6:30 Welcome Remarks and Announcements (Room 102)
   New member induction: James Wiebler

6:35 "Morphologic Indicators of Fossoriality and the Evolution of Burrowing in Dicynodonts (Amniota: Synapsida)"
   Jessica Scheckel
   Augustana College, Biology Department, Dr. Allison Beck.

   Among the extinct ancestors of mammals, the Dicynodontia is a clade of ecologically-important herbivores that lived 270-200 MYA. Despite the description of dicynodonts as generally fossorial by many workers, this assumption has yet to be tested. We tested for the presence of morphological indicators of burrowing behavior in dicynodonts by using quantitatively identified osteological correlates of fossoriality in extant mammals, whose behavior is known. We collected linear measurements on the forelimb and hindlimb skeletons of 39 Permian to Triassic dicynodonts and 157 extant mammals spanning 15 orders. Extant mammals were binned into three categories. Reduced major axis regression analyses and discriminant function analyses clearly distinguish between three functional groups -- subterranean, fossorial, and non-burrowing. Mapping inferred fossoriality into a phylogenetic context indicates that there was a single clade of specialized burrowing dicynodonts and that other burrowers were not closely related. Our results suggest that burrowing has evolved independently multiple times within dicynodonts.

6:45 "Personality can predict physiological responses to images of others in pain"
   Allison Lattanzio, Sara Strever and James Steele
   Augustana College, Dr. Ian Harrington.

   The mirror neuron hypothesis suggests that brain systems involved in sensing one's own situation also are activated when perceiving another in a similar situation. In this study, we measured participants' implicit arousal via their skin conductance responses, narcissism, and empathy. Participants looked at images of hands and feet in uncomfortable to comfortable situations. We measured the amplitude of the changes in the conductance responses and correlated the results to the respective image and the rating of comfort. We expected that scores on explicit emotional empathy and narcissism scales would be inversely related: those scoring higher for narcissism will show less physiological arousal when viewing pictures of others in simulated pain than those who score lower on (or higher on empathy). This research will provide further insight to the relationship between empathy, narcissism, and the perception of pain in others using both self-reports via standard personality measures and physiologically measures.

7:00 "Moral reasoning: Preliminary observations of physiological and behavioral correlates"
   Christopher Carter
   Augustana College, Dr. Ian Harrington.

   The purpose of this study was to determine participants' behavioral responses (i.e., explicit judgments) and physiological responses (i.e., skin conductance responses, SCR) to non-moral (NM), impersonal- moral (IM), and personal-moral (PM) scenarios. Greene et al. (2001) have demonstrated that personal moral scenarios engage emotional centers in the frontal lobe to a much greater extent than impersonal moral scenarios, and Koenigs et al. (2007) have demonstrated that patients with damage to these frontal lobe areas were more likely than controls to endorse "utilitarian" solutions to personal moral scenarios. These studies and others continue to suggest that emotional responses help to shape our decisions. In this study, we explored the ability of students to provide solutions to these scenarios, and recorded the nature of their decisions, the time needed to render those decisions, and an index of physiological arousal (SCR). In particular, we were interested in the differences between those who are likely to endorse utilitarian outcomes and those who are not.

7:10 "The Synthesis of a Salinomycin-Hyaluronic Acid Prodrug for the Treatment of Cancer Stem Cells"
   Nathan J. Smith
   MD Anderson Cancer Center, Houston, TX. Department of Experimental Therapeutics, Dr. John M. McMurray.

   Salinomycin (SM) is a polyether antibiotic derived from Streptomyces albus that is common in the poultry industry and acts as a potassium ionophore. Recent research has demonstrated SMs ability to induce apoptosis and significant cytotoxicity in cancer stem cells (CSCs) as well as drug and apoptotic resistance cancer cell lines. However, due to
associated muscular and neural toxicities observed in humans, its application as a chemotherapeutic is not practical. CSCs over-expression of CD44 receptors, which bind hyaluronic acid (HA), is a possible targeting molecule to transport SM selectively for the treatment of CSCs to reduce tumor metastasis and regeneration. I present a proposed synthesis and preliminary observations for the synthesis of a HA-SM conjugated prodrug for this purpose through binding of SM to HA via a 6-aminohexanol cross-linker.

7:20
"Creation of an HA-tagged α-catenin Deletion Mutant: Preliminary Successes in Investigating the Role of the α-catenin/Merlin Complex in Regulation of the Actin Cytoskeleton and Cell Adhesion"

Justin Smith
MD Anderson Cancer Center, Dr. Andrew Gladden.

Adherens junctions (AJ) are transmembrane protein complexes that allow for the intimate connection of neighboring cellular cytoskeletons. By mediating adhesion among neighboring cells, these complexes have been shown to play an important role in cellular polarity, contact-mediated inhibition of proliferation, and metastasis in cancer. Recent studies have shown that α-catenin, an important component of the AJ complex is key in regulating the actin cytoskeleton through a dynamic role involving binding of the AJ complex and mediating actin branching; this begs its importance as a key factor in cell adhesion/migration and metastasis. Merlin, a membrane-cytoskeletal protein, has been designated as a bona fide tumor suppressor and has been shown to associate with the AJ complex through binding of α-catenin. Additionally, Merlin deficient cells show great defects in cytoskeletal reorganization upon stimulation of junction formation. Here we report preliminary successes in creating an expressible form of an α-catenin deletion mutant that will aid in future experiments to elucidate the function of this α-catenin/Merlin complex.

7:30
"Raspberry Plant Dispersion and Abundance in Oak vs. Pine Forests"

Alison Bjork
Augustana Green Wing Environmental Lab, Dr. Kevin Geedey.

Raspberry plants provide nutrition to both humans and animals in various environments. This study researches the dispersion and abundance of raspberry plants comparatively between an oak forest and pine forest at the Augustana Green Wing Environmental Lab in north central Illinois. Raspberry plants in each population were assessed for plant height, abundance, dispersion, soil moisture, temperature, pH, and amount of light. The pine forest had a higher abundance of raspberry plants than an oak forest, this higher abundance was associated with plant height, soil moisture, and pH.

7:40
"Characterization of the Structure and Antibiotic Resistant Properties of β-lactamase in Meiothermus Ruber"

Tara Groen and Carla Mann
Augustana College, Dr. Patrick Crawford.

We isolated and examined a gene encoding a β-lactamase, an enzyme known to contribute to antibiotic resistance in the β-lactam family of antibiotics. The gene was transferred from Meiothermus ruber to pKT1, a plasmid that, in addition to now carrying the β-lactamase gene, carries an ampicillin resistance gene. This ampicillin resistance gene can contribute to difficulties in researching the functionality of the β-lactamase gene because the action of the ampicillin resistance gene can mask the predicted functionality of the β-lactamase enzyme. In order to prevent confusion in antibiotic resistance experiments, we transferred the β-lactamase gene from pKT1 to a separate plasmid known as pET26b. The next step will be the transformation of this plasmid to Escherichia coli cells in order to over express and purify the β-lactamase enzyme. Future studies on this enzyme will consist of substrate preferences and kinetic and site-directed mutagenesis studies in order to characterize the structure and function of the β-lactamase.

7:55
"Rate Based Models of Neural Networks and Plasticity"

Peter Wiese
Augustana College, Dr. Tom Bengtson.

Synaptic plasticity is the increase the strength of different synapses. In my study, I look at different forms of plasticity; specifically those based on rate based coding. Rate based models assume that information is stored in rates specific to stimulus, and that the pre and post synaptic rates can be used to determine the change in the synaptic efficacy. I worked on creating a model of a simple rate based neural network and combined the network with different learning laws, and analyzed the model. I am currently working on adding another learning law, based off of BCM theory, which is a form of metaplasticity.
"Endocranial Anatomy of Cryolophosaurus ellioti (Dinosauria: Theropoda)"

Vernon Meidlinger-Chin and Elizabeth Fisher
Augustana College, Dr. William Hammer.

Cryolophosaurus ellioti, a theropod dinosaur discovered in 1991, represents both the most complete dinosaur skeleton from Antarctica and the largest theropod from the Early Jurassic. The holotype skull contains a nearly complete and undistorted cranial cavity, which was scanned using noninvasive CT methods to create a digital endocast. Our research entails a detailed comparative anatomical description of the braincase and endocranial anatomy of Cryolophosaurus and a phylogenetic study of braincase and endocast features in Theropoda. This research aims to establish a foundation of data upon which future phylogenetic studies can be conducted. This was ongoing research as part of the Transantarctic Vertebrate Paleontology Project.

Poster Session
Introduction of the students who are presenting their posters (Room 102)

8:22 Refreshments - Viewing the posters (Atrium)

Poster
"Water Quality as It Flows Through Green Wing Laboratory's Watershed"
Janelle Gothner
Augustana Green Wing Environmental Laboratory, Dr. Kevin Geedey.

I looked at several variables of water quality within the Green Wing Laboratory watershed including nitrogen, oxygen, conductivity, indicator insect species, lake chemistry and landscape position temperature, depth, land use, and a few others. I then looked at how those levels were affected as the water flowed towards the end point, which was the Green River off of the Green Wing property. I concluded that land use was one of the biggest contributes to nitrogen, which resulted in extremely high levels.

Poster
"Exploration of Three-Body Decay Using Jacobian Coordinates"
Mark Hoffmann
Augustana College, Dr. Nathan Frank.

Experiments on neutron-rich nuclei may result in the emission of one or more neutrons. Attempting to find a clear signature of two-neutron decay is possible in some systems, but more difficult in others. The goal in a two-neutron analysis is improving the algorithm for biasing toward true two-neutron events while removing one-neutron scatter. A continuing challenge are to find better methods to do this task. A contaminant beam of $^{32}$Mg produced isotopes of $^{30}$Na and $^{29}$Na with possible two-neutron coincidences during an experiment using the Sweeper-MoNA facility at the National Superconducting Cyclotron Laboratory (NSCL), located at Michigan State University. We utilized these two isotopes by using Jacobian coordinate systems and comparing to typical gates that the research collaboration have used previously. The exploration of physical parameters to Jacobian coordinates will be presented.

Poster
"Productivity within Macrophyte Communities Found in Main Pond"
Ashlee Tiernan
Augustana Green Wing Ecological Field Station, Dr. Kevin Geedey.

Dissolved oxygen (DO) is one of the most important qualities to consider when managing the health of a pond, and it can vary greatly throughout the same pond. This study, conducted in Main Pond at Augustana's Green Wing Ecological Laboratory, focuses on macrophytes as communities and microhabitats to understand the variance in DO observed throughout the pond. The water within different macrophyte communities exhibited different concentrations of DO, which can be affected by both consuming and producing organisms. Due to further experimentation and the apparent lack of photosynthetic microorganisms, the trends observed in the pond were determined to be caused primarily by the plants themselves rather than the species living among the plants. The macrophytes also exhibited the same trends in productivity in a controlled study.
Experiments on neutron-rich nuclei have identified changes to the structure of nuclei far from stability. The Sweeper-MoNA-LISA facility at the National Superconducting Cyclotron Laboratory (NSCL), located at Michigan State University, is used for performing experiments on neutron-rich nuclei. These experiments have been limited to the mass region below neon due to the resolution of the charged fragment detectors, which limit isotope separation. The resolution of the system has been improved with changes to the setup, primarily due to a new scintillator array. The new array consists of twenty-five Na-doped CsI crystals arranged in a 5x5 configuration. The array measures the kinetic energy of charged fragments with energies in the GeV range. The improved resolution will allow experiments of unbound systems above neon. The testing, assembly, and current status of the detector array will be presented.

We have simulated an existing experimental design to determine the resolution improvement upon energy measurements of neutron unbound nuclei. A number of experiments of this type have been performed at the National Superconducting Cyclotron Laboratory (NSCL), located at Michigan State University. An excited nucleus is typically produced with a radioactive beam interacting with a passive Beryllium target. Many different nuclei are produced in experiment, each of which immediately decays into a charged particle and neutron. The charged particles are detected and the neutrons interact in scintillation detectors such as the Modular Neutron Array (MoNA) and Large Multi-Institutional Scintillation Array (LISA). In our simulation, we have constructed an active target that provides additional information such that the point of nuclear interaction within the target may be determined. This information improves the resolution in decay energy measurements of neutron unbound isotopes. This presentation will cover some aspects of the simulation process, as well as showing some of the results that demonstrate the simulated improvement over a passive target.

Inadequate drinking water quality and poor sanitation are among the leading causes of morbidity and mortality in the world. Nicaraguan drinking water currently has no regulation and is a possible source of many illnesses observed in the clinics hosted by Augustana College and PRAXIS. This pilot study was designed to be the first step in evaluating Nicaraguan drinking water as a possible source of pathogen transmission as well as other disease causing characteristics. In this study pH, TDS, and coliform/ E. coli presence were investigated in both Nicaragua and in rural USA as a means to compare regulated and non- regulated drinking water quality. Due to complications with equipment, we are unable to draw any conclusions from the data and further studies are required.