamatory statements into two categories: slander and libel. Oral defamation is considered as slander and is more difficult to prove one's reputation was injured from the comment. Written texts are treated as libel and do not require definitive proof of damage done allowing the plaintiff to more easily collect compensation. Current lawsuits involving online defamation have all advanced on the basis that these statements are libelous. However, the author argues that just as distinction between oral and written language exists offline so too does it exist online. Drawing on work done in the field of linguistics this project examines the similarities and differences in spoken and written language as it compares to CMD. By placing language on a continuum it is argued that certain forms of online communication are closer in nature to spoken language and others closer to written. By adopting this viewpoint it is therefore necessary to subject CMD to either laws of slander or libel based upon its position on the continuum.

Indiana

STUDENT: Katrina G. Van Zant

INSTITUTION: Ball State University

FACULTY ADVISOR: Melody Bernot

POSTER TITLE: The Effects of Pharmaceuticals on Microbial Production and Respiration.

DIVISION: Biology

DISPLAY AREA: 2I

FUNDING: Ball State University

ABSTRACT: Since the 1970's pharmaceuticals have been found in freshwaters around the world. This is of concern as these emerging contaminants may have adverse effects on aquatic ecosystems or human health through unintended consumption in drinking water. The effects of cotinine (nicotine metabolite), ibuprofen (non-steroidal anti-inflammatory drug), and sulfamethoxazole (common antibiotic) on microbial respiration and production were measured using both laboratory and field experiments. For the laboratory experiments, sediment and water were collected from two streams in central Indiana with one area being predominantly anaerobic and the other area being predominantly aerobic habitat. For the field experiment, pharmaceutical-amended substrata were incubated in the stream at the anaerobic and aerobic sites. Effects of individual pharmaceutical compounds as well as combinations of target compounds were tested on microbes to identify antagonistic or synergistic effects. In an anaerobic sediment, all pharmaceutical treatments decreased sediment respiration. In contrast, microbial respiration in aerobic sediment increased in the presence of cotinine combined with sulfamethoxazole. These data indicate pharmaceuticals do influence sediment microbial activity, even at trace concentrations currently present in freshwaters. Further, the effect of pharmaceuticals on sediment microbial activity is dependent on oxygen availability. The EPA currently regulates many contaminants in waters though no pharmaceutical compounds are regulated. More studies are needed to identify potential effects on aquatic ecosystems as well as human exposure in drinking water.

Iowa

STUDENT: Blaise Adam Mikels | Jean Lea Mullen | Jill Marie Jessee | Stephen Edward Henrich

INSTITUTION: Simpson College

FACULTY ADVISOR: Murphy Waggoner

POSTER TITLE: Assessment and Proposed Modification of Biological Sampling Regimes in Insect Populations

DIVISION: Mathematics and Computer Sciences

DISPLAY AREA: 2J

FUNDING: Center for Undergraduate Research in Mathematics

ABSTRACT: Development of poikilotherms, such as insects, is highly dependent on temperature accumulation rather than passage of time. Due to temporal temperature fluctuations over the growing season, data obtained from sampling at regular time intervals may lead to incorrect estimations of population parameters. Discrepancies between real and apparent population growth rates can result in incorrect estimates of pest populations which pose a threat in a number of ways including health risks to livestock and destruction of natural resources. Here, we assess standard biological sampling regimes in insects (which are typically evenly spaced temporally) as well as proposed methods of degree-day based sampling. Our hypothesis is that sampling with evenly spaced time intervals alone will skew resultant population growth estimates of insects. We test our hypothesis by using time scales calculus to construct mathematical models of exponential growth. Due to the nature of biological sampling, discrete analysis is necessary to effectively model exponential growth in insect populations. Our results reveal that data collected from weekly sampling regimes does not convey an accurate trend of development. Analysis of degree-day based sampling showed a strong functional dependency between insect population and accumulated temperature measures. This dependency allows us to efficiently model growth rates, to more precisely and accurately determine population parameters and to better predict population fluctuations. The principle of temperature-based development in poikilotherms has long been acknowledged, however sampling techniques have yet to conform to the recognition of this concept. This assessment provides support for a large scale reconstruction of current sampling regimes.

Iowa continued

STUDENT: Aaron Charles O'Shea

INSTITUTION: University of Northern Iowa

FACULTY ADVISOR: Tim Kidd

POSTER TITLE: Doping Dichalcogenide Nanotube Bundles

DIVISION: Physics and Astronomy

DISPLAY AREA: 3A

FUNDING: Iowa Office of Energy Independence grant #09-IPF-11

ABSTRACT: For the first time, magnetic elements have been incorporated into dichalcogenide nanotubes. These nanotubes have shown new magnetic properties, characteristics that have promise in the creation of stronger magnets. By creating these materials in nanotube form, we hope to take advantage of the unique properties of nanotubes. Dichalcogenides are layered like graphite. Much like graphite, a dichalcogenide can be induced to form nanotubes, which are single sheets of atoms that have rolled up to create tubes. These tubes have widths measured in the nanoscale and may be several millimeters in length. Graphite based nanotubes have a wide variety of applications due to their unusual properties. These nanotubes are stronger than steel and have been found to be better conductors than copper; not to mention their very small size, which allows for the creation of smaller electronics. Dichalcogenide nanotubes have unique properties as well, with potential for use as energy storage devices, superconducting materials, and ultra-high strength nanocomposites. By incorporating magnetic elements into the dichalcogenide nanotubes, we have pushed the physical size limits of magnets and found new properties. It was determined that these materials have a memory effect which lasts orders of magnitude longer than traditional dichalcogenides. These magnetic memory features might be integrated into computer memory systems or quantum computers. Furthermore, magnetic dichalcogenides have magnetic properties similar to rare earth elements that could make them highly advantageous for creating next generation motors and generators. This could lead to a renaissance of domestic manufacturing of new technologies in power generation.

Kansas

STUDENT: Yuchen Chen | Yuying Cao

INSTITUTION: Emporia State University

FACULTY ADVISOR: Qiang Shi | Joe Yanik

POSTER TITLE: Using SIR Equations to Model the Spread of Influenza A H1N1

DIVISION: Mathematics and Computer Sciences

DISPLAY AREA: 3B

ABSTRACT: In April 2009, an outbreak of a new strain of influenza A (H1N1) virus was identified. This strain of the flu was referred to as swine flu. The Kermack-McKendrick SIR model was used to study the spread of H1N1 virus. The use of mathematical methods to study the spread of contagious disease goes back at least to some work by Daniel Bernoulli in 1760 on smallpox. In more recent years many mathematical models have been proposed and studied for many diseases. The SIR model is one effective model to study disease outbreak in large population. The model divides the static population into three categories: those susceptible to the disease, those infected by it, and those who have recovered from it. The SIR model establishes and investigates the relationship of the rates of change among these three categories. Two important parameters, the recovery rate and the basic reproduction number, affect the behavior of the solution. H1N1 cases obtained from Centers for Disease Control and Prevention were analyzed using the SIR model to simulate and predict the spread of the swine flu in different regions in the United States. The herd immunity theory was also explored. Based on the data and our model, it is proposed that the vaccination of a certain portion of a population may prevent the breakout of the swine flu.

Kentucky

STUDENT: Benjamin Howard

INSTITUTION: Western Kentucky University

FACULTY ADVISOR: Richard Schugart

POSTER TITLE: Using a Mathematical Model to Analyze the Treatment of a Wound Infection with Oxygen Therapy

DIVISION: Mathematics and Computer Sciences

DISPLAY AREA: 3C

ABSTRACT: A mathematical model was developed focusing on using oxygen therapy to fight bacterial infection in chronic wounds. The model is a set of ordinary differential equations, which describes the relationship among neutrophils, bacteria, oxygen, inflammatory cytokines, and reactive oxygen species (ROS). A quasi-steady-state assumption was made for the inflammatory cytokines and ROS by setting the derivative equal to zero for all time. This reduces the model to a system of three equations – neutrophils, bacteria, and oxygen. Two steady-state analyses were conducted – first on the neutrophil/bacteria subsystem, and then on the three-equation system – to evaluate what happens when time goes to infinity. Model parameters were estimated from both values found in the literature and the steady-state analyses. Model simulations were conducted using Mathematica for different oxygen concentrations in the wound. The results identified the amount of oxygen needed to remove bacteria from a wound for varying amounts of time that the oxygen is administered.

Louisiana

STUDENT: Seth Amin Figueroa

INSTITUTION: Tulane University

FACULTY ADVISOR: Michael Moore

POSTER TITLE: Modeling Neuronal Growth

DIVISION: Mathematics and Computer Sciences

DISPLAY AREA: 3D

FUNDING: Louis Stokes Louisiana Alliance for Minority Participation

ABSTRACT: The development and repair of the Central Nervous System is dependent on accurate neuronal patterning. It has been shown that both the absolute concentration and the steepness of the concentration gradient of certain growth factor proteins are crucial in path finding for developing neurites. However, it still remains unclear how exactly neurites respond to these proteins. The purpose of this project is to create an accurate 2-D mathematical model of nerves growing in response to these growth factor proteins diffusing through a restricted growth environment. The results show that the model matches concentration dependent guidance ratios as well as turning ratios for neurites found in in-vitro experiments. Preliminary images simulated how the neurites grew in a restricted domain, both with and without a concentration gradient present. The simulations show a similarity to in-vitro experiments when there are no growth factor proteins. There is a difference in growth patterns when there is a concentration gradient of growth factor proteins in the growth environment compared to when there is no concentration gradient present. This model will serve as a foundation for future studies where neurites are exposed to several guidance factors simultaneously, which is the case in in-vivo development.

Maine

STUDENT: Jacqueline M Boudreau

INSTITUTION: University of New England

FACULTY ADVISOR: Charles Tilburg

POSTER TITLE: Destruction of the Delaware Bay Ecosystem by the Invasive species Mitten Crabs (*Eriocheir sinensis*) : A study of the their behavioral and dominating presence

DIVISION: Geosciences

DISPLAY AREA: 3E

ABSTRACT: Invasive species cause extensive ecological damage by dominating a region, wilderness areas, particular habits, and outcompeting native species. The Chinese Mitten crab, *Eriocheir sinensis* known for its hairy mitten-like claws and high migration ranges, is one such species that originated in Asia. Recently, it has been spotted in estuarine communities and fisherman's crab pots in Delaware Bay. Bordered by the state of New Jersey to the north and the state of Delaware to the south, Delaware Bay is one of the richest biological resources on the East Coast. It is home to hundreds of marine species and a \$7 million dollar Blue Crab commercial and recreational crabbing industry whose larvae are susceptible to predation by the mitten crab. As part of the crab's life cycle, females spawn larvae that then spend two to three weeks free-floating vertically in the water column before settling closer to shore. Eventual settlement can then be determined by the movement and behavior of the crab larvae. Using a larval swimming behavior model coupled to a circulation model, we show that environmental factors such as wind direction, magnitude, and different larvae behavior are strong determinants of settlement patterns and in all help to determine whether larval settlement is to be expected on New Jersey or Delaware sides of the bay. Greater knowledge of the settlement patterns will help to understand how the larvae will react to climate change and will aid resource managers in determining their possible future settlement locations.

Maryland

STUDENT: Tana Jin Luo

INSTITUTION: University of Maryland- College Park

FACULTY ADVISOR: Andres De Los Reyes

POSTER TITLE: Interpreting Differences in Parent and Adolescent Reports on Parental Monitoring

DIVISION: Psychology

DISPLAY AREA: 3F

FUNDING: University of Maryland General Research Board

ABSTRACT: Parental monitoring refers to what parents know about their adolescent's whereabouts and activities and how they come to know them. When parents fail to adequately monitor their adolescents, there is a greater likelihood that adolescents will engage in dangerous activities such as illicit drug use and risky sexual practices. Psychologists typically assess these behaviors using reports completed by parents and adolescents. However, parents and adolescents report about these behaviors quite differently. These disagreements might mean that parents and adolescents think about different situations when answering questions. Further, adolescents, themselves, can vary widely in what they do when they are not at home (parties, going to the movies) and where they go (school, a friend's house, mall). Developing assessment approaches that include contextual information may increase psychologists' understanding of disagreements between parent and adolescent reports. Two pilot studies assessed a new approach that teaches parents and adolescents how to use personally meaningful contextual information when completing reports. In Study 1, parents and adolescents provided reliable reports of the situations they considered personally relevant to their perceptions of parental monitoring. In Study 2, parents and adolescents were trained to identify and use these situations when responding to parental monitoring questions. Interestingly, this training made their reports even more different than without training, and the validity of these differences was corroborated by measures that parents and adolescents completed before receiving training. These findings have implications for improving interpretations of the differences between parent and adolescent reports in both research and clinical settings.

Massachusetts

STUDENT: Joseph Moloney

INSTITUTION: Bridgewater State University

FACULTY ADVISOR: Christa Polczynski-Olson

POSTER TITLE: Locations of Drug and Robbery Offenses: Spatial Analyses Based on Social Disorganization Theory

DIVISION: Social Sciences

DISPLAY AREA: 3G

FUNDING: Office of Undergraduate Research

ABSTRACT: In this study, drug and robbery activity in a small city in New England were examined using spatial analyses. The study focuses on a particular neighborhood that constitutes 22% of the total population of the city (105,167) (US Census Bureau, 2000). Located just outside the inner city, this neighborhood has similar characteristics that would classify it as a zone in transition, or an area where land use and population is constantly changing. The specific offenses studied in this research took place between 2006 and 2009 and include all drug-related arrests and reported robberies. The analyses consist of examining the density of offenses and conducting time-frame comparisons while applying the criminological theory, social disorganization, as presented by Shaw and McKay (1969, [1942]). The section of the city examined in this study coincides seamlessly with Shaw and McKay's theory due to its location just outside of the inner city, its population demographics and socio-economic class. Limitations and suggestions for future research are included.

STUDENT: Lauren Masiunas

INSTITUTION: Smith College

FACULTY ADVISOR: Rob Gutermuth

POSTER TITLE: Where Are the Young Stars?

DIVISION: Physics and Astronomy

DISPLAY AREA: 3H

ABSTRACT: Stars like the sun form near sibling stars in clusters, created from gravitational contractions in the densest regions of molecular clouds. Little is known about how the forces effect where the dense regions form and how many stars will be made. Studying the structure of the stellar and the gas content of clustered star-forming regions allows us to better understand the star-formation process and hopefully address these questions. An analysis of mid-infrared imaging from NASA's Spitzer Space Telescope using the IRAC and MIPS cameras along with deeper near-infrared pictures taken at Kitt Peak National Observatory with the SQIID camera will be presented. Using their color at infrared wavelengths, we have identified 339 young stellar objects (YSOs) in the AFGL 490 star-forming region, found in the constellation of the Giraffe. Several distinct cluster cores have been observed locally over-dense groups of YSOs forming together. The most populated group contains 215 YSOs (63% of the cluster's members) and has an area of 12 square parsecs. Contrary to expectations, the most massive star is not at the center of the cluster, but resides nearly a parsec away. These statistics were compared to other young stellar nurseries, to see whether other clusters are offset from their most massive star. By studying this, we will be able to determine what happens with stars during the first moments of their life, the period when they are forming planets. This project studies new stars, many of which could form planets that could foster or even create life.

Michigan

STUDENT: Daniel Robert Holycross

INSTITUTION: Central Michigan University

FACULTY ADVISOR: Minghui Chai

POSTER TITLE: NMR Studies on PEI Polymers for Potential Enhancement of Pharmaceuticals

DIVISION: Chemistry

DISPLAY AREA: 3I

ABSTRACT: Hyper-branched poly(ethyleneimine) (PEI) polymers are very water soluble with multiple different amino groups, capable of forming complexes with metal ions and biomolecules such as nucleic acids and proteins. These unique features render PEI polymers great potential in biomedical applications. They have been effective non-viral vectors for DNA transfection, which may lead to potent gene therapy. PEI can also serve as vehicles for drug delivery to improve the solubility of insoluble drugs thus enhancing their efficacy and extending the release of these pharmaceuticals in medication. In this research, multinuclear such as ^1H , ^{13}C & ^{15}N , and multidimensional including 2D homonuclear ^1H - ^1H correlation (i.e. COSY), & heteronuclear ^1H - ^{13}C or ^1H - ^{15}N correlation (e.g. HMQC, HMBC, & HMQC-TOCSY) NMR experiments were employed to study a set of representative PEI polymers including high & low molecular weight hyperbranched polymers, and a low molecular weight linear oligomer. Furthermore, the protonation of various amino groups in PEI polymers was also studied via titration by in situ monitoring ^{13}C chemical shift changes with pH. Information gained from these studies is then applied to probe how PEI can interact with insoluble pharmaceuticals such as the anti-inflammatory drug ibuprofen as well as the anti-Parkinson's drug L-dopa to enhance their solubility. Such a PEI-drug complex will still keep the function of the drug but with higher efficacy and lower side-effects in the treatment. This is because the enhanced solubility will reduce the drug dosage and the complex form of drug will also provide a controllable slow-release in the medical applications.

STUDENT: Danielle Silletti

INSTITUTION: Hope College

FACULTY ADVISOR: Graham Peaslee | Catherine Mader

POSTER TITLE: A Novel Nuclear Forensics Application

DIVISION: Chemistry

DISPLAY AREA: 3J

FUNDING: Department of Homeland Security

ABSTRACT: The spread of nuclear technology and the threat to national security from unsecured nuclear materials have renewed our national interest in not only detecting the presence of these materials, but also the detection of materials pathways into this country. Currently, the only method to identify where special nuclear materials have been stored involves measuring induced radiation in adjacent materials, which is usually short-lived radiation. We have identified a permanent change to the luminescent properties of certain common minerals due to neutron irradiation that could be developed into a novel nuclear forensics tool. Calcites are ubiquitous minerals in sand and dust that are known to luminesce under electron bombardment. The visible light spectra of hundreds of individual calcite grains were measured with cathodoluminescence (CL) spectroscopy before and after neutron irradiation. CL spectroscopy uses an electron beam to induce fluorescence in certain minerals due to their chemical composition and defects in their crystal lattice structure. The presence of ionizing radiation causes additional crystal lattice defects that leave a permanent CL signature. With the dose-response curve obtained from this study, it is possible to devise a test for sand grains to see if they have ever been in the presence of neutron-producing materials. In an event that required forensic investigation into where special nuclear materials had been stored, having a clear signature measured in sand and dust grains will be a valuable addition to the nation's nuclear forensics capability.

Michigan continued

STUDENT: Jessica Renay Lopez

INSTITUTION: University of Michigan

FACULTY ADVISOR: Gurjit S Mandair

POSTER TITLE: Assessing Bone Quality using Raman Spectroscopy

DIVISION: Chemistry

DISPLAY AREA: 4A

ABSTRACT: The accurate assessment of bone fragility depends on a greater understanding of the compositional contributors to bone quality. While computed tomography provides quantitative measures of bone mineral density (BMD) from three-dimensional skeletal images, this technology is costly and exposes patients to radiation. Alternatively, Raman spectroscopy could be used to examine the mineral and matrix composition of bone compromised by ageing, disease, or injury. Knowledge of mineral heterogeneity may also be an important predictor of bone quality, whereby tissues with different degree of mineralization and age are taken into consideration. The purpose of this study is two-fold: (i) to determine if Raman measures of bone mineralization are correlated with BMD, and (ii) if reduced mineralization is correlated with increased mineral heterogeneity. Canine tibial bone specimens were scanned using computed tomography and mapped using Raman spectroscopy. Raman maps of mineral-to-matrix ratios were created, mean values extracted, and compared against BMD measurements. Pixel histograms generated from the Raman maps were fitted with a single Gaussian distribution curve in order to determine the extent of mineral heterogeneity. Similarly, measurements were obtained from chemically-aged bone in order to simulate the conditions of reduced mineralization and increased bone fragility. Linear correlations between BMD and Raman measures of bone mineralization were established. Mineral heterogeneity was found to be higher for less mineralized bone, including chemically-aged bone. Raman measures of bone composition and mineral heterogeneity provide greater insight into bone quality, which may be used as potential predictors of fracture risk in prospective clinical studies.

Minnesota

STUDENT: Jeremy Anthony

INSTITUTION: Augsburg College

FACULTY ADVISOR: John Zobitz

POSTER TITLE: Understanding Ecosystem Carbon Uptake and its Relationship to Environmental Variables using Wavelets

DIVISION: Geosciences

DISPLAY AREA: 4B

ABSTRACT: Recently, much public attention and scientific effort has addressed the biogeochemical responses of terrestrial ecosystems to anticipated changes in climate. The objective of this research is to investigate ecosystem carbon uptake at a high elevation coniferous forest using mathematical tools and measurements related to the biogeochemical cycling of the forest. I examined carbon uptake in relationship to measured environmental variables such as temperature and sunlight. I used advanced mathematical techniques (wavelets) to contrast these environmental variables. Utilizing wavelets allows for the comparison of the coupling or decoupling of environmental variables to carbon uptake at hourly, daily, monthly, and seasonal time scales. From the years 1999-2007, there was a general trend in decoupling between carbon uptake and temperature over the daily time scale. The result of this decoupling over the years poses many questions of the current and future response of this ecosystem to environmental variation. Future research plans include: statistically analyzing the wavelet data; applying our technique to additional ecosystems across the United States and the world; further connecting these mathematical tools to measurements made in the environmental geosciences.

Minnesota continued

STUDENT: Alison M Smyth

INSTITUTION: Carleton College

FACULTY ADVISOR: Deborah S Gross

POSTER TITLE: Size, Chemical Composition, and Sources of Industrial Atmospheric Aerosol Particles.

DIVISION: Chemistry

DISPLAY AREA: 4C

ABSTRACT: The air we breathe contains aerosol particles which have implications for many aspects of society, including climate change and human health. This particulate matter originates from natural sources as well as a number of anthropogenic sources, including industry and automobile traffic. In this study, we investigated particles and their sources in Milwaukee, WI during July and August 2010. An Aerosol-Time-of-Flight Mass Spectrometer was used to collect continuous measurements of particle size and chemical composition in real time. The size of the particle determines how far it can penetrate into a human body, where it can damage the lungs or enter the bloodstream and affect other organs. The composition provides insight into the source of the particle, as different sources emit particles containing different chemical signatures. Additionally, the source can be deduced by combining the time a particle was sampled with the wind direction and speed at that time at the sampling location, effectively tracing a particle type back to its likely origin. This sourcing method can provide additional insight by focusing on particles containing specific metals or other chemical signatures. This analysis investigates the size, chemical composition, time resolution, and sources of aerosol particles. This information could be useful in efforts to improve the air quality in urban areas.

STUDENT: Crystal Anne Taylor | Susan Michelle Gerbensky

INSTITUTION: Minnesota State University- Mankato

FACULTY ADVISOR: Penny Knoblich

POSTER TITLE: Effects of reducing salt-regulating hormones on high blood pressure development in a rat model.

DIVISION: Biology

DISPLAY AREA: 4D

FUNDING: Center for Undergraduate Research

ABSTRACT: Hypertension, also known as high blood pressure, is a well known cause of cardiovascular disease, the leading cause of death in the United States. The cause of hypertension is poorly understood, but an increase in sodium retention by the kidneys, causing expansion in blood volume and a rise in blood pressure, is a contributing factor. The hormone aldosterone is produced in the outermost layer of the adrenal gland and increases the amount of sodium retained by the kidneys and may be a contributing factor to hypertension development. Eliminating aldosterone by removing both adrenal glands results in death of the animal. However, the effect of surgically reducing aldosterone in young hypertensive rats has not been investigated as a means to prevent development, or reduce the severity of hypertension. This study used an adrenal freezing procedure that reduced the amount of aldosterone secreted to approximately 30% of normal. The rats were studied using a remote monitoring device that was implanted in the femoral artery (in the hind leg). This system allowed the recording of blood pressure and heart rate while the rat was freely moving in its cage. The development of high blood pressure was compared between the adrenal frozen rats and the control rats. A reduction in blood pressure in the adrenal frozen rats was expected, indicating that aldosterone has a significant role in the development of hypertension. This information may lead to new measures to prevent hypertension in genetically predisposed individuals.

Missouri

STUDENT: James Martin Pflug

INSTITUTION: University of Missouri- Columbia

FACULTY ADVISOR: Robert W. Sites

POSTER TITLE: A phylogeny of Naucoridae (Heteroptera) using whole mitochondrial genomes

DIVISION: Biology

DISPLAY AREA: 4E

ABSTRACT: Molecular systematics is the use of biological molecules, such as DNA, in the identification of species. It is a rapidly growing field of study which promises to change the face of modern biology. Of particular interest are the so called "next-generation" DNA sequencing technologies. These new techniques have been largely untested on the largest animal group: the insects. The field of entomology as a whole is quickly expanding into this new horizon of research, with model organisms such as *Drosophila* leading the way. Potential applications include the identification of known and exotic pests, improvement of pesticides, development of biological controls, the enhancement of economically important insect species (such as honey bees and silk worms), and the improvement of conservation techniques (including population monitoring and gene tracking). One intriguing group of insects, the family Naucoridae, is replete with uncertainty, and is an excellent proving ground for these new methods. Commonly known as creeping water bugs, Naucoridae is an aquatic insect family with 369 described species worldwide. The evolutionary relationships of Naucoridae have been subject to much debate and revision. Currently, five subfamilies are recognized based on morphology; however, the validity of these groups remains untested by molecular methods. To resolve this uncertainty, very large gene fragments (~ 15,000 base pairs, containing 15 genes) from several species of Naucoridae, distributed across all major taxa, were sequenced on a 'next-generation' platform and used to evaluate relationships. Data support the validity some sub groups but indicate the need for taxonomic revision within the family.

Montana

STUDENT: Kimberly Michelle Spurzem

INSTITUTION: University of Montana

FACULTY ADVISOR: Timothy B Conley

POSTER TITLE: Assessing Montana's Multiple Offender Drunk Drivers for Prevention Strategies

DIVISION: Social Sciences

DISPLAY AREA: 4F

ABSTRACT: The purpose of this research study is to perform a secondary analysis of previously gathered data from felony offender drunk drivers currently incarcerated by the Department of Corrections in Montana. Previous research collected data from offenders on ideas for proposed legislative changes with hopes of empowering these individuals to prevent others from drinking and driving by making certain that their ideas and opinions are included in the legislative process. The research the team collected data from the Montana State Men's Prison, the Montana State Women's Prison, the Warm Springs Addiction Treatment and Change Program (WATCh) at two locations: East and West. At the facilities research participants were given a paper survey to assess their opinion on what Montana could do to prevent individuals from drinking and driving. Moreover, any individual with 5 or more DUI's were invited by the research team to take part in a focus group to further discuss their opinions. This study will provide an original new qualitative thematic analysis of the transcribed focus group dialog (225 pages) for key concepts. These classified key concepts voiced by the research participants, will be compiled and documented into an addendum report that will be disseminated to Montana Legislature.

New Hampshire

STUDENT: Sasa Tang

INSTITUTION: University of New Hampshire

FACULTY ADVISOR: Lawrence Reardon

POSTER TITLE: Tanzanian Government and Non-Governmental Organizations

DIVISION: Social Sciences

DISPLAY AREA: 4G

FUNDING: International Research Opportunities Program

ABSTRACT: Non-governmental organizations, NGOs, have proliferated in Tanzania since the economic collapse of the late 1980s to provide social welfare services to the citizens of Tanzania. Some scholars perceive service provision work of NGOs as unsustainable because it does not produce structural change in the system which created poverty and need in the first place. Advocacy work of NGOs aims to create systemic change by handing the responsibility of social welfare provision back to the government in a sustainable fashion. This research looks at the movement of advocacy through interviews conducted in Dar es Salaam, Tanzania and tries to answer where advocacy is the answer to sustainable aid.

New Jersey

STUDENT: Gabriel Giraldo

INSTITUTION: Rutgers University New Brunswick

FACULTY ADVISOR: Jerry W Shan

POSTER TITLE: Scalable, Large-Area Carbon-Nanotube Membranes for Energy-Efficient Water Filtration

DIVISION: Physics and Astronomy

DISPLAY AREA: 4H

FUNDING: National Science Foundation

ABSTRACT: Recently there has been significant interest in the manufacture of carbon-nanotube membranes due to their potential to greatly increase the energy efficiency and cost effectiveness of water filtration and desalination. This can be done by exploiting the flow enhancing properties of small-diameter carbon-nanotube pores. Current manufacturing processes (namely chemical-vapor-deposition synthesis of nanotubes followed by encapsulation) are limited by their high cost, long production time, and a lack of scalability for producing these membranes in large sizes and quantities. Our project's goal is to design a scalable, cost-effective method of producing these membranes from bulk samples of small diameter carbon nanotubes. The proposed method also enables the use of smaller diameter (1-nm and below) carbon nanotubes, which are difficult to grow by chemical-vapor-deposition in aligned form, but are expected to be more effective at water desalination and filtration. Nanotubes suspended in an epoxy are aligned using an electric field, and then the solution is hardened by exposure to pulses of UV radiation. This poster describes observations regarding the alignment behavior for varying electric field strengths as well as varying nanotube concentrations and nanotube sizes.

New Jersey continued

STUDENT: Julia Flagg

INSTITUTION: The College of New Jersey

FACULTY ADVISOR: Diane C Bates

POSTER TITLE: Recycling in the Context of Cultural "Greening"

DIVISION: Social Sciences

DISPLAY AREA: 4I

ABSTRACT: This study seeks to discover whether support for a recycling program predicts other pro-environmental behaviors. If recycling and/or other "green" cultural activities are becoming widespread norms, this suggests that a cultural greening is taking place. The presence of a cultural greening suggests that society is shifting towards becoming more pro-environmental. Support for a recycling program is measured by respondents' knowledge of and participation in the program. The dependent variable, other eco-friendly cultural activities, includes respondents' level of concern about pollution, respondents' level of estrangement from their waste, green consumerism, and participation in other sub-cultural "green" activities (i.e. driving less, eating less meat, etc.). In order to test this empirical question, forty undergraduate classes offered at The College of New Jersey during the fall 2010 semester were randomly selected and surveys were distributed to the students in these classes. Surveys were also distributed to all full-time faculty members of the College. Over 500 responses were collected. If support for recycling predicts other pro-environmental actions, then recycling can be added to the list of pro-environmental behaviors; if not, then recycling and pro-environmentalism can be seen as two distinct concepts. If only a small set of respondents support a recycling program and/or other green cultural activities, then support for recycling and/or other green cultural activities are sub-cultural issues, whereas if one or both of the variables are widespread among the sample, this is a sign of wide cultural change towards a "greener" society.

New Mexico

STUDENT: Cristhian Omar Carrillo

INSTITUTION: University of New Mexico

FACULTY ADVISOR: Sally Seidel

POSTER TITLE: Development of Radiation-Hard Silicon Sensors for Use at the Large Hadron Collider and Beyond

DIVISION: Physics and Astronomy

DISPLAY AREA: 4J

FUNDING: Department of Energy

ABSTRACT: This poster presents new information on the response of silicon detectors to irradiation and high temperature annealing. The detectors are candidates for use in the ATLAS Experiment at the Large Hadron Collider but have broad applicability beyond that. ATLAS is a large detector at CERN, a proton-proton collider with center of mass energy of 7 TeV. This center of mass energy has never been achieved at a collider previously, and it makes possible the production of particles not previously seen. Discovering these new particles may indicate new physics and provides precise tests of predictions by the Standard Model. To detect these particles, ATLAS will need to use extremely radiation-hard detectors. To develop these, radiation damage effects on p- and n-type Float Zone and Magnetic Czochralski silicon diodes are being characterized at the University of New Mexico by studying the capacitance and leakage current of the devices. The value of silicon detectors goes beyond particle physics experiments, as they are used in household semiconductor electronic devices such as transistors, solar cells, LED's, and integrated circuits. Silicon detectors are also useful for medical imaging, space travel, nuclear verification and radiation detection in cargo ships. Our annealing study characterizes the sensors' voltage, capacitance, leakage current and proton fluence and draws conclusions about the annealing behavior and expected radiation lifetime of several types of silicon. These studies use sensors irradiated in the proton beam at Los Alamos National Laboratory and characterized by the researcher at the University of New Mexico.

New York

STUDENT: Lindsey Ellis | Alex Canter

INSTITUTION: Rochester Institute of Technology

FACULTY ADVISOR: Stephanie Ludi

POSTER TITLE: AccessLecture: Improving Access to Science and Math Instruction for Visually Impaired Students via Accessible Real-Time Presentation

DIVISION: Mathematics and Computer Sciences

DISPLAY AREA: 5A

FUNDING: Collaborative Research Experience for Undergraduates Program

ABSTRACT: Imagine you have low vision and are enrolled in a math or science course. The instructor writes on the whiteboard. You try to capture notes based on what is said by the instructor but you can't grasp the material until you get a copy of the notes after class. But after class it is too late to connect what the instructor is saying to the material he/she is writing. This is the common state of Math and Science classes for visually impaired students. Access to science and math education is critical to facilitating science, math, engineering and technology careers. The goal of AccessLecture is to develop a working prototype that provides visually impaired students in grades 6-12 with greater access to science and math presentations in the classroom. University students will also find benefit. The project includes the development of a portable system, attaching to a whiteboard that communicates with a computer. This enables students with low vision to participate in math and science lectures, thus improving achievement. Students use a portable tablet to enlarge and adjust the material as needed, navigate through material and refer to prior material and notes. The real-time presentation of material enables students to ask questions at the time the material and activities are presented. In order to meet the needs of students and instructors, detailed surveys and interviews have been conducted at both the secondary school level and university level. The depth of analysis, design, and evaluation will be presented and demonstrated with the working prototype.

North Carolina

STUDENT: Robert A Gardner

INSTITUTION: Elon University

FACULTY ADVISOR: Eric E Hall

POSTER TITLE: The Influence of Concussion History on Cognitive Performance in College Athletes

DIVISION: Health Sciences

DISPLAY AREA: 5B

FUNDING: Elon University Undergraduate Research Program

ABSTRACT: Student-athletes, specifically in sports such as soccer and football, have a high risk of concussions because of the high amount of contact. Concussions may subsequently impair long-term cognitive function. This research project investigated the influence of concussion history on cognitive function in student-athletes. 100 student-athletes from football ($n = 59$), men's soccer ($n = 23$) and women's soccer ($n = 18$) participated in the study. Each participant completed the Immediate Post-Concussion Assessment Cognitive Testing (ImPACT). Additionally, brain activity via EEG was recorded to determine event related potentials (ERPs) during the Eriksen Flanker Task and an auditory oddball task. Verbal memory, as measured via ImPACT, was worse in those who have previously had a concussion versus those with no history ($p = 0.013$). Impairments in percent correct were found in the Flanker Task ($p = 0.033$) with concussion history being detrimental. Evidence was found that P3 latency was influenced by concussion history with those suffering from a previous concussion to have larger latency during the Flanker Task indicating slower processing of information ($p = 0.038$). The auditory oddball task provided additional evidence with greater P3 amplitude for those with a concussion history which indicates needing more resources to do the same work ($p = 0.007$). Collectively, the results of the present study indicate that having previously suffered a concussion to have a negative influence in cognitive processing in student-athletes. These decrements could possibly influence academic achievement and quality of life in those with a concussion and needs to be explored more.

North Dakota

STUDENT: Logan Wayne Stundal | Korey Southerland

INSTITUTION: University of North Dakota

FACULTY ADVISOR: Dana Michael Harsell

POSTER TITLE: Online Social Networks: Privacy Ramifications and Public Policy Solutions.

DIVISION: Social Sciences

DISPLAY AREA: 5C

FUNDING: McNair Program

ABSTRACT: In the past half-decade private social networking websites have provided an attractive platform to Internet subscribers seeking connection: connection to their world, their neighbors, co-workers, and family, as well as to complete strangers. These sites provide many conveniences to the subscriber. Subscribers can see the lives of those in their network that have their information permanently published on the Internet. The user accomplishes this by selecting "feeds" of social information to follow. Users also share their own lives with their networks by updating their status, uploading pictures and videos, and leaving messages for their "friends" to read. However, the rapid migration of users to these sites poses a significant threat to privacy and individual autonomy. The subscribers' rapid dissemination of reputational information across the spectrum of the Internet brings multiple social norms into conflict. Free speech protects the users ability to seamlessly share information about others at the expense of the other's privacy. Privacy interferes with the subscriber's right to avoid deception by investigating another user's life. Finally, undisciplined dissemination of information may instigate digital, libelous accusations that require the protections of legal recourse. The U.S. Constitution enshrines both a fundamental right to free speech and to privacy. This research articulates why subscribers must have the capability to secure their online reputations by having the means to prevent other users from publishing invasive content on social networks. Public policy must seek to regulate the protections afforded to the subscriber in order to reconcile conflict between these two fundamental rights.

Ohio

STUDENT: Daphne Allyn Guinn | Jennifer Miller

INSTITUTION: Ashland University

FACULTY ADVISOR: Jeff Weidenhamer

POSTER TITLE: Cadmium contamination of consumer products: An emerging threat to children's health

DIVISION: Chemistry

DISPLAY AREA: 5D

ABSTRACT: Cadmium concentrations above 900,000 ppm have recently been found in children's jewelry. Cadmium bioaccumulates in the body and chronic exposure causes kidney damage and weakens bones. The Consumer Product Safety Comion has issued five recalls of high-cadmium jewelry and proposed cadmium standards based on tests which simulate mouthing or swallowing jewelry. Our objectives were to characterize the extent of cadmium contamination of inexpensive jewelry and to determine its bioavailability through leaching tests. Jewelry was screened for cadmium by X-ray fluorescence (XRF). Bioavailability was measured by placing items either in saline solution at 37°C for six hr to simulate exposures from mouthing of jewelry, or in dilute HCl at 37°C for 6-96 hr, which simulates the worst case scenario of a child swallowing a jewelry item. Total cadmium was determined by atomic absorption. A total of 113 components of 69 jewelry items were found to contain >10,000 ppm cadmium by XRF. The six hr saline extraction of these items yielded as much as 2200 µg, while 24 hr dilute HCl extraction yielded a maximum of more than 20,000 µg. Leaching of cadmium in dilute HCl increased linearly over 6-96 hr, indicating potential for increasing harm the longer an item remains in the stomach. Leaching did not correlate directly with cadmium content. In conclusion, there is potential for dangerous cadmium exposures to children who wear, mouth, or accidentally swallow high-cadmium jewelry ite Continuing studies are examining the potential hazards of handling high-cadmium jewelry and glassware decorated with lead and cadmium paints.

Ohio continued

STUDENT: Elise Blankenship

INSTITUTION: The Ohio State University College of Medicine

FACULTY ADVISOR: Nancy Lill

POSTER TITLE: Efficacies of chemotherapeutic agents, alone or combined with EGF family ligands, in killing breast cancer cells

DIVISION: Health Sciences

DISPLAY AREA: 5E

ABSTRACT: Current breast cancer therapies focus on the use of hormones to control tumor cells. However, triple negative breast cancers (TNBC) lack receptors for the hormones estrogen and progesterone and lack the HER-2 protein, three common targets of breast cancer therapies. TNBC therapy is often limited to non-targeted chemotherapeutic agents. There is another receptor present on the cell surface of most TNBC cells, called epidermal growth factor receptor (EGFR), which could serve as a target for new therapies. The EGFR drives cell proliferation following its activation by epidermal growth factor (EGF) family ligands. These ligands include amphiregulin, betacellulin, and EGF. Each ligand stimulates the receptor, but the outcome of stimulation varies with the ligand (Stern et al. 2008). Little research has been done on the ability of EGF family ligands to function as components of combination therapies. EGF has been shown to enhance cell death when combined with a platinum-based DNA alkylating agent. In this therapy, the ligand tells the cells to grow while the alkylating agent tells them to stop growing, causing cell death. It was hypothesized that various EGF family ligands can be combined with alkylating agents to destroy EGFR-positive triple negative breast cancer cells. Tests of the hypothesis involved pharmacological dose-response studies. The data show that different EGF family ligands, used in combination with a DNA alkylating agent, have different efficacies for killing triple negative breast cancer cells. The results suggest that only certain ligands should be used in combination therapy to improve tumor cell destruction by alkylating agents.

Oklahoma

STUDENT: Courtney Dawn Garcia

INSTITUTION: Southwestern Oklahoma State University

FACULTY ADVISOR: Lori Gwyn | Tim Hubin

POSTER TITLE: Development in Potential Anti-HIV & Antimetastatic Drugs: C3-Symmetric Tris-Linked Bridged Tetraazamacrocycles as Potential CXCR4 Antagonists

DIVISION: Chemistry

DISPLAY AREA: 5F

ABSTRACT: CXCR4 and CCR5 chemokine receptors provide entry routes for HIV into cells, generating interest in new therapeutic approaches to treatment via fusion inhibitor drugs. CXCR4 expression has also been reported in at least 23 different cancers, demonstrating a role in stimulation of tumor growth, angiogenesis, and metastasis of breast cancer cells. Target organs for breast metastases such as liver, lung, and bone, trigger the migration of breast tumor cells that express the CXCR4 receptor. Due to the wide-ranging potential biomedical applications that might result, there is a need to develop new antagonists for the CXCR4 co-receptor. They are conformationally fixed macrocyclic compounds where the unrestrained equivalent is a known CXCR4 antagonist. Over 50 metal complexes of bis-tetraazamacrocycle ligands have previously been synthesized for screening as CXCR4 antagonists. The bis-linked complexes are highly efficient antagonists, while single-macrocycle analogues are much less effective. In this experiment, the objective was to synthesize C3-symmetric tris-linked analogues of our most effective bis-tetraazamacrocycle metal complexes and to characterize their chemical and physical properties in preparation for determining if the added macrocycle enhances their antagonism of CXCR4. Synthetic routes extending the bis-linked ligand syntheses to use the C3-symmetric linker 1,3,5-tris(bromomethyl)benzene were developed. Copper(II), nickel(II), cobalt(II), and zinc(II) complexes were made using the previous methods. A collection of various characterization methods was obtained. The resulting complexes will inform the understanding of the requirements for producing even more efficient CXCR4 antagonists of this class.

Oregon

STUDENT: Kyleigh M. Gronseth | Lucrecia Lawer | Chelsey Asbury | Stephanie M. Gerhardt

INSTITUTION: Western Oregon University

FACULTY ADVISOR: David Foster

POSTER TITLE: Effects of Member Competitiveness and Group Development on Group Decision Making Performance

DIVISION: Psychology

DISPLAY AREA: 5G

ABSTRACT: Accuracy of group decisions is seen as dependent on the effective integration of individual members' information to produce a result that is better than that of any member alone. Effective integration of information, however, typically requires cooperation among group members. Consequently, we hypothesized that information integration and subsequent group performance would be influenced both by the competitiveness of the group members as well as the group's level of development. Data were collected from 112, three-person groups. Participants completed two decision making tasks first individually, then as a group. Group development was manipulated using both a forming activity and feedback. In the forming conditions, participants became acquainted with other group members through variations of a team building exercise. Prior to starting the second task, participants either received performance, participation, or no feedback. Competitiveness was measured using a modified version of Smither and Houston's (1992) Competitiveness Index. Group performance was operationalized as Group Added Value; the residual of group performance with individual member expertise statistically removed. The results showed that there was a significant main effect for competitiveness relative to individual expertise. Groups where the most expert member was more competitive than the least expert member had higher group added value compared to groups where the most expert member was less competitive than the least expert member. The results also showed that this effect varied by the types of development exercises groups experienced. Taken together, these results suggest that personality and environmental variables jointly shape group performance during decision making tasks.

Pennsylvania

STUDENT: Brian Michael Culp

INSTITUTION: Bloomsburg University of Pennsylvania

FACULTY ADVISOR: Cynthia Venn

POSTER TITLE: Integration of Quickbird Satellite Imagery and GIS to Map Subzones within a Salt Marsh near Wallops Island, VA.

DIVISION: Geosciences

DISPLAY AREA: 5H

ABSTRACT: Mapping coastal marshes using remote sensing techniques provides a means of monitoring large coastal areas with a greater frequency than is possible using ground surveys. We compared high resolution (0.6m/pixel) imagery to ground-based plant survey data (transects every meter on each of three 50 X 50 meter plots) collected in a salt marsh near Wallops Island, VA, to determine the ability to detect small changes in vegetation within low marsh and high marsh areas. We created a high resolution (0.6m/pixel) infrared false color image covering a large area of the marsh by the process of pansharpening. When the three detailed hand-mapped plots of vegetation were overlaid on the pansharpened images, some of the mapped subzones of the low marsh and high marsh were clearly identifiable. The patterns that clearly correlated with distinct subzones in the ground truthed plots were then used to identify and quantify similar subzones in the available imagery covering a much larger area of the salt marsh. GIS would be the ideal platform with which to track and analyze this information over time. Several methods of integration will be explored to determine the most efficient and effective method. Implementation of this method may provide a means of monitoring small scale changes in Wallops Island salt marsh subzones over time and provide a useful tool for coastal managers.

Pennsylvania continued

STUDENT: Katrina M Shughrue

INSTITUTION: Juniata College

FACULTY ADVISOR: Richard R. Hark

POSTER TITLE: Analysis of the 'conflict mineral' columbite-tantalite using laser-induced breakdown spectroscopy (LIBS)

DIVISION: Chemistry

DISPLAY AREA: 5I

FUNDING: II-VI Foundation

ABSTRACT: Laser-induced breakdown spectroscopy (LIBS) has been applied to the analysis of the 'conflict mineral' columbite-tantalite for the first time. 'Conflict minerals' are natural resources mined in an environment characterized by armed conflict and human rights abuses. For example, the profits from the illicit sale of these minerals are being used to fund the ongoing conflict and genocide in the Democratic Republic of the Congo. Two of the elements found in coltan, tantalum and niobium, are used in everyday electronics and are of high commercial value. Recent legislation holds all U.S. companies accountable for where they purchase raw materials and components to produce their products. Determining the chemical composition of columbite-tantalite is one means of ascertaining its provenance. LIBS offers an attractive means of rapidly distinguishing different geographic sources for minerals because the LIBS spectrum provides a 'chemical fingerprint' of any material in real-time. This analytical technique is simultaneously sensitive to all elements with a single laser shot. To test this idea for columbite-tantalite, an examination of three samples sets from spodumene-bearing granite-associated pegmatite fields was undertaken. The elements of interest were defined (based on major and trace elements known to be present in these minerals) and each elemental wavelength was identified. Since the LIBS spectra were similar, multivariate statistical techniques were used for discrimination and analysis of the data allowed for 100% sample-level classification using a highest confidence approach. These very promising preliminary results suggest that additional work with a larger, more geographically diverse data set is warranted.

South Carolina

STUDENT: Susan Antoinette Irizarry

INSTITUTION: Clemson University

FACULTY ADVISOR: Jeffrey A. Fine

POSTER TITLE: Senate Responsiveness to Public Opinion on Environmental Issues

DIVISION: Social Sciences

DISPLAY AREA: 5J

FUNDING: Political Science Department

ABSTRACT: Given the relevance of environmental policy due to current global climate change and energy issues, it is important to determine why and how Congress enacts environmental legislation. Much of the literature on environmental voting examines the topic using roll call votes or election returns, rather than linking public opinion to congressional voting. While some research considers whether members of Congress vote consistently with their environmental campaign promises, to date no studies have examined public opinion of constituents and environmental voting records of members of Congress. Based on assumptions that congressional members respond to the preferences of their constituency because they want to give a voice to their constituents, provide sound policy for members of their districts, and seek reelection, this study looks at the responsiveness of senators to the environmental preferences of the people in their respective states. Public opinion data derived from a large national survey are aggregated to the state level to evaluate whether constituency attitudes affect senators' voting alongside the League of Conservation Voters. Controlling for traditional determinants of senator voting behavior, it was investigated whether the environmental voting records of senators align with public preferences, thereby determining the responsiveness of senators to the public. During the past decade, the resurgence of the environmental movement has moved these issues to the forefront of American discourse. In trying to understand how environmental issues are perceived by the public and then translated into congressional action, we can begin to understand how necessary environmental change can occur in the United States.

South Carolina continued

STUDENT: Jeffrey Paul Schwindaman

INSTITUTION: College of Charleston

FACULTY ADVISOR: Vijay M Vulava

POSTER TITLE: Sorption and Transport of a Common Anti-bacterial Agent, Triclosan, in Soils

DIVISION: Geosciences

DISPLAY AREA: 6A

FUNDING: College of Charleston Undergraduate Research and Creative Activities department

ABSTRACT: Pharmaceutical and active ingredients in personal care products are some of the most ubiquitous compounds found in surface water across the world. Triclosan (5-chloro-2-(2,4-dichlorophenoxy)phenol), used as an antibacterial agent in many hand soaps, toothpastes, textiles, and even toys, is one of the most common of these compounds detected in surface waters. Recent studies have linked this compound to endocrine-disrupting activity in mammals and aquatic life. After it is discharged into surface water as wastewater effluent, little is known about the fate of triclosan in the environment. Because it is relatively nonpolar ($\log K_{ow} = 4.76$) and highly insoluble in water, triclosan tends to accumulate in soils, sediments, and very importantly, in lipid tissues of organisms that come in contact with it. The main goal of this study is to quantify how strongly triclosan is absorbed onto soils and sediments as a function of soil and sediment composition (organic carbon content, clay mineral content, etc). Batch sorption and column experiments were conducted using soils from Southeastern U.S. Strong adsorption of triclosan was found in soils rich in organic matter, whereas triclosan did not adsorb as strongly to soils with high clay mineral content. Additionally, triclosan was retained strongly in glass columns packed with organic rich soils. These results indicate that triclosan has the potential to accumulate in stream and estuarine sediment.

STUDENT: Richard M. Graybill | Hillary Rodgers

INSTITUTION: Furman University

FACULTY ADVISOR: John Wheeler | Sandy Wheeler

POSTER TITLE: Investigating the Interaction between Novel Chromium Complexes and DNA in Search of Alternative Routes to Chemotherapy

DIVISION: Chemistry

DISPLAY AREA: 6B

FUNDING: Howard Hughes Medical Institute

ABSTRACT: The platinum-containing pharmaceutical cisplatin has been a leading anti-tumor agent for many years, owing its effectiveness to its ability to interrupt the cycle of DNA replication. Unfortunately, like many chemotherapeutic drugs, cisplatin exhibits undesirable side effects due to its inability to discriminate between cancerous and healthy tissue. Past research has involved developing a variety of novel complexes that contain the transition metal chromium (Cr), focusing on the interaction of these compounds with DNA. Complexes of chromium that incorporate organic groups known as diimines have the potential to overcome this problem due to their ability to be transformed from an inactive "pro-drug" to a reactive form via stimulation with light. When excited by ultraviolet (UV) light, these complexes are able to interact with DNA through two unique pathways, each ultimately affecting the capacity of DNA to replicate: (1) insertion into the DNA strand followed by oxidation of individual nucleotides; and (2) formation of permanent bonds, or "adducts" with the DNA strand such as occurs with cisplatin. Evidence supports each of these models, and it has been observed that the damage to DNA occurs exclusively in the presence of targeted UV light. Irrespective of the pathway followed, these interactions can be successfully characterized using a variety of analytical and biochemical techniques. Such characterization is essential in determining which chemical structures are most selective - and therefore most promising - in the development of new pharmaceuticals.

South Carolina continued

STUDENT: Ankur Kumar

INSTITUTION: University of South Carolina, Columbia

FACULTY ADVISOR: Esmail Jabbari

POSTER TITLE: Electrospinning Fibrous Scaffolds for Bone Regeneration

DIVISION: Biology

DISPLAY AREA: 6C

ABSTRACT: The current treatment method for bones broken beyond the point of repair is prosthetics. Prosthetics, however, provide a limited range of motion and poor quality of life. Recent efforts focus on using tissue engineered bone as treatment. Bone is a fibrous tissue uniformly distributed with cells; it contains peptide ligands that cells recognize with specificity. Tissue engineering scaffolds must mimic these characteristics. We hypothesize that using a modified electrospinning assembly to generate a poly(lactic-co-glycolic acid) (PLGA) scaffold modified with an Arginine-Glycine-Aspartic acid (RGD) peptide sequence and hydroxyapatite crystals will create a successful scaffold for bone regeneration. Electrospinning is a process by which a polymer solution is pulled into nanofibers by a strong electric field. By manipulating the electric field, we were able to control the placement of our PLGA nanofibers, thus allowing us to dictate the pore distribution throughout the scaffold; controlled pore distribution is essential for uniform tissue development. Next, we attached an RGD peptide to the nanofibers by dissolving it into the electrospinning solution; RGD peptide enhances cell attachment to the nanofibers. Next, we dipped the scaffolds into a simulated body fluid solution to allow hydroxyapatite crystal formation on the nanofibers; these crystals help simulate the setting of bone cells. We tested our scaffolds by seeding them with bone marrow stromal cells and analyzing cell attachment, migration, and morphology. Preliminary results show that we can create PLGA scaffolds with controlled pore distribution, attach the RGD peptide to the scaffold, and observe their effects on cell attachment and morphology.

Tennessee

STUDENT: Jeannie Moore Stubblefield

INSTITUTION: Middle Tennessee State University

FACULTY ADVISOR: Anthony Lee Newsome

POSTER TITLE: Potential Use of Chlorine Dioxide to Decontaminate Skin Surfaces in an Animal Mass Casualty Response.

DIVISION: Biology

DISPLAY AREA: 6D

FUNDING: Southeastern Regional Research Institute

ABSTRACT: The ability to timely and safely contain the spread of bacterial pathogens in an outbreak is a matter of high concern for national security as well as the national food supply. In this study, chlorine dioxide was evaluated as a means of decontaminating animal carcasses to decrease the risks involved in handling and disposing of mass casualties that have been contaminated with both naturally-occurring pathogens, as well as spore-forming bacterial pathogens that might be used in a deliberate terrorist attack or in a naturally-occurring outbreak. The use of chlorine dioxide as a decontaminant is not new. However, issues related to the safety of transport and expertise needed to generate it onsite have hindered its broad-scale consideration in local response scenarios. The recent development of a two-component sachet delivery system eliminates these problems. Untreated pig skin samples were inoculated with the spore-forming bacteria *Bacillus atrophaeus* as a model for *Bacillus anthracis*, the causative agent for anthrax, and treated with various protocols using chlorine dioxide gas and solutions. The structure of skin surfaces presented unique challenges in sampling and enumeration of bacteria. Methods were developed to standardize sampling of skin bacteria to more accurately quantify the treatment effectiveness. Results indicate that chlorine dioxide gas is effective as both a decontaminant and as a sterilant for naturally-occurring skin bacteria as well as the spore-former *Bacillus atrophaeus*. Additional research is needed to optimize broad-scale application protocols, but these results have clear applications for inclusion in outbreak responses.

Texas

STUDENT: Vincent William Au | Jae Seo Pi

INSTITUTION: University of Texas at Austin

FACULTY ADVISOR: Kristen Procko

POSTER TITLE: Thermodynamic Analysis of Molecular Interactions for Structure-based Drug Design.

DIVISION: Chemistry

DISPLAY AREA: 6E

ABSTRACT: All biological processes result from specific interactions between molecules. The carbohydrates and fats we consume are processed by various protein macromolecules to produce the energy and biological structures necessary to live. Our immune system produces antibodies which direct for a pathogen's destruction through interacting with proteins specific to each pathogen. However, despite this universal nature of biological interactions, its physical basis—how the structure of one molecule interacts with that of the other—is still poorly understood. For scientists designing novel drugs that deal with a plethora of emerging infectious diseases and conditions like Alzheimer's and cancer, this knowledge is vital to efficient designs of drug molecules that can bind strongly to key proteins and either inactivate or stimulate their function for a desired effect. This research attempts to elucidate this physical basis of biological interactions. A series of structurally-similar novel molecules that bind to a model protein, the mouse major urinary protein, have been synthesized via organic chemistry techniques. Structural biology methods such as computer modeling and X-ray crystallography are used to interpret and visualize how a series of these molecules interact with the protein. Finally, a biophysical chemistry approach, isothermal titration calorimetry, will be used to determine the underlying thermodynamic variables of these interactions. This analysis is used to find relationships that can be applied to structure-based drug design.

Utah

STUDENT: Amy J Friend

INSTITUTION: Weber State University

FACULTY ADVISOR: Lauren Fowler

POSTER TITLE: The Effects of Twelve Hour Shifts On Performance In Pharmacy Personnel

DIVISION: Psychology

DISPLAY AREA: 6F

FUNDING: National Science Foundation NSF-REU #0648735

ABSTRACT: Pharmacist medication errors cause an estimated 44,000 to 98,000 deaths each year in the United States, and these errors can cost up to 50 billion dollars annually (Gianutsos, 2008). The majority of medication errors are committed due to pharmacists and technicians having a high workload, being short-staffed, working long hours, and experiencing fatigue. Most pharmacies operate on 12-hour shifts. While working these shifts pharmacists experience extended exposure to work-related stress, sleep schedule inflexibility, and decreases in alertness and performance. Previous research examined why errors occurred retrospectively. This study was designed to assess under what conditions medication errors due to fatigue were most likely to occur in pharmacists and technicians working a 12-hour shift. Time of day, number of prescriptions, and number of shifts per week were areas of interest for possible error. Participants were tested every four hours throughout a twelve-hour shift for three shifts a week for two weeks. In each testing period participants were asked to complete four different tasks. The tasks were intended to evaluate perceived, physiological, and cognitive fatigue. Results revealed that time of day and the number of shifts that week did not have an effect on fatigue and errors. However the number of prescriptions that were filled did have an effect on perceived fatigue and cognitive performance. This research indicates that workload may be a likely predictor of when errors could occur. Therefore as workloads increase additional effort should be made to incorporate fatigue countermeasures to avoid potential medication errors.

Vermont

STUDENT: Benjamin Torello Chaucer | Danielle Renee Gregoire | Autumn Rose Santor

INSTITUTION: Johnson State College

FACULTY ADVISOR: Anjanette Watson | Elizabeth Dolci

POSTER TITLE: Discovery of Extremophiles from Stressed Aquatic Communities Within the Vermont Asbestos (VAG) Mine

DIVISION: Biology

DISPLAY AREA: 6G

FUNDING: Johnson State College

ABSTRACT: Bacteria live in complex communities that until recently have been poorly understood. Aquatic microorganisms cultured in the laboratory represent less than 1% of the community at large. With breakthroughs in DNA sequencing and bacterial analysis researchers can identify microorganisms that were previously undetectable. By developing a comprehensive understanding of the complex interactions among bacteria, we are given insights into an individual organism's niche within its environment. The fate of our species is intrinsically linked to that of our bacterial neighbors. The little we know about bacteria however, is disproportionate to their immense role within our lives. The Vermont Asbestos Group (VAG) mine was the second largest asbestos mine in the U.S. operating from the early 1900's to 1993. To this day VAG mine tailings leach heavy metals and asbestos fibers into public and private waterways. The VAG mine is a model microcosm for evaluating the effects of bacterial communities on contaminated aquatic environments. From the toxic mine water, bacterial cultures were grown and isolated. DNA was extracted from each isolate and sequenced to establish a profile of all culturable microorganism. To date, 110 individual organisms have been identified. Many of the bacteria isolated are extremophiles, capable of living in harsh environments, validating the importance of further investigation. Using the emergent technology of metagenomics, a comprehensive portfolio of all bacteria, both culturable and non culturable, will be developed. Data generated from our research can help guide development of public policy and protocols for maintenance of asbestos contaminated sites.

Washington

STUDENT: Jason Andrew Milne

INSTITUTION: Central Washington University

FACULTY ADVISOR: Michael Jackson

POSTER TITLE: The first 9 THz laser eion generated by optically pumped O-18 methanol

DIVISION: Physics and Astronomy

DISPLAY AREA: 6H

FUNDING: National Science Foundation

ABSTRACT: This year marks the fiftieth anniversary of the laser, and hence, fifty years of laser innovation (House Resolution 1310). LASER is an acronym for Light Amplification by Stimulated Emission of Radiation. At the time of its discovery, critics ironically dubbed the laser as "the solution in search of a problem." The laser has proven to be just that. Today lasers are integrated in all aspects of our lives: at the checkout counter, in defense and medical applications, they are even used in laser light shows for entertainment. The laser project at Central Washington University involves the discovery of new sources of light in the far-infrared region, spanning wavelengths from 20 to 1000 micron. For this project, a carbon dioxide laser was used to excite a far-infrared laser that operates using an isotope of methanol. Once a far-infrared laser emission was detected, its frequency was measured using a heterodyne (mixing) technique yielding a fractional uncertainty of a few parts in ten million. During this investigation, four new far-infrared laser lines were discovered and twelve laser frequencies were measured for the first time. This includes the discovery of the 33.15 micron laser line whose frequency is the first 9 THz laser emission generated by this laser medium. These newly discovered and measured laser lines have expanded the frequency range for which this laser operates by a factor of three. This presentation will focus on discussing the experimental system and the process involved in the discovery and frequency measurement of far-infrared laser lines.

Washington continued

STUDENT: Meredith Leigh Houck | Jennifer Welch | Isa Harrison

INSTITUTION: Central Washington University

FACULTY ADVISOR: Richard Mack

POSTER TITLE: The Impact of the Great Western Development Strategy on Northwestern China

DIVISION: Social Sciences

DISPLAY AREA: 6I

FUNDING: National Science Foundation

ABSTRACT: The astonishing economic growth of China has been the subject of much recent discussion. Standards of living have dramatically improved, and China is becoming an important player in the global economy. However, China cannot be labeled a development success story yet. The landlocked provinces of Western China lag far behind. In particular, the provinces of Northwestern China are plagued by a host of problems such as severe environmental degradation, and lack of investment in infrastructure and human capital. To address these problems, the Chinese government announced the implementation of the Great Western Development Strategy (GWDS) in 1999. The purpose of our research was to examine the impact of the GWDS on the economic, social, and environmental conditions of Northwest China. It focused specifically on the provinces of Shaanxi, Ningxia, and Gansu. Quantitative data from published sources were used in conjunction with observations and interviews made during 30 days of travel in the three provinces, sponsored by the National Science Foundation. A regional comparative analysis was conducted using cross-sectional data to assess the impact of the policy during its initial implementation phase from 1999 to 2007. Relying upon both qualitative and quantitative data, we found that overall, the GWDS has had a positive impact on these provinces, specifically on education, standards of living, rural household incomes, and structural changes from primary to secondary industries. However, the research also revealed deficiencies in water resource management, disparities in the allocation of investment across and within provinces, and other shortcomings of the GWDS.

West Virginia

STUDENT: Emily Elizabeth Beckelhimer

INSTITUTION: Marshall University

FACULTY ADVISOR: Menashi Cohenford

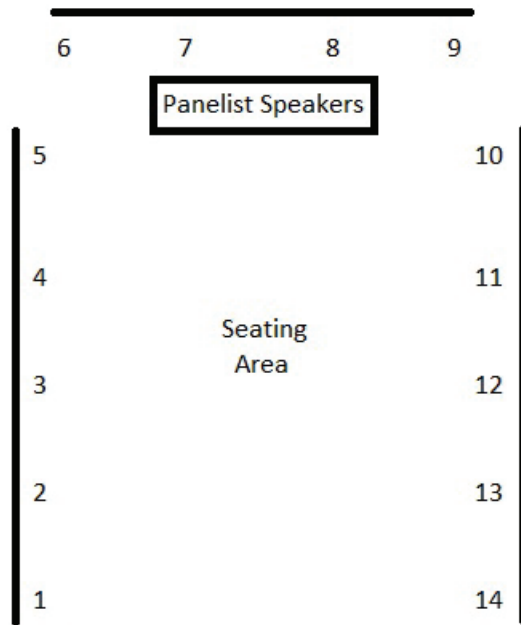
POSTER TITLE: FT-IR Analysis of Tissue Sections from Normal and Malignant Mouse Colorectal Tissues

DIVISION: Biology

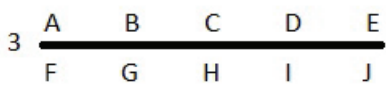
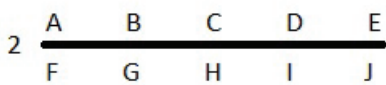
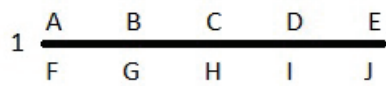
DISPLAY AREA: 6J

ABSTRACT: There are innumerable benefits to starting cancer treatment as early as possible, but early treatment can only be achieved through early detection. One promising approach for discriminating between normal and cancerous tissues uses Fourier Transform-Infrared (FT-IR) microspectroscopy. By measuring the spectrum of absorbance of infrared radiation into tissue samples, it is possible to detect biochemical changes in tissues that indicate the formation of tumors. The objectives of this study were: to collect the FT-IR spectra of mouse colorectal tissues that have been identified by a physician as normal or cancerous; to compare the spectra of normal and malignant mouse colon tissues; and to mathematically analyze the spectra and create standards for cancerous and non-cancerous spectra. Analysis of the spectra from tissues that were either entirely non-cancerous, or a combination of cancerous and non-cancerous, revealed significant structural, chemical, or metabolic changes associated with tumor formation. This encourages the speculation that FT-IR microspectroscopy may aid in the diagnosis of colon cancer. Mathematical evaluation of results revealed that 284 out of the 288 cancer fields that were analyzed were correctly classified, not including one corrupted field that was excluded from the analysis. A mathematical logarithm was designed to predict whether certain spectra were cancerous, given templates made from the data that was collected. This logarithm was used to correctly distinguish 246 of the 249 spectra from normal tissues. These studies warrant further investigation as FT-IR microspectroscopy may prove to be a powerful tool for the early detection of colon cancer.

Rayburn House Office Building Rooms B-339 – Humanities Luncheon Session

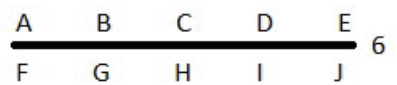
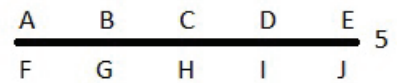
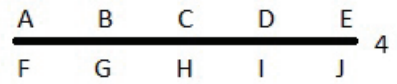


Rayburn House Office Building Rooms B-338, B-339 & B-340 – Sciences Evening Session



Entrance

Reception
Area



Entrance

Participants

Alabama

University of Alabama at Birmingham

Alaska

University of Alaska Anchorage

Arizona

Arizona State University

University of Arizona

Arkansas

University of Arkansas at Little Rock

California

California State University, Long Beach

California State University, San Bernardino

Pepperdine University

University of California, Los Angeles

University of the Pacific

Colorado

Colorado College

Connecticut

Eastern Connecticut State University

Delaware

Wesley College

District of Columbia

Georgetown University

Florida

University of North Florida

Georgia

Georgia Institute of Technology

North Georgia College and State University

Spelman College

Idaho

Boise State University

Illinois

Southern Illinois University Carbondale

Indiana

Ball State University

Iowa

Simpson College

University of Northern Iowa

Kansas

Emporia State University

Kentucky

Murray State University

Western Kentucky University

Louisiana

Tulane University

Maine

University of New England

Maryland

University of Maryland, College Park

Massachusetts

College of the Holy Cross

Bridgewater State University

Smith College

Michigan

Central Michigan University

Hope College

University of Michigan

Minnesota

Augsburg College

Carleton College

Minnesota State University- Mankato

Missouri

University of Missouri, Columbia

Montana

University of Montana

Nebraska

University of Nebraska-Kearney

New Hampshire

University of New Hampshire

New Jersey

Rutgers University New Brunswick

The College of New Jersey

New Mexico

University of New Mexico

New York

State University of New York at Geneseo

Rochester Institute of Technology

North Carolina

Elon University

Mars Hill College

North Dakota

University of North Dakota

Ohio

Ashland University

The Ohio State University College of Medicine

Oklahoma

Southwestern Oklahoma State University

Oregon

Western Oregon University

Pennsylvania

Bloomsburg University of Pennsylvania

Juniata College

South Carolina

Clemson University

College of Charleston

Furman University

University of South Carolina

South Dakota

University of South Dakota

Tennessee

Middle Tennessee State University

Texas

Abilene Christian University

University of Texas at Austin

Utah

Weber State University

Vermont

Johnson State College

Virginia

George Mason University

Washington

Central Washington University

West Virginia

Marshall University

Wisconsin

University of Wisconsin - Stevens Point