Session S – Humanities and Social Sciences
(Alphabetical)

Experimental Determination of Melting Rates of Ice in Subglacial Volcanic Eruptions
Veronica Anderson
Mentor: Magnús Guðmundsson

Although the most familiar landforms and lithofacies associated with continental glaciations tend to be sedimentary, subglacial volcanic eruptions have also left their own characteristic mark on the geologic record. In order to use information gained from classical subglacial volcanic features such as tuyas and tindars to reconstruct ice conditions at the time of their formation, we must first understand the processes at work during a subglacial eruption – currently, we can observe such events mainly in Iceland and Antarctica. The 1996 eruption at Gjàlp and the 2004 Grímsvotn eruption (both in Iceland) allowed geologists to make detailed observations and measurements of subglacial eruptions in real-time. However, due to the impossibility of placing sensors and making observations within the eruption site, we still lack an understanding of the mechanisms of heat transfer from the lava to the ice and meltwater during these eruptions. This project attempts to investigate the parameters controlling the melting rates of ice in an eruption by varying the temperature, pressure, and tephra load of a jet of water, and observing its effect on a block of ice in a laboratory. We then attempt to correlate these findings with the observed rates of melting in actual eruptions, and to connect them to the possible thermal conditions at the eruption site.

Open Basin Lakes on Mars: History and Implications for Noachian and Early Hesperian Hydrology
Peter B. Buhler
Mentors: James W. Head III, Caleb I. Fassett and Michael P. Lamb

Open basin lakes (OBLs) are craters or depressions that have an inlet valley and an outlet valley. Several hundred of them were detailed in *Valley network-fed, open basin lakes on Mars: Distribution and implications for Noachian surface and subsurface hydrology* (Fasset and Head, 2008). During the course of this research the catalogue of open basin lakes was reviewed and augmented with several newly discovered lakes. From the catalogue several OBLs were selected for closer investigation. The lakes were analyzed using image and mineralogical data in order to reconstruct their history. Criteria such as the presence of fan deposits, stratification and phyllosilicates were used to determine the behavior of the water that flowed through the OBL systems. Later, the reconstructed histories of lakes in close proximity were collated to determine the history of water in that area. The findings point to lakes with volumes on the order of tens of cubic kilometers that were probably filled episodically and to varying levels. There is also strong evidence that these lakes had precipitation as their source for at least part of their existence.

Dynamic Question Selection
Michelle Filiba
Mentor: Colin Camerer

Many experimental setups are based on asking a subject a set of predetermined questions in order to discover some information specific to the subject. Unfortunately, these experiments can include hundreds of questions. A subject who has to answer these questions may eventually get tired and start to tremble which will reflect negatively on her results possibly providing incorrect information. Additionally, some of the questions may not even be very useful for specific subjects. Our goal is to minimize the number of questions that we have to ask a subject while still gaining the same amount of information. Our approach to this problem is to dynamically choose the questions that we ask a subject in real-time. Based on a subject's previous answers to questions, we determine the next question to ask that will provide us with the most information. We are proving the effectiveness of this method by using the data from previous experiments to determine if it was possible to use fewer questions to get the same information. In the future, we hope that this method will be adopted by other scientists in their experimental designs.

Working Memory and Self-control in Dieters: A Study of Food Preferences
Adrienne Law
Mentor: Colin Camerer

Evidence suggests that a high working memory load tends to favor lower-order cognition. Shiv and Fedorikhin's (1999) findings suggest that rehearsing a number for recall can lead to a food choice that favors taste over health. In this experiment, dieter subjects rate 100 different food items for healthiness, then rate the foods for taste, on a scale of 1 to 5. Next, the subjects choose between each of the food items and the same reference food item, that is, a food they rated neutral in taste and health. During this choice task, subjects are also asked to remember a 2 or a 9-digit number and recall the number in a multiple choice format in five food choice blocks. We test the hypothesis that the subjects will privilege

taste over health in the 9-digit blocks but not the 2-digit ones because only the 9-digit recall requires a high working memory load. We are in the process of data gathering.

Using Cloud-Tracked Wind Data to Observe the Madden-Jullian Oscillation
Benjamin L Slawski
Mentors: Yuk Yung and Duane Waliser

The Madden-Jullian Oscillation (MJO) is a pattern of rainfall anomalies which propagates eastward through the tropics, most easily observed during the winter period (November - April). Attempting to observe this pattern directly through rainfall observations is notoriously difficult, so finding alternative methods of tracking the MJO is very beneficial to understanding and predicting it. Modern satellite technology has made it possible to track winds using high resolution imaging of cloud movement. Using a data set generated in this way, provided by Duane Waliser for this project, and MATLAB, I have generated a three dimensional model of wind anomalies caused by the MJO. These images demonstrate that it is possible to observe the MJO through cloud-tracked winds.

Chemical Composition of Protoplanetary Disks
Jamie Tayar
Mentors: Geoffrey Blake and Colette Salyk

Protoplanetary disks are flattened, rotating clouds of gas and dust gravitationally bound to a young star. Through accretion and viscous spreading, they can eventually form planetary systems. The composition of these disks is of interest because it can provide information on the origins and evolution of molecules such as water and volatile organic compounds that are central to life as we know it but difficult to form on the surface of the early Earth. This project examined the concentrations of simple molecules such as water and simple organics in a sample of forty-six stars with disks. First, the spectral type and rotation rate of each central star was approximated and the contribution of the star was removed from the spectrum. Then, optically thick and optically thin emission lines were used to determine the composition of the disk and the location of the molecules. Comparing these results to the predictions of the current models of disk structure and evolution allowed a study of the accuracy of these models.

An Experimental Approach to Understanding the Relationship between Curiosity and Monetary Reward
Katherine M. Wong
Mentors: Colin F. Camerer, Stephanie W. Wang, and Min Jeong Kang

In general, there are two main types of motivation, intrinsic and extrinsic motivation. When these two types of motivation interact, three situations may arise. Presence of an extrinsic motivator may: increase intrinsic motivation, decrease intrinsic motivation, or have no effect. Of particular interest in education, curiosity is an intrinsic motivator that encourages gaining knowledge for knowledge's sake. My project seeks to understand how an extrinsic motivator, monetary reward, interacts with curiosity.

Using an experimental treatment where subjects are given the choice to see answers to trivia questions and are paid to remember certain answers, I have examined how curiosity interacts with monetary factors for a select subject pool. A better understanding of this interaction for a broader population will have implications for future studies of how payment affects learning, especially in the quest to encourage more students to stay and do well in school.