February 28 – March 2, 2013

Austin College Student Scholarship Conference

Austin College

AC SC
Welcome

Austin College delights in welcoming you to our inaugural Student Scholarship Conference. This conference brings together over 150 students, their mentors, friends, and family from a variety of disciplines, to celebrate their intellectual scholarship. The students participating in this conference are presenting their accomplishments in research and creative activities that have engaged their intellectual curiosity and allowed them to explore novel ideas. Regardless of their career goals after Austin College, students’ participation in this kind of deep inquiry has provided them skills and habits of mind that will serve them well in their professional lives, and instill a joy in lifelong learning. We commend their perseverance and congratulate them on their endeavors.

Faculty sponsors have encouraged these talented young women and men to pursue their ideas and have supported their intellectual development. The relationships built between the faculty sponsors and the students during these projects embody one of the highest forms of teaching and provide these students with a lasting link to the college. We thank those faculty members, who have embraced the extra commitment beyond the classroom, for their support of these budding scholars.

This conference provides a forum to lift up academic exploration, engage in dialogue with others, meet new individuals from our community, and grow in understanding. I encourage you to share in the enthusiasm and knowledge of these students. Enjoy your experiences, and thank you for your attendance and support.

Marjorie Hass
President
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Schedule of Events

**Thursday**
7:30 p.m.
Chamber Music for Voices and Instruments
   Recital Hall – Craig Hall

7:30 p.m.
Theatre Production- “When We Dead Awaken”
   Beardsley Arena Theatre – Ida Green

**Friday**
12:30 p.m.
Conference Registration table opens
   Wright Campus Center Lobby

2:00-5:00 p.m.
Poster Symposium
   Mabee Hall – WCC

5:00 p.m.
Welcome Remarks from Dr. Hass
   Mabee Hall Stage – WCC

5:15-6:15 p.m.
Reception for participants and visitors
   Johnson Gallery – WCC

7:30 p.m.
“When We Dead Awaken”
   Beardsley Arena Theatre

9:30 p.m.
Improv Troupe Performance
   Beardsley Arena Theatre
Schedule of Events

**Saturday**
8:30 a.m.
Conference Registration Table Opens

8:30-9:00 a.m.
Coffee Reception (Sponsored by Acumen)

9:00-10:30 a.m.
Block I Student Presentations

10:15-11:00 a.m.
Refreshments Break (Sponsored by Suspension)

10:45 a.m.-12:15 p.m.
Block II Student Presentations

12:30-2:00 p.m.
Artists' Reception

2:00-3:15 p.m.
Chamber Music for Voices and Instruments

2:00 p.m. & 7:30 p.m.
“When We Dead Awaken”
# Student Contributors

<table>
<thead>
<tr>
<th>Name</th>
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<tr>
<td>Katherine Ailshire</td>
<td>Alyssa Ali</td>
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<td>Samrena Allawala</td>
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<td>Joe Goldman</td>
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<td>Yasanthi Gomathinayagam</td>
<td>Caitlin Graves</td>
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<td>Mark Hagge</td>
<td>Meagan Hair</td>
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<td>Amy Harvey</td>
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<td>Brock Inouye</td>
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<td>Roya Jamshidi</td>
<td>Rachel Jimenez</td>
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<td>Timothy Johnston</td>
<td>Rebecca Jones</td>
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Student Contributors

Jazmin Kelly  
Anastasia Krisan  
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Olivia Lewis  
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Sarah Martin  
Samantha Matulis  
Evelyn Mitchell  
Yanela Montoya  
Saman Najmi  
Spencer Nystrom  
Anika Nichols-Payne  
Laura Perez  
Steven Phillips  
Eric Prinslow  
Surya Ravi  
Christen Reamy  
Summer Roberts  
Evan Runyon  
Eric Schuppe  
Edward Jordan Selvik  
Caleb Sherer  
Jacob Smith  
Walter Smith  
Oscar Tovar  
Emma Treu  
Archit Vasan  
Amanda Kay Wiggins  
Jacob Wilson  
Robin Wright  
Chelsea Wylie  
Ryan Zimmerman  

Jason Kirkwood  
Stephanie Kutler  
Catherine Lark  
Stephanie Lee  
Lucy Li  
Lizzy Lincoln  
Araceli Lopez  
Ashley Malcom  
Deepika Mannem  
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Eristeo Perez  
Jessica Pehrson  
Leticia Pilar  
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Edgar Rodriguez  
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Akshaya Selvamani  
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Connie Tran  
Roberto Varela  
Kathryn Wattenbarger  
Harrison Wilkie  
Lyndsey Womack  
Allison Wurmbbrand  
Arthur Yang
Committee

Coordinator
Lance Barton

Political Science
Nathan Bigelow

Computer Science and Mathematics
Aaron Block

Psychology
Renee Countryman

English
Carol Daeley

Music
Ricky Duhaime

Theatre
Kirk Everist

Chemistry
Karla McCain

Student Intern
Bethanie Livernois
Chamber Music for Voices and Instruments

Thursday, February 28, 7:30 p.m.
Saturday, March 2, 2:00 p.m.
Recital Hall – Craig Hall

Performed by Austin College Students and Faculty

Student Performers:
Katie Armstrong
Turner Bilodeau
Anna Bryant
Edward Kim
Kevin Drummond
Deepika Mannem
Alexander Ray

Faculty Performers:
Wayne Crannell
Ricky Duhaime
Wolfgang Lueckel
John McGinn
Sylvia Rivers

Featuring Ensemble Music by:
J.S. Bach, W.A. Mozart, Mendelssohn, Fauré
“When We Dead Awaken”

February 28, March 1, March 2 at 7:30 p.m.
March 2 at 2:00 p.m.
Beardsley Arena Theatre—
Ida Green Communication Center
Tickets $8, Free with AC ID

Henrik Ibsen dubbed his last play, *When We Dead Awaken*, a “Dramatic Epilogue.” Austin College presents a new translation of this provocative and passionate study of glory, inspiration, and guilt, of the effects of art and the possibility of re-inventing one’s life. Student designers collaborate with Professor Liz Banks to take the audience into the artist’s imagination. Directed by Dr. Kirk Andrew Everist, a cast of undergraduate actors creates the famous sculptor Arnold Rubek; his restless wife, Maja; the hunter, Ulfhejm; the mysterious woman from Rubek’s past, Irene; and the people of their community in this gripping psychological drama.

The Austin College Improv Troupe returns from its appearance in Austin, Texas, last January to provide the campus with Sherman-style, long-form live improvisation. Friday night following *When We Dead Awaken* (approximately 9:30 p.m.) the cast of the troupe – entirely undergraduates – will take audience suggestions and provide a post-show jam session. All scenes are improvised on the spot.
“When We Dead Awaken”

**Cast:**
Mateo Ervine
Lizzy Lincoln
Cody Edwards
Missy Lyttle
Harrison Wilkie
Amy Anderson
Julio Torres
Katherine Ailshire

**Design & Crew:**
Stefany Cruz
Lyndsey Womack
Jessica Pehrson
Jessica Shanks
Johanna Hunter
Anika Nichols-Payne
Edgar Rodriguez
Kaitlin Forsman
Austin College Student Art Exhibition

A Statement About The Exhibition:
Senior Conference, the final step in the art program at Austin College, gives senior art students the opportunity to critique one another on their artwork, and to practice curating, preparing, and installing an exhibition.

Artwork from several classes in the fall 2012 semester, along with artwork from the Senior Conference class, was selected to represent the school’s artistic accomplishments as a whole. Art appreciation classes, upper-level classes, and students doing independent work were all included in the pool of possible entries. Senior Conference students hand-picked the exhibition from the collected entries, and organized and installed the show. All curatorial responsibilities were left in the hands of students, making the show completely student-led.

The exhibition presents an accurate and insightful view of the art community at Austin College. The pieces are diverse, well-executed, and deeply original, ranging from photography and painting to metalwork and found object collections.

-Chelsea Wylie and Evan Runyan, senior art students

What we call research for studio art students is, in essence, making original art, with awareness of histories and traditions of art making as a part of the study. This process begins in the earliest, most fundamental, classes and continues for as many classes as the student takes. Seniors (majors, some minors and other invited students) participate in Senior Conference in advance of the penultimate experience, the Senior Thesis Exhibition. Every experience in Senior Conference, as well as in every other art or art history class, is meant to prepare them for that exhibition, the most sophisticated and thematically concise art work they are prepared to present.
Austin College Student Art
Exhibition

Artists
Amanda Kay Wiggins
Aven Jackson
Brendan Kelleher
Catherine Chang
Chelsea Wylie
Evan Runyon
Janel Lionberger
Laura Massey
Lauren Bolinger
Madeline Smith
Mary Katherine Bond
Rebecca Jones
Robert Reilly
Sarah Martin
Steven Phillips

Curators
Elizabeth Flint
Roya Jamshidi
Umme Lalani
Emma Treu
Poster Session
Abstracts

Mabee Hall
Friday, March 1
2:00–5:00 p.m.
Session 1: Odd numbers 2–3:30 p.m.
Session 2: Even numbers 3:30–5 p.m.

Refreshments sponsored by Sigma Xi
Synthesis of Porphyrins for Nanomachines

Stephanie Lee, Matt Moore, & Stephanie Gould
Chemistry Department, Austin College
Abstract #1

Porphyrins will be used in the construction of supramolecular systems, because they are stable macrocycles that can have varied structures to allow for hydrogen bonding and ligand coordination. Their architectural and photosensitive properties make it possible to manipulate them into mimicking systems that are found in nature such as photosynthesis. Our goal is to study geared motion through porphyrin frameworks. Using the Lindsey method, zinc 5, 10, 15-Tris(4-carbomethoxyphenyl)-20-(ethynylphenyl)porphyrins were synthesized. Two of these porphyrins were linked together with a 1, 4-ethynylbenzene rotor to form the target dyad. These compounds will form porous coordination frameworks by complexation with bidentate ligands. Interactions within the framework will be used to study geared motion. Herein, the successful synthesis of the dyad is reported.
Perceptions of Couples on Ethnic Identity

Diana Dihn, Jazmin Kelly, Ashley Malcom, & Lisa Brown
Psychology Department, Austin College
Abstract #2

New research suggests people make judgments about the ethnic identity of another person from his/her appearance (Wilkins, Kaiser & Rieck, 2010). We studied perceptions of brides and grooms. People observed photos in which both bride and groom were White, both were Black and one was Black and one was White. People were randomly assigned to view the original photo with both bride and groom or an edited photo in which either the bride or groom was edited out. The study used a mixed model experimental design in which couple (Black, White, interracial) was a within-subjects variable and picture (couple, one person blocked out) was a between-subjects variable. Participants rated the ethnic identity of people in the photos. We hypothesized each member of an interethnic couple would be perceived as having lower ethnic identity when seen together than when one member is edited out of the photo and also relative to members of monoracial couples. Consistent with the hypothesis, there was a significant effect of couple, $F (5, 59) = 12.1$, $p < 0.001$, Wilks' Lambda = 0.5. Brides ($M = 6.0$) and grooms ($M = 6.0$) of Black-White couples were perceived to have lower ethnic identity than brides ($M = 6.4$) and grooms ($M = 6.4$) of White-White couples who were perceived to have lower ethnic identity than brides ($M = 6.6$) and grooms ($M = 6.8$) of Black-Black couples. The condition by couple interaction was significant, $F (10, 118) = 3.6$, $p < 0.001$, Wilks' Lambda = 0.6. Brides and grooms in Black-White couples were viewed to have lower ethnic identity when both were in the picture than when the picture showed only the bride or groom. In contrast, brides and grooms in Black-Black and White-White couples were perceived to have higher ethnic identity when viewed together than when viewed alone.
Effects of Prairie Restoration Managements on Soil Enzymes and Fungal Communities in Grayson County, Texas

Spencer Nystrom, Michaela Modén, Anastasia Krisan, Keith Kisselle, & Kelly Reed
Biology Department, Austin College

The Blackland Prairie is one of the most endangered ecosystems in the world. Its importance to the North Texas climate is evidenced through the ecosystem services it provides. Historically, periodic disturbances, such as wildfires and migrating herds of bison, served as natural regulators of the Blackland Prairie by giving grasses a competitive advantage over trees. Three managements that mimic historical disturbances of the Blackland Prairie were established in triplicate to test the effects of different managements on prairie restoration: prescribed burning (FM), grazing (CM), and a combination of burning and grazing (FCM). These management sites are compared to Blackland Prairie remnants (positive control), and degraded Blackland Prairie (pastures; negative control) in triplicate. In this study, we compared the effects of the managements on soil characteristics (soil organic matter (SOM), soil moisture, pH), soil enzyme activity (β-Glucosaminidase, N-acetyl-β-1,4-glucosaminidase, and phosphatase), and belowground fungal community structure; restoration effectiveness can be observed through shifts in these variables in the management sites towards values similar to those of the prairie sites. The prairie remnants were significantly different from the pasture sites in terms of SOM, soil moisture, and fungal community structure. This shows that the prairie and pasture sites can function as positive and negative controls in the long term restoration experiment. While the restoration sites did not differ from either of the controls in terms of fungal community structure, the differences observed between the controls indicates we should be able to detect shifts in the community structure in the restoration sites if they occur.
Site-Directed Mutagenesis of $\beta$-2 Microglobulin

Tyler Liang & John Richardson
Chemistry Department, Austin College
Abstract #4

Protein aggregation has been discovered as the driving force behind many diseases over the past decade. This has sparked further investigation into the mechanism of protein folding and aggregation. Beta2-microglobulin has been identified as a precursor to amyloid fibrils in dialysis-related amyloidosis. Mapping out the energetic profile of $\beta$-2 Microglobulin folding, landscapes should provide the ability to characterize the folding process from native state to unfolded molecule. Introduction of site directed mutants of $\beta$-2 Microglobulin will allow for comparison of the natural sequence to a variant of known chemical property. Site-directed mutagenesis is the changing of nucleotides in the genetic code to facilitate change of amino acid residue sequence resulting in a mutation of the protein. Site-directed mutagenesis was carried out using polymerase chain reaction with custom-designed primers, to make the changes D39V and I5T. The objective of this project is to develop the $\beta$-2 Microglobulin DNA for the selected mutations through site-directed mutagenesis.
Dye Sensitized Solar Cells: Characterization of Metal Ligation to Monolayers of Surface Based Ligands on Titanium Dioxide

Caleb Sherer & Karla McCain
Chemistry Department, Austin College
Abstract #5

Solar cells have the potential to replace fossil fuels as the primary method for acquiring energy in the average person’s life. The problems that the current silicon based solar cells face are the lack of efficiency and the exorbitant cost. Dye sensitized solar cells (DSSC) have the potential to be much more efficient in energy output as well as tremendously decrease production cost, allowing for practical and clean energy. The method used to create these monolayers of surface bound dyes differs from other researchers because of the use of a bottom up method instead of the more common top-down approach. The top down approach builds the dye molecules, and then attaches those molecules to the titanium dioxide. The bottom up approach allows for a step-wise addition of each component of the dye to the titanium dioxide until the dye molecule is complete on the particle. The bottom up approach is advantageous because it allows for better geometric control of the dye molecule, better control of coverage of the dye on the titanium dioxide particles, and it covalently bonds the dye to the surface, instead of a van der Waal bond that is accomplished using top down approach. This was accomplished by the reaction of silane based amine ligands to nanoparticle titanium dioxide, followed by the ligation of transition metals to the modified surface. After reaction, particles are centrifuged and dried in an oven. The particles were characterized by attenuated total reflectance infrared spectroscopy (ATR-IR) and bands corresponding to the C-H stretch and N-H bend from the silane based ligands are observed upon reaction with silane. Large changes in peak position, height, and shape are observed in the N-H bending bands upon ligation with metal indicating ligation.
Global Warming is Not Just About Temperature

Mark Hagge & David Baker
Physics Department, Austin College
Abstract #6

Data from the Austin College weather station located at the Sneed Prairie, which encompasses local weather, has been collected for over 8 years. Humidity and temperature data from those years was used to determine the total amount of energy in the atmosphere; part of which comes from the temperature of the air and part from the latent heat of vaporization of water leading to humidity. The total amount of energy in our local atmosphere is, as expected, higher during the summer months. In addition, the total atmospheric energy has been rising over the years 2004-2010. The data shows that the increase in total atmospheric energy has, surprisingly, not led to a large increase in temperature, but rather to much higher relative humidity through the evaporation of more water.
Territory Marking: Hickeys and How the Behavior Relates to Dominance & Insecurity

Stephen Phillips, Ashlyn Conrad, & Renee Countryman
Psychology Department, Austin College
Abstract #7

Humans are territorial by nature (Lyman & Scott, 1967), and the incriminating mark on the neck of a teenager after a date, may be a manner in which territorial behavior is exhibited. The purpose of this research is to gather general information about the practice of giving and receiving hickeys as well as to determine how hickeys relate to dominant, submissive, and insecure personality traits. An additional goal is to build upon a field in which research is lacking. Participants will be asked to fill out a content analysis questionnaire that contains open ended, researcher designed questions regarding participants’ personal hickey giving and receiving behaviors; selections from the Mate Retention Inventory Short Form (MRI-SF); the Attridge, Berscheid, and Sprecher Insecurity scale; adjective sets from the Interpersonal Adjective Scale (IAS-R); and Security and Assertiveness scales from the International Personality Item Pool California Psychological Inventory. The questionnaire will also be formatted to be presented online. Participants will be recruited from the Austin College Psychology Department participant pool, postings on Craigslist, and postings on Facebook. We hypothesize that those who give hickeys the most often will have higher ratings within an interpersonal dominance scale and will agree more with statements that describe dominant behavior. We also hypothesize that those who receive hickeys the most often will agree more with statements that describe submissive behavior. Finally, we will examine whether or not those who receive and give hickeys the most often have higher ratings of insecurity.
Synthesis of a Platinum(II) Dithiolene Building Block with Labile Diimmine Ligands

Jacob Smith, Paul J. Derry, & Bradley Smucker
Chemistry Department, Austin College
Abstract #8

In our quest to synthesize and characterize light-harvesting building-blocks utilizing diimmine platinum(II) dithiolene complexes, we report the synthesis and characterization of cis-(pz)2Pt(mnt) (mnt = maleonitriledithiolate, pz = pyrazine). This building-block exhibits light-absorbing and redox properties as well as possessing relatively labile monotopic pyrazine ligands. The exchange of pyrazine with a variety of bridging immine ligands is utilized in the syntheses of new building-blocks with greater stability and more desirable redox and light-harvesting properties for use in the self-assembly of supramolecular squares and model complexes.
The Stability of Native State β-2 Microglobulin Monitored by Circular Dichroism

Arthur Yang & John Richardson
Chemistry Department, Austin College
Abstract #9

Beta-2 microglobulin (β2m) is a small 99-residue protein found on the surface of all nucleated cells as part of the major histocompatibility complex class I. Patients who experience kidney failure and undergo long term hemodialysis lose the ability to degrade proteins from their blood; therefore the concentration of β2m increases by 60-fold. β2m proteins are then deposited into osteoarticular tissues as misfolded state amyloid fibrils causing dialysis-related amyloidosis. The objective of this study was to examine this question: how exactly do proteins fold, unfold, and misfold? To investigate this question, we aimed to determine the stability (∆G) associated with the protein folding mechanism by comparing the free energy of β2m in its folded and unfolded states. Same concentrations of β2m were put into different concentrations of urea denaturant for a set amount of time and then results were analyzed using circular dichroism (CD). We expected to see that as the concentration of denaturant increased, the magnitude of absorbance should decrease since proteins lose their structure when denatured. For future experimentation, we will reproduce this experiment and perform CD analysis with site directed mutants which will then produce results that increase our understanding of the stability of the native state β2m protein and how it relates to the mechanism of protein folding.
Testosterone Reactivity in Fathers Following an Acute Stressor

Eric Schuppe & Renee Countryman
Psychology Department, Austin College
Abstract #10

To increase future reproductive success, males would have evolved biological and psychological mechanisms to allow them to shift priorities between child care and conceiving more offspring. These differences in stress response and child care are at least partially due to hormonal shifts in fathers. Few studies have examined the hormonal changes in fathers with children of varying age groups following a parental stressor. The current study seeks to determine whether fathers have been selected over evolutionary history to have a different stress response than non-fathers as a way of ensuring the survival of their offspring. In this study, we will use 30 fathers and pair-bonded non-fathers. Participants will be asked to free write about what is the worst thing that could potentially happen to their child. After this, they will be asked to listen to a 5-minute audio clip of a baby crying from pain. Before the stressors and afterwards, participants will be asked to provide two saliva samples which will be analyzed for cortisol and testosterone concentrations. We hypothesize that individuals in the experimental condition will experience spikes in cortisol but not testosterone following an acute stressor. Also, fathers with more paternal experience (i.e. a greater number of children or an older child) will experience a smaller change in testosterone and cortisol.
Texting And Driving: 
Is It Worth It?

Yasir Hashim, Brock Inouye, Spencer Gander, Waleed Fazal, 
& Lisa Brown
Psychology Department, Austin College
Abstract #11

With the advancements in technology, texting and driving-related accidents have been on the rise. The objective of this project was to simulate texting and driving in a video game, and examine driving latency and accuracy with subjects that either do or do not text. Previous research indicates that distracted driving has led to higher latency and decreased accuracy. This knowledge was taken and used to test the specific distraction of texting while driving. To determine whether there is an effect on latency and reaction time, 40 participants were asked to voluntarily participate in a study that tested latency and accuracy in a simulated vehicle. Participants were randomly assigned to either a texting group or a non-texting group (control). The results of latency and accuracy will be compared between the control and the texting group. The hypotheses is that the group that texts while driving in the video game will have slower latencies and worse accuracy than the control group.
Porphy. Synthesis for Use in Nanomachines

Ashley Hellman, Matthew Moore, & Stephanie Gould
Chemistry Department, Austin College
Abstract #12

A framework of diporphyrin monomers with an internal phenyl ring rotator has been synthesized. These dyads will be used to study geared rotation and the formation of molecular gears and machines by creating larger frameworks through bidentate ligand coordination with the internal zinc atom of the porphyrin. Bidentate ligands of varying length will be studied to determine the ideal framework in which the phenylene rotators have correlated motion in the solid-state material. The porphyrin, 5,10,15-Tris(4-carbomethoxyphenyl)-20-(4-(trimethylsilyl)ethynylphenyl) porphyrin, was synthesized using the Lindsey method. Following zinc insertion and alkyne deprotection, a Sonogashira coupling was used to form the final dyad. Isolation of the final product has been difficult and only a very small amount of pure product was obtained.
Synthesis and Characterization of Mono and Di Substituted Silane Bis Urea Organogelators

Colt Corey & Andrew Carr
Chemistry Department, Austin College
Abstract #13

The goal of this research is to determine how tail length, type of tail, and number of tails substituted on silicon branch points affect the strength and properties of bisurea organogelators. Six different tails, hexanol, octanol, dodecanol, methoxy polyehtylene glycol 350 (methoxy PEG 350), triethylene glycol ethyl ether (TEG ethyl ether), and triethylene glycole butyl ether (TEG butyl ether), were used in the study. Preliminary gelation studies were conducted with mono and di-substituted derivatives. These studies show that the mono-substituted derivative is a much better organogelator than the di-substituted derivative. The reason for the different length alkyl tails is to find an optimal tail length that gels with lowest weight percent in a solvent. Gelation studies have shown that mono hexoxy and dodecoxy derivatives gel at the same weight percent in both toluene and hexane. The octoxy tail gelled at a higher weight percent in both toluene and hexane. The methoxy PEG 350, which is equivalent to about 25 carbons long, was successful in gelling toluene and acetone but was insoluble in hexanes. Both the TEG ethyl ether and TEG butyl ether had similar results to the methoxy PEG 350 in toluene and were both able to gel acetone but at a higher weight percent.
The primary purpose of the present study was to see if exposure to more critical thinking classes would affect how much influence an article about a controversial topic had when intertwined with an fMRI scan. Recently fMRI’s have been a very popular topic in the media. McCabe and Castel (2008) found that brain images can persuade individuals to accept information more easily than articles that do not contain brain images. In our study, an article on the biological basis of homosexuality was given to participants to read. In the first condition, participants only read the article. In the second condition, participants read the article and were given a bar graph that represented the data. In the third condition, participants read the article and were given an fMRI scan and bar graph to represent the data. There was a significant difference in agreement for the biological basis of homosexuality depending on the article condition the participants were placed in, F(2,57) = 3.86, p < 0.05. Participants who received the bar graph and fMRI images with the article rated homosexuality as significantly more biological than the participants in the graph/article condition, p < 0.05. We also found that participants with a Science major agreed that homosexuality was biological more so than non-science majors [t(58) = 2.86, p < 0.05] and reported a greater change in their opinion of homosexuality after reading the article [t(58) = 3.11, p < 0.05]. When participants scored high on scientific reasoning, they were also more likely to be influenced by the material in the article regardless of condition. Together, this research suggests that opinions concerning the biological basis of homosexuality can be changed with exposure to research, and in some case the use of fMRI images is more persuasive.
Organogelator Molecular Structure and its Effect on Hydrogen Bonding and Conformational Defects

Jonathon Quiring, Andrew Carr, & Karla McCain
Chemistry Department, Austin College
Abstract #15

The purpose of this study was to learn about the structure-function relationship within a series of branched silane-based organogelators. More specifically, Fourier-transform infrared spectroscopy was used to study both the hydrogen bonding between urea groups and conformational defects in the alkyl tails as a function of organogelator molecular structure. Three molecules existed in the series all having a C6 linker length between the urea and lengths ranging from C3 to C6 from the urea to the silicon atom. Organogels were prepared at concentrations ranging from 0.3 to 40 mg/mL in spectrophotometric grade benzene and infrared spectra of them were acquired in a liquid transmission cell. The amide band was used to determine both the organization and relative amounts of hydrogen bonding between urea groups. The relative amounts of conformational defects were determined upon examination of the methylene bending region. It was found that the organogelators involved in this study had slightly lower critical concentrations than that of previous bisurea organogelators as well as less hydrogen bonding overall. We have hypothesized that this trend toward less hydrogen bonding is due to the bulky, branched groups on the ends of the organogelators, preventing the diffusion to their hydrogen bonding sites. Future work with other molecules in this series will allow us to explore this hypothesis further.
The Fluoro-Feed Assay: A Novel Two-Choice Paradigm for Experience-Dependent Ethanol Preference and Consumption in Drosophila

Matthew Nye¹, Raniero L Peru Y Colón de Portugal², & Adrian Rothenfluh²
¹Chemistry Department, Austin College
²University of Texas Southwestern Medical Center
Abstract #16

Alcoholism is prevalent across the world and is responsible for many negative impacts to both the person affected by the disease as well as society. Drosophila melanogaster has been demonstrated to be a suitable model system to study the behavioral and genetic aspects of alcohol addiction, such as increased consumption over time and relapse into drinking ethanol after a period of abstinence. Our lab has developed the Fluoro-Feed Assay (FFA), a general novel two choice feeding assay. This summer’s research focused on optimizing the parameters of the Fluoro-Feed Assay in order to better define and study the various aspects of ethanol self administration in flies, including “relapse-like” behavior after deprivation from ethanol.
The purpose of my project was to conduct a functional analysis of tantruming behavior for a 12-year-old boy with Autism and then use those results to develop and test a functionally-derived intervention. Initial interview data were used to develop an operational definition of the behavior that was then tested by two observers. The inter-rater reliability for the tantruming definition was 95.83%, indicating a reliable operational definition. Additionally, initial interview and observation results led to the development of the following hypothesis: “Child X tantrums in the presence of adults in order to get their attention.” To test this hypothesis, I conducted a functional behavior assessment using the following 4 conditions: attention, preferred item, escape, and control. Tantrum behavior occurred in 100% of the attention trials, whereas it occurred in 0% of the other three condition trials. Based on the functional analysis results, I developed two functionally based interventions, one cognitive and one behavioral. For the cognitive intervention, I chose a social story technique to teach strategies for coping with anger and frustration (Gray, 2010). For the behavioral intervention, I used differential reinforcement to decrease the instances of attention-seeking behavior and increase latency of gratification (Repp & Horner, 1999). Both of these are evidence-based strategies and, based on the data, I think these will be successful in decreasing Child X’s tantrum behavior. This study adds to the growing research on the effectiveness of functional analysis to design interventions to reduce problem behaviors typically associated with Autism Spectrum Disorder.
Effects of PA28γ on Anti-apoptotic Signaling by AKT

Melanie Bishop, Allison Wurmbrand, Timothy Johnston, & Lance Barton
Biology Department, Austin College
Abstract #18

Proteasomes are multi-catalytic enzymes that regulate cell cycle progression and apoptosis via protein degradation. The substrate selectivity, enzymatic activity, and localization of proteasomes in the cell are regulated by association with various proteasome activators (PA). PA28γ, a constitutively expressed proteasome activator, is overexpressed in various cancers and is important for maintaining genomic stability and controlling cell cycle progression. To further examine the role of PA28γ in carcinogenesis, its effects on intrinsic apoptosis of Akt proliferative signaling will be explored. Akt (PKB), a serine/threonine kinase, plays a key role in cell growth, proliferation, and survival via inhibition of apoptosis. Akt can also become constitutively active in many cancer cells. Akt phosphorylates downstream targets that prevent the release of cytochrome C from the mitochondria. Akt is negatively regulated by phosphatase and tensin homolog deleted from chromosome ten (PTEN), which is frequently mutated in many cancers. Interestingly, PTEN transcription is regulated by p53, which is down regulated by MDM2-mediated degradation in the presence of PA28γ. Degradation of p53 is predicated on MDM2 phosphorylation by Akt; thus, creating a possible feedback loop for carcinogenesis under cellular stress. This study will examine Akt and PTEN phosphorylation in PA28γ−/− murine embryonic fibroblasts (MEFs) under oxidative stress to mimic the beginning stages of carcinogenesis. It is hypothesized that PA28γ plays a role in promoting the activity of the Akt anti-apoptotic pathway through suppressing the synthesis and activity of the regulator, PTEN.
A New Revolution: Analyzing Rotation in a Solid Molecular Gear

Brian Clinton, Raven Clark, & Stephanie Gould
Chemistry Department, Austin College
Abstract #19

A porous coordination material with rotational units pillared through porphyrins and connected using coordinating ligands in a crystalline structure was created in order to study the properties of geared motion from the interactions of the rotational groups. Dyad monomer units containing an anthracene rotator capped by porphyrins were synthesized. The porphyrin was synthesized by the Lindsey method but establishing the identity of the coupled porphyrin dyad proved challenging due to insolvability. Upon full characterization, the porphyrin dyad will be coordinated with bidentate ligands to form the crystalline network and rotational motion of the gears will be analyzed by solid state NMR.
in situ Monitoring of the Modification of TiO2 Surfaces for Dye-sensitized Solar Cells

Connie Herrera & Karla McCain
Chemistry Department, Austin College
Abstract #20

Dye-sensitized solar cells (DSSC) have the potential to replace silicon solar cells currently used commercially. DSSCs could be cheaper and more efficient than silicon-based cells. The focus of the experiment was developing a method to synthesize the dye molecules on the surface of titanium dioxide semiconductor. These dyes are usually synthesized in solution and then attached to the titanium dioxide. Instead, the dyes will be synthesized on the titanium dioxide particle surface. This method could be a better way to build the dye, because the traditional method can be difficult to control the geometry and surface coverage of the attachment of the dye on the titanium dioxide. An in situ method using attenuated total reflectance infrared spectroscopy (ATR-IR) was developed to examine the kinetics of the first step in this process: the reaction of silanes with titanium dioxide. Titanium dioxide nanoparticles were suspended in a slurry with ethanol, and a thin layer was deposited on a ZnSe internal reflection element (IRE) using a razor blade. This IRE was placed in the flow cell of an ATR accessory and 0.0025M solutions of 3-aminopropyltriethoxysilane and N-[3-(trimethoxysilyl)propyl]ethylene-diamine in ethanol to the titanium dioxide were flowed as spectra were acquired every 2-3 minutes. It was determined that the formation of a full silane monolayer on titanium dioxide was complete after about 10 minutes. Future work will involve the synthesis of the rest of the dye complex on the surface by the ligation of transition metal ions to the silane-based ligand, and finally the addition of a capping ligand.
Self-Report Methods of Sexual Identity and its Correlation with Homophobia

Stephanie Kutler, Ashley Darby, Christen Reamy, Archit Vasan, & Lisa Brown
Psychology Department, Austin College
Abstract #21

Previous research has shown a strong correlation between sexual identity and levels of homophobia. However, the research remains unclear as to whether the method of measuring sexual identity affects its correlation with homophobia. This study examines this correlation and the differences between methods of reporting sexual identity. We utilized the Heterosexual Attitudes toward Homosexuality Scale (Larsen, Reed, & Hoffman, 1980) to calculate a homophobia score for each participant. We used three different sexual identity scales: 1) an item in which participants were forced to choose bisexual, gay, heterosexual, or lesbian; 2) a Kinsey-like scale which presented heterosexual and homosexual on opposite ends of a continuum; and 3) a scale measuring level of homosexual identity followed by a scale measuring heterosexual identity. We predict that the more consistently a participant reports his/her sexual identity across these three measures, the more strongly sexual identity will correlate with homophobia.
The Effect of Ethnic Names on Hiring Decisions

Samrena Allawala, Surya Ravi, Alyssa Ali, Danny Fuchs, & Jill Schurr
Psychology Department, Austin College
Abstract #22

The influence of stereotypes and prejudice can affect how employers evaluate prospective applicants from various ethnic backgrounds (Dovidio et al., 2010; Gilbert et al., 2003). Historically, this area of research has been conducted with people from either Hispanic or African American backgrounds. The present experimental study sought to add to this literature by investigating how the perceptions of Asian Americans may impact hiring decisions when evaluating a potential applicant for a tutoring job. Using a sample of 56 undergraduate college students, we tested how highly applicants with different ethnic names (Asian, Caucasian, and Hispanic American) were rated using Leasher's Hiring Decision Measure (Leasher, Miller, & Gooden, 2009). A one-way ANOVA displayed a statistically significant difference between the three groups, $F(2, 53) = 5.570, p = 0.006, \eta^2 = 0.174$. Results suggest that participants rated the applicant with a Hispanic name more positively than the Asian American and Caucasian American applicants (which were rated similarly). While our findings were significant, the results were not in the direction we predicted, and the implications of these findings present support for other factors that can affect evaluation of skills. These alternative explanations are discussed.
Effects of Branching and Linker Lengths on Silicon Containing Bisurea Organogelators

Kathryn Wattenbarger & Andrew Carr
Chemistry Department, Austin College
Abstract #23

Thermoreversible organogelation has been the focus of many studies due to its possible use in oil spill recovery and drug delivery. Though many compounds have been shown to be organogelators, very few contain silicon. A structure function relationship study was conducted using silicon as a branching point to increase the number of alkyl tails in the organogelator. The highly branched bisurea compounds were synthesized by reacting silyl chlorides with amino alcohols followed by reaction with bisisocyanates to create potential gelators in a one-pot, two-step process. Our preliminary studies have shown that several of these compounds gel toluene and hexanes at ≤ 1 wt/wt%.
Tetrakis(phenazine)platinum(II) tetrafluoroborate was synthesized in high yield and characterized using standard spectroscopic methods. The complex exhibits strong absorption in the UV and visible region and has four reversible reductions between 0.2V and -1.0V. Subsequent reactions of this complex with varying di-thiolene ligands are also reported.
The Presence of Gender Biases in College Students’ Evaluations of Potential Professors

Roxanne C. Crouch, Madeline E. Cohn, Benjamin J. Burnett, & Renee Countryman
Psychology Department, Austin College
Abstract #25

According to the United States Census Bureau, women make $0.77 for every dollar that a man makes. Women are underrepresented in the workforce, especially in several areas of science. In order to investigate the possible gender bias that exists between men and women in the academic fields of physics, psychology, and biology, 123 undergraduate students evaluated one of six possible curricula vitae for potential assistant professors. In a 2x2x3 factorial design, the gender of the participant, the gender of the professor, and the department of the professor were analyzed against the participant’s evaluation of the competency, hireability, potential salary, and likeability of the professor, and against the participant's score on the Modern Sexism Scale. The main hypotheses were as follows: (1) males would be deemed the more competent candidate overall for all three disciplines, (2) female applicants in stereotypically female fields would be rated as more competent than female applicants in stereotypically male fields, and (3) these disparities would exist no matter the gender of the participant. The data suggested that male applicants were rated as slightly more competent than females, regardless of participant gender. The findings indicated that women were slightly more likely to rate the female applicants lower in competency than the male applicants, and that participants were more likely to award the highest salary to the male physics applicants and the lowest salary to female biology applicants. The male biology applicant received the highest hireability ratings over all other applicants, while the female biology applicant received the lowest hireability ratings.
Adaptive Multiprocessor Real-Time Systems

William Kelley & Aaron Block
Computer Science and Mathematics, Austin College
Abstract #26

Recently, there has been an increased interest in multiprocessor computing. Multiprocessor systems provide more computational power, while requiring less voltage. This is important in mobile devices where battery life is vital. Additionally as multimedia applications are becoming more prevalent, it is important that operating systems be capable of satisfying timing constraints (i.e., allocate enough processing time to each application so that each application can complete its work in a timely fashion). In our research, we examined two different algorithms that attempt to optimize the overall quality of service of the system on a multiprocessor system with timing constraints. We worked on making the operation system adaptive to reduce how often the system has to be reset while maintaining a high quality of service. In this research, we implemented an adaptive algorithm that allows processes to migrate freely between processors to prevent any single processor from becoming overloaded. We are currently working on the adaptive partitioned scheduling algorithm in which each task is semi-permanently assigned to processors, which reduces the amount of time lost migrating tasks between processors but may result in one processor becoming overloaded. The results of this research are still pending because the implementation of the partitioned approach has not yet been completed.
Snell Geometry

Albert Chung & Jack Mealy
Mathematics Department, Austin College
Abstract #27

In the summer of 2012, the Snell Geometry group focused on finding and describing new and varied asymptotic regions in various Snell geometries. Essentially, an asymptotic region is one which would be “at the end of a list” of specific finite regions. For example, in the diagram following,

![Diagram](image)

If one vertex of a triangle, starting with [AB], is ‘pushed’ further and further away in a given direction, and with no bound on the distance away, a specific asymptotic region is obtained. The properties of such regions in various non-Euclidean systems can be quite surprising. The overall goal of our study was to find and describe new asymptotic regions with particularly unexpected combinations of geometric properties.
Beta2-microglobulin (β2m) is a small, 99 residue protein that is a major component of the formation of amyloid fibrils in dialysis-related amyloidosis (DRA). DRA is a disease associated with renal failure and the deposition of insoluble amyloid fibrils in the musculo-skeletal system. This research is focused to understand the mechanism behind the formation of amyloid fibrils. First, analysis of the unfolding transition of β2m will need to be determined and compared to literature values. To determine the free energy, ΔG, of the native state, the conformational transition is monitored by the use of a chemical denaturant, guanidinium hydrochloride (Gdm-HCl). Unfolding was followed by fluorescence emission of the amino acid tryptophan. Literature reports a difference in the value of ΔG depending upon identity of chemical denaturant used. The nature of the differences in the unfolding in different denaturants may indicate a possible mechanism for the identification of the amyloidogenic species. Our preliminary results showed cooperative unfolding using Gdm-HCl, but also gave a higher value for ΔG then previously recorded research and published literature.
The Effect of PA28γ Genotype on Recovery of the Mouse Gut Microbiome Following Treatment with Streptomycin and Bacitracin

Jesse Baker, David Calderilla, Abdurrahman Allawala, Steven Burns, Tiffany Collins, Olivia Flaggert, Vasanthi Gomathinayagam, Lucy Li, Oscar Tovar, Lance Barton, & Kelly Reed
Biology Department, Austin College
Abstract #29

The composition of microbes in the gut has been linked to the development of various chronic diseases. PA28γ is a proteasome activator in the gut that regulates intestinal epithelial cell turnover and primes the immune system, which could lead to changes between the host and microbiome (microbial community). Previous research demonstrated that antibiotic treatment causes long term alterations in the structure of the mouse gut microbiome, indicating that host factors may be important for microbial colonization following antibiotic treatment. In this study, we compared the mouse gut microbiome of PA28γ+/+ mice (WT) with PA28γ−/− deficient mice (KO) before and after antibiotic treatment. Fecal samples were collected before (BA), immediately after (A0), and 21 days after (A21) a 10-day oral treatment with streptomycin and bacitracin. The bacterial communities in the feces were analyzed using viable bacterial count, as well as pyrosequencing and terminal restriction fragment length polymorphism (TRFLP) of the 16S rDNA fragments to determine differences in microbial community structure. These analyses indicate there was a genotype dependent change in the fecal microbiome immediately following antibiotic treatment; Proteobacteria dominated the WT microbiome, while Bacteroidetes dominated the KO microbiome at A0. At A21, the WT and KO mice possessed bacterial community structures that were not significantly different from each other. This suggests that antibiotics have a profound effect on the gut microbiome, but the environment likely plays a larger role than PA28γ genotype in re-colonization of the microbiome after antibiotic treatment.
Immediate Impact of Television on Executive Function

Roya Jamshidi, David Calderilla, Mikayla Hill-Elliot, Diana Garza-Gonzalez, & Renee Countryman
Psychology Department, Austin College
Abstract #30

Previous research suggests that watching television affects executive functioning skills and the accuracy of performing given tasks. The objective of our study was to determine the immediate impact of watching slow-paced television versus fast-paced television, by testing participants on four major executive functioning tasks: memory, reasoning, concentration, and planning. We designed the experiment so that participants watched either a slow-paced show (Ugly Americans) or fast-paced show (Superjail). In a recent study, Lillard and Peterson (2011) state that excessive television watching (especially in the early years) decreases one’s ability to make cognitive decisions, affects memory recollection, and increases attention problems. Following up on their research, we conducted a similar study with college students rather than young children, to determine if the same impairments would be observed in young adults. Unlike the study from Lillard and Peterson (2011) we did not find any evidence of impaired executive functioning in the college students exposed to fast-paced television in comparison to students exposed to slow-paced television, all p’s > 0.05. Our findings suggest that perhaps the detrimental effects of television for young children do not continue into adulthood.
Partial Competition between PIP2 and SNARE-complex for Synaptotagmin Binding
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\textsuperscript{1}Chemistry Department, Austin College
\textsuperscript{2}University of Texas Southwestern Medical Center
Abstract #31

The goal of this research is to analyze the proteins involved in synaptic vesicle exocytosis. As synaptic vesicles travel down the presynaptic terminal, they dock to the plasma membrane in a primed meta-stable state. The four helix bundle SNARE-complex, which consists of the three proteins synaptobrevin, syntaxin, and SNAP-25, attaches to both the vesicle and plasma membrane. Synaptotagmin-1 then triggers membrane fusion and fast neurotransmitter release upon Ca\textsuperscript{2+} binding. The goal of this particular project was to determine the degree of competition between SNARE-complex and PIP2, the major phospholipid found in mammalian cells, for synaptotagmin binding. We collected 15N TROSY-HSQC spectra of synaptotagmin titrated with PIP2 and monitored the change in chemical shifts to determine both where and how much PIP2 is binding to synaptotagmin. 1D 15N-edited 1H NMR spectra compared SNARE-complex binding to synaptotagmin with and without PIP2. The partial return of signal with addition of PIP2 represented partial competition between PIP2 and SNARE-complex for synaptotagmin binding. Our current model consists of synaptotagmin bound to PIP2 and SNAP-25 in the SNARE-complex. This model hypothesizes that partial competition between SNARE-complex and PIP2 is due to the proximity of the two binding sites and the negatively charged nature of both molecules. Future experiments look to determine if SNARE-complex and PIP2 bind to the same or nearby sites on synaptotagmin.
Branching Out: Synthesis and Characterization of Bisureas Containing Branched Ester Tails

Robin Wright & Andrew Carr
Chemistry Department, Austin College
Abstract #32

Thermoreversible organogelators may serve many purposes from solidifying spilled oil to matrix-assisted delivery of pharmaceuticals. Before these desired uses can be commercialized, a deeper understanding of the gelation phenomena needs to be obtained. To improve our understanding of the properties of thermoreversible bisurea organogelators, a structure function relationship study was undertaken using ester branched tails. In the literature it has been proposed that entanglement of the tails of a bisurea organogelator may enhance the stability/rigidity of a gel. Currently the synthesis of a very sturdy and robust gel developed at Austin College requires seven synthetic steps. We propose that similar results may be achieved using simpler structures starting from an amino alcohol. Two synthetic pathways were investigated, one where the amino alcohol was reacted directly with a bisisocyanate and the more traditional route involving protection chemistry. The solubility of the bisurea generated from the reaction of the amino alcohol with the bisisocyanate proved to be extremely poor, prohibiting further reaction in any synthetically useful solvent. The alternative route where the amine was first protected by a BOC group followed by esterification of the alcohol using branched acid chlorides proved very effective. Upon deprotection of the amine, the bisurea was easily generated. Preliminary gelation test of the synthesized organogelators in hexanes and toluene indicate that several derivatives produce robust gels having critical concentrations well below 1 wt/wt%.
The present study examines the effects of the Acceptance and Commitment (ACSR) stress reduction therapy on participants in a drug court recovery program. Sixteen participants were randomly assigned to either ACSR or standard therapy, had two 1-hour stress therapy sessions, and then completed the Coping Resources Inventory Survey (CRIS) and the Acceptance and Action Questionnaire. I hypothesized the experimental group would show higher coping scores on the two measures. Manova on the CRIS data failed to find any reliable differences between groups on the CRIS total score or on any of the five subscales (all $p > 0.05$), though the small sample size had little power. An Anova test demonstrated no reliable differences between groups on F values ($p>0.05$). Results show that there were no reliable differences between the two groups.
Identifying Suppressors of Altered Calcium
Homeostasis Phenotypes in \textit{pgm2}Δ Mutants in \textit{Saccharomyces cerevisiae}

Akshaya Selvamani, Courtney Goldstein, Rachel Jimenez, Saman Najmi, Lysandra Chan, Bernard Kauffman, & David Aiello
Biology Department, Austin College

Phosphoglucomutase (PGM) is an enzyme that interconverts glucose-6-phosphate (G6P) to glucose-1-phosphate (G1P) during carbohydrate metabolism. A knockout of this enzyme (pgm2Δ) in \textit{Saccharomyces cerevisiae} results in phenotypes that affect carbohydrate metabolism when galactose is utilized as the carbon source. Carbohydrate metabolism phenotypes of pgm2Δ include slow growth on galactose and an accumulation of G1P. Intriguingly, phenotypes related to altered calcium homeostasis are also observed in pgm2Δ strains. These phenotypes include no growth on Cyclosporine A, increased total cell calcium, sensitivity to high extracellular Ca^{2+}, and altered ER protein folding presumably resulting from low lumenal ER Ca^{2+} levels. The current working model proposes these phenotypes result from an imbalance in the relative levels of G1P/G6P in pgm2Δ strains. The objective of this project is to identify the mechanism linking these two separate, seemingly unrelated processes of carbohydrate metabolism and calcium homeostasis. Our approach was to undertake an EMS mutagenesis screen to specifically identify suppressor phenotypes of the pgm2Δ mutation. We isolated sixteen candidate strains each exhibiting a suppressor phenotype, referred to as "suppressor of pgm2Δ defects" (spd). By tetrad analysis, phenotypes in four of the spd strains were shown to be resultant of a single recessive mutation. Screening with a genomic library has identified a complementing genomic fragment from chromosome VII capable of suppressing the spd phenotypes in two of the four strains. The work presented here identifies a specific gene within this genomic fragment, SPT4, as a candidate spd gene whose loss of function suppresses pgm2Δ phenotypes related to altered calcium homeostasis.
Molecular Rotors: Gearing Up for the Future

Raven Clark, Brian Clinton, & Stephanie Gould
Chemistry Department, Austin College
Abstract #35

Towards our goal of creating controlled geared motion in the solid-state, a molecular gear monomer was designed containing a rotator group capped by two porphyrin units that can be coordinated to bidentate ligands, thereby creating the target molecular gear. Crystallization with several bidentate ligands will determine the ideal ligand length for coordination. Since ligand length determines the distance between rotator units, an ideal ligand allows for correlated motions of the rotator units within the crystalline solid. Dyad synthesis was done with a convergent pathway that allows for modification of the rotator unit. While several porphyrins have been attempted, the porphyrin presented here was chosen because it can be separated from non-desirable porphyrins in the initial synthesis with relative ease. Herein we describe the synthesis of an anthracene rotator capped by two zinc 5,10,15-tris(4-carbamethoxyphenyl)-20-(4-(trimethylsilyl)ethynylphenyl) porphyrins and the initial attempts to crystallize this material with bidentate ligands.
An Investigation of the Effects of Temperature on Resistivity of Materials

John Donor, Ryan Zimmerman, & Andra Troncalli
Physics Department, Austin College
Abstract #36

The research investigated the effects of temperature on the resistivity of different materials. Temperatures between 10K and 300K were investigated; particular emphasis was given to the effects of very low temperatures and how the behavior of resistivity differed from higher temperatures. We found that for copper and constantan, the materials display a linear dependence of resistivity on temperatures above 50K. Both our room temperature resistivity and temperature coefficient of resistivity were consistent with previous research. Below 50K the behavior becomes non-linear for copper and depends on the square and cube of the temperature. For constantan, the behavior appeared to be relatively linear, although resistivity decreased at a different rate than for higher temperatures.
Study Skills: The Effects of Highlighting on Reading Comprehension

Lacy Durham, Samantha Le, Rachael Cook, Nicole Stack, & Lisa Brown
Psychology Department, Austin College
Abstract #37

College students use a variety of tools and techniques in order to advance their understanding and retention of materials learned in the classroom. The purpose was to investigate the effects that highlighting had on comprehension of a standardized GRE passage. Previous research by Fowler & Barker (1974) found that highlighting textual evidence can be an effective means of studying and preparing for a test in a college course. The study conducted was a 2 (highlighting: appropriate vs. inappropriate) by 2 (color: green vs. yellow) between-subjects design with an offset control group having no highlighting. Participants involved in the research were 22 male and 30 female Austin College students between the ages of 18 and 23 years old (M = 20.4). One participant was Native American Indian, 2 Asian, 5 Latino, 28 White and 1 multiethnic. Participants received a general GRE passage to read with one of the five highlighting conditions and subsequently answered questions about the passage. Based on previous research by Gier et al. (2010), we hypothesized that reading comprehension scores would be higher in participants who read the appropriately highlighted passage over the inappropriate or not highlighted passages, and that those who read the passage with yellow appropriate highlighting would outperform those who read the passage with green appropriate highlighting. Consistent with our hypothesis, results showed that participants who had appropriate yellow highlighting (M = 2.7) scored significantly higher than those who had appropriate green highlighting (M = 1.9), inappropriate green highlighting (M = 1.7), inappropriate yellow highlighting (M = 2.1), and no highlighting (M = 1.6) as the complex a priori contrast analysis was significant, t (48) = 2.4, p = 0.02.
Mimicking Catalytic Activity of Carbonic Anhydrase II using Zn-Artificial Peptide Palindromes

Jessie Berger¹, Joy Gallagher², & Mary Elizabeth Williams²
¹Chemistry Department, Austin College
²Pennsylvania State University
Abstract # 38

With the rising concern of growing levels of greenhouse gases, it is essential to find a process that can convert these gases into beneficial substances, such as fuels. Enzymes, such as Carbonic Anhydrase II (CAII), offer highly efficient routes for converting CO₂ into bicarbonate, a step on the pathway to methane production. Inspired by the active site of CAII, which contains a tetra-coordinate Zn(II) coordinated to three histidine residues and H₂O, we designed a catalyst geared to structurally mimic CAII with the goal of invoking catalytic behavior. Our synthetic design utilizes artificial tripeptides with pendent metal-binding ligands containing either three pyridine (py) units or three bipyridine (bpy) units, respectively. Zn(II) cross-links the tripeptide strands to form three discrete Zn(bpy)(py)(H₂O)²⁺ complexes tethered together via the poly-amide peptidic backbone to form Zn₃(bpy-bpy-bpy)(py-py-py)(H₂O)₃²⁺ which was confirmed by NMR and UV-Visible spectroscopy. Electronic absorbance spectroscopy was used to observe the hydrolysis of p-nitrophenylacetate, an initial indicator for CO₂ conversion, which showed minimal catalytic activity. These results suggest that our metal-center environment is not in the proper geometry to undergo catalysis. Future studies will look to adjust the scaffold to promote closer geometric agreement with the CAII active site, as well as explore alternative metal ions shown to exhibit catalytic activity in other CAII mimics.
A Culture of Mathematics: A Look Into the Historical Maths of Asia

Elise K. Burch & E. Don Williams
Mathematics Department, Austin College
Abstract #39

During the last four hundred years, Europe and her cultural dependencies have played a dominant role in world affairs, a fact lending strong Eurocentric flavor to the manner in which the histories of non-European societies are represented, particularly with respect to their creations and developments within the sciences and mathematics. In this paper, I have attempted to support a 'subversion' of such analysis that has gained significant momentum in recent years by delving specifically into the origins of independent systems of Asian mathematics. I first delve into the histories of the major players: India, China, and Japan. Then, I proceed by looking into the influences these had upon their surrounding neighborhood, both amongst themselves and upon the smaller – if not less unique – cultures of Korea, Mongolia, Tibet, and last the little-approached Vietnam. In this way, I hope to draw alternative trajectories to the development of mathematics and lend a more global view to a significantly earlier period. Though beyond my direct scope, some influences by and correlations with Babylonia and Arabia will be addressed, alongside some comparison with Greek developments contemporary to a given event in Asia. However, the focus is not to draw from the prestige of Hellenistic mathematics, but to expand the view of its Asiatic counterparts. Such an analysis lends a fuller view of the discipline and certainly a greater respect for the cultural aspects of mathematics, for not only do societies interact through the arts but also the sciences, one being the science of math.
Dye sensitized solar cells (DSSC) are proving to be a cost effective alternative to silicon-based solar cells. Many prospective efficient dyes for DSSC’s contain metal complexes that can be expensive. The prospect of an organic-based absorber for a DSSC is an area of extensive research in the past few years. Herein, the synthesis of a new light-absorbing porphyrin pentad system is described. Porphyrins are ideal structures for a dye because they can be found in nature where they are utilized in photosynthesis. A convergent synthesis was developed for the pentad centering around a key Sonagashira coupling to form the final X-shaped molecule. This short synthesis route holds high potential to produce a large variety of organic-based solar cells dyes.
Student Oral Presentations
Block 1
9:00–10:30 a.m.
Space, Material, Culture, and Gender

Moderator: Dr. Carol Daeley
Block I: 9:00–10:30 a.m.
Wright Campus Center 254

Student Presenters
(In Order of Presentation Time):

Jason Kirkwood
Meagan Hair
Summer Roberts
Caitlin Graves
Everyday Space of the (Literary) World

Jason Kirkwood
English Department, Austin College
Abstract #41

In this paper I investigate the role of physical space in contemporary American novels, specifically, in Sandra Cisneros’ *House on Mango Street*, Helena Maria Viamontes’ *Their Dogs Came with Them*, and Toni Morrison’s *Sula*. Space, as opposed to setting, consists not merely in its physical organization and structure, but also in its ability to condition and produce certain kinds of social experiences and interactions, depending on its physicality and the ways it is used. For this reason, I argue that in each of these novels space is more than innocuous background upon which social life presents itself, but is rather a determining agent, an active mechanism, which actually produces and influences social life. In this way, I aim to analyze the ways characters inhabit space, as they become bound up in a network of material social activities of everyday life. In order to conduct such an analysis, I utilize Marxist theory and critical spatial theory. Such an analysis of the ways space affects social life in literature allows us to envision new ways of thinking about the relation between setting and character development, as well as to better understand the social and ethical issues grounded in real-world spatial organization.

Faculty Director: Greg Kinzer
Catullus, Antimilitarism, and Literary Power Dynamics

Meagan Hair
Classics Department, Austin College
Abstract #42

This paper seeks to explain why Catullus, a Roman poet in the Late Republic, vehemently and consistently attacked military figures in his writing. During his lifetime, two trends shaped the sociopolitical scene: the high cost of engagement in public life and the expansion of power by military leaders, politically and financially. Catullus perceived the rising glory and influence of military leaders as a threat to the authority of the aristocracy. To preserve his social circle's power and status, Catullus cultivated in his poetry a distinction between military men and true aristocrats, portraying both military leaders and their followers as anathema to proper Roman society. Aware of the Roman commitment to tradition, Catullus relied on conservative values and conventional methods of social discrimination, primarily invective and stereotyping. Appropriating these methods rewarded Catullus in two ways: not only could he paint military figures as corrupt and hostile to the social order, but his position as accuser also cast him and his social circle in a positive moral light. In recognizing and responding to a contemporary social threat, Catullus' poetry moves beyond personal invective to actively renegotiate the social roles and power structures of the Late Republic.

Faculty Director: Bob Cape
Man and Myth: Lee Child's Hero-Detective

Summer Roberts
English Department, Austin College
Abstract #43

In this paper I investigate the resurgence of Romance traditions in three contemporary American thrillers from Lee Child's Jack Reacher series. Specifically, I look at Jack Reacher as a modern-day 'knight errant' figure, a wandering detective hero with no sense of origin and no destination. Detective fiction is often rooted in the idea of the detective as a protagonist only one step away from the criminals he chases; throughout the history of detective fiction, there have been many detectives who are not heroes. However, in Child's recombination of heroic and detective archetypes he raises the question of whether it is possible in the modern world to be a hero without being a detective, and whether it is possible to be either a hero or a detective without experiencing a perpetual alienation from society. I argue that Reacher's heroism is dependent upon his alienation; in effect, his isolation from society is a condition of his success as both a detective and a hero. Examining Lee Child's blending of Romance archetypes with the realism of modern detective fiction shows us the feet of mortal clay that propel his protagonist, Jack Reacher, toward pseudo-mythic status.

Faculty Director: Carol Daeley
Reinventing The Wheel:
Women’s Cars in the 1950s

Caitlin Graves
American Studies Program, Austin College
Abstract #44

My research examines the cultural significance of cars designed specifically for women in the 1950s, and what this short-lived phenomenon says about women, men, and American society. For a few years in the late 1950s and early 1960s, car companies produced models with feminine names, such as the La Femme and the La Comtesse, with most models coming in traditional female colors, some with smaller engine sizes, and with a battery of color-coordinating accessories just for women drivers. These cars did not last long on the market, but I argue that these pastel progenitors to the Second Wave feminism of the 1960s should be regarded as an indicator of the changes that were to come. I have studied these cars in the context of the historical and cultural moments in which they were produced, received, and ultimately failed—including the women’s movement and women’s changing role in society, shifts in post-WWII advertising and consumer culture, and fluctuating notions of masculinity during and after the Korean War. I am interested primarily in why the cars were not successful with American consumers, particularly women. The reason for the cars’ failure is complex, but I believe it stems from many issues including the overly feminized look, which drove both men and women away, as it stood for a threat to the American male and undermined women’s desire for freedom from traditional, constrictive gender roles. By analyzing the failure of these vehicles, we can gain insight into the complex intersections of the consumerism, feminism, and masculinity that shaped the later social and political movements of the 1960s.

Faculty Director: Randi Tanglen
Social Science I: Examples of Qualitative Studies

Moderator: Dr. Nathan Bigelow
Block I: 9:00–10:30 a.m.
Wright Campus Center 231

Student Presenters
(In Order of Presentation Time):

Ummekulsoom Lalani
Nicole Holland
Evelyn Mitchell
Samantha Matulis
Turkmenistan-Pakistan-Afghanistan-India
Natural Gas Pipeline: Geopolitical Outcomes and the Silk Route to Peace

Ummekulsoom Lalani
Political Science Department, Austin College
Abstract #45

This paper examines the multiple players involved in the proposed Turkmenistan-Pakistan-Afghanistan-India natural gas pipeline. The paper further examines the strategic geographical location and geopolitical importance of Central Asia and its rich natural resources, specifically natural gas. It attempts to elaborate on the various aspects of the power struggle, among various regional and extra-regional players, for control of natural gas resources in the region and how this places the region at the center stage of world politics. This study focuses on the natural gas resources of Turkmenistan and the possible economic and political fall out of the much-debated proposed Turkmenistan-Afghanistan-Pakistan-India Gas Pipeline. By examining the geopolitical implications, the role and interests of multiple players in the project such as the United States, Russia and China as well as the historical relations between the four regional actors, i.e., Turkmenistan, Afghanistan, Pakistan and India, this study seeks to provide an overview of why this proposed project could be the solution for peace within these regions. It explains why the TAPI pipeline could potentially form a Silk Route and tie the countries of Central Asia to South Asia in an interdependent relationship.

Faculty Director: Don Rodgers
Based on the findings from previous research, I hypothesize that certain conditions of the working environment influence whether an individual decides to take family leave. Because of rights such as tenure, academic freedom, and faculty governance, college professors enjoy a relatively high level of autonomy within their working environment, yet are still influenced by the structure and policies of their institutions. I hypothesize that individuals who are more involved in the decision-making processes at their workplace will be more confident in utilizing their right to family leave without worrying about their careers or finances suffering. My research focuses on faculty’s decision-making processes regarding family leave and the workplace conditions that affect those decisions. Participants are tenured and tenure-track faculty at bachelor-degree granting institutions who have qualified for family leave within the last three years. To date, I have conducted 13 in-depth telephone interviews about required and perceived workloads, personal experiences with family leave, intra-departmental atmosphere, and faculty and administration relationships. Based on preliminary coding and analysis of the data, I argue that the institutional features of the academic environment that most influence participants’ decision to take family leave are departmental factors, such as supportive or unsupportive department chairs and intra-department relationships, and general institutional characteristics, including policies regarding salary, workloads and tenure, and whether institutions had official or unofficial family leave policies. Personal factors, such as financial situations and supportive partners, also influence these decisions. This research adds to our understanding of how institutional features of the academic workplace enable or limit faculty’s abilities to balance work and family-related commitments.
South African Universities: Creating Social Spaces for Racial Integration

Evelyn Mitchell
Political Science Department, Austin College
Abstract #47

This paper explores South African university efforts to increase integration and improve interaction among different racial groups on campuses since the end of apartheid. Segregating universities was one component of the apartheid system. The National Party implemented legislation, notably the Extension of University Education Act of 1959, which made it illegal for non-whites to attend universities designated for white students. Since 1994 these policies have been reversed, allowing for full legal integration of the schools. While segregation may be illegal, de facto discrimination persists in South African universities. In 2008, several white students at the University of the Free State tricked black university workers into eating stew that contained urine. This inhumane act prompted the university to implement programs to decrease racist behavior, and increase racial integration. This paper analyzes the actions universities have taken to create social transformation within the broader South African context. It begins with an overview of theories of conflict resolution, reconciliation, and social integration (Kelman 1997, Fisher 1997, and Lederach 1997). Using both archival and interview data, I then evaluate programs implemented in South African universities to improve intergroup interactions. The paper concludes with policy recommendations for improving integration at the university.

Faculty Director: Don Rodgers
Life After IDP Camp: Case Study of the Cultural and Psychological Effects of an IDP Camp in Koch Goma Sub-County

Samantha Matulis
Political Science Department, Austin College
Abstract #48

The northern districts of Uganda have been devastated by over twenty years of armed conflict between the Government of Uganda and the Lord’s Resistance Army (LRA). The conflict caused massive displacement for the population of the north. Over 1.7 million people were forced to leave their homes and seek refuge in government mandated Internally Displaced Persons camps (IDP camps). In 2006, after ten years of IDP camp mandate, the Ugandan government began camp phase out. This meant a chance for civilians to return to their villages and an attempt to return to their old lives. However IDP camp life left lasting impacts on the culture and psyche of those who lived in the camps, making the transition from camp to village difficult. This study explores the cultural and psychological effects on the people in the village community of Koch Goma. To investigate this issue I conducted twenty-seven formal interviews using semi-structured questions over a period of 30 days, from November 11, 2011 to December 11, 2011. The research utilized two translators, both of whom are residents of Koch Goma. I lived within the community of Koch Goma during the research period in order to gain insight of the people and the community of which the research was focused. Results of the research indicate that the IDP camp negatively affected Acholi culture in several ways including compromising morals, spread of disease, lack of education, and heavy indulgences of alcohol as well as land conflict. The psyche of IDP camp inhabitants was altered, transforming self-sufficient proactive farmers to passive people relying on handouts, thus making the return to village life difficult.

Faculty Director: Don Rodgers
Collaborating in Behavioral Neuroscience

Moderator: Dr. Renee Countryman
Block I: 9:00–10:30 a.m.
Wright Campus Center 255

Student Presenters
(In Order of Presentation Time):

Sam Duesman
Lauren Bolden
Carina Parikh
Alzheimer’s Disease (AD) is characterized by its detrimental effect on memory. Currently, no treatment effectively reverses this effect for a prolonged period of time; however some research suggests that polyphenols can improve memory acquisition, consolidation, storage, and retrieval. Polyphenols are antioxidants that are highly concentrated in green tea. In the current study we measured the effect of green tea on memory in rats that were either treated with scopolamine or saline prior to learning. Scopolamine works by blocking muscarinic acetylcholine receptors, which causes temporary memory deficits. In order to test memory, rats were tested using the Object Recognition Task (ORT) following a 3-hour delay. If green tea improves memory, rats will spend a greater amount of time with a novel object during the recall test. In addition, we hypothesize that green tea treatment will be protective against memory impairments due to scopolamine treatment. Following statistical analysis, we found no significant effect of green tea on either memory protection or enhancement. Bromodeoxyuridine (BrdU) staining will also be conducted after behavioral testing in order to track the proliferation of new cells in the hippocampus.

Faculty Director: Renee Countryman
Effects of Green Tea on Hippocampal and 
Striatal Memory

Lauren Bolden
Psychology Department, Austin College
Abstract #50

Previous research has provided support that a long-term administration of green tea improves learning and memory (Haque et al. 2006). Research has also shown that green tea facilitates neurogenesis in the developing hippocampus (Takeda, et al. 2011). The purpose of this study was to examine the effects of green tea on striatal vs. hippocampal learning in healthy, adolescent Long-Evans rats, using the cross maze behavioral task. A daily supply of either green tea or water was provided ad lib for a period of three to seven weeks. It is hypothesized that the green tea treated rats will use a place learning strategy more than a response learning strategy on the cross maze task, which will provide support that green tea improves the hippocampal memory system. It is also hypothesized that the green tea treated rats will learn the cross maze in significantly fewer trials and have a significantly smaller latency time when learning the trials compared to the control rats. All rats will be injected with Brd-U before being sacrificed, and immunocytochemistry will be conducted to assess cell proliferation in the hippocampus. It is hypothesized that the green-tea treated rats will have greater cell proliferation in the hippocampus compared to the control rats. A multivariate t-test will used to analyze the behavioral data.

Faculty Director: Renee Countryman
Effect of Green Tea on Associative Memory

Carina Parikh
Psychology Department, Austin College
Abstract #51

Research looking at green tea’s effect on memory has yielded mixed results in previous studies. The majority of past experiments have focused on spatial and recognition memory. We investigated how green tea supplementation affects social and associative learning and memory through the Social Transmission of Food Preference (STFP) task. This behavioral method requires odor memory and flexible associations to complete the task successfully, and is a popular test for rat models due to their keen sense of smell and odor recognition. We provided male Long-Evans rats (n=20) with either green tea or water ad lib for three to seven weeks before testing began. To mimic a dementia model, rats were administered i.p injections of 1 mg/kg scopolamine, a muscarinic blocker that acts as an acetylcholine antagonist. Half received scopolamine and half received saline during the first trial, and the groups were switched in the second trial. We looked at how green tea affected performance on the STFP task in scopolamine-induced versus saline-treated rats. We hypothesized that scopolamine-treated rats would perform worse than when they were treated with saline. We also hypothesized that scopolamine rats given green tea would perform better than ones provided just water. We will also inject the rats with BrdU prior to sacrificing them in order to see if green-tea treatment induces cell proliferation in the hippocampus. We hypothesize that green-tea treated rats will have more BrdU-labeled cells than non-treated rats. No significant differences between green tea treated rats and controls when injected with either scopolamine or saline were found (F=0.22, p=0.645). Our results suggest that green tea has no effect on memory.

Faculty Director: Renee Countryman
Research Highlights from the Science Division I

Moderator: Dr. Karla McCain
Block 1: 9:00–10:30 a.m.
Ida Green 112

Student Presenters
(In Order of Presentation Time):

Landon Hendrix
Catherine McKenas
Anna Sliz
The purpose of our research project is to detect exoplanets for the NASA Kepler Mission. Exoplanets are planets orbiting stars outside our solar system. The Kepler Mission uses the transit method to detect these planets. When a planet passes between its parent star and Earth, a portion of the star’s light intensity will be blocked out – a stellar eclipse. Exoplanets can be detected by looking for small periodic dips in a star’s light intensity over time. The transit method can provide information on the planet’s orbital period, planet’s radius, the semi-major axis, and the orbital inclination. We obtained Kepler data from the public data website planethunters.org. Our team analyzed over 5,000 stars looking for exoplanets. We marked approximately 2.3% of the observed stars as having potential planetary transits. One object in particular (Kepler Object of Interest 1325 (KOI-1325)) has been nominated by the Kepler Science Team for planet candidacy. It will undergo further testing by the Kepler Team in order for planetary confirmation. Future work consists of observing more stars’ light intensity curves and using other methods to confirm exoplanet existence and other planetary features.
Analysis of Carboxylate Based Monolayers on TiO$_2$ Surfaces by FT-IR Spectroscopy

Catherine G. McKenas
Chemistry Department, Austin College
Abstract #53

FT-IR spectroscopy was used to examine the formation of carboxylate monolayers on the surface of TiO$_2$. TiO$_2$ has many applications which include being the UV-resistant material in sunscreen and the photocatalyst in Grätzel solar cells, and its modification with carboxylic acid derivatives has the potential to lead to better performance in these applications. Suspensions of TiO$_2$ were stirred in ethanolic solutions of carboxylic, centrifuged into a pellet, heated to remove excess solvent, and then spectra were acquired of the dried pellets. It was found that the length of the carbon chain affected the ordering of the self-assembled monolayers. By analyzing the position of the CH$_2$ stretching peak, the monolayer’s phase (liquid or solid) can be assessed. It was determined that in carboxylic acids, as the number of carbons in the alkyl chain increase, the peak frequency decreases corresponding to a more ordered or solid like phase. It was also found that monolayers with longer alkyl groups had less water adsorbed to the TiO$_2$ surface.

Faculty Director: Karla McCain
PA28γ Regulates Cell Fate Decisions During Double Strand Break Repair

Anna Sliz
Biology Department, Austin College
Abstract #54

PA28γ is a proteasome activator that facilitates protein degradation by 20S proteasomes. Many of the proteins selected for degradation by proteasomes are involved in cell cycle regulation and apoptosis. Some of the known targets of PA28γ-proteasomes include p21<sup>Cip1</sup>, p1<sup>INK 4a</sup>, p1<sup>ARF</sup>, and p53. Murine Embryonic Fibroblasts (MEF) lacking PA28γ display a decreased growth rate coupled with increased rates of spontaneous apoptosis in culture. These cells also show increased viability and decreased caspase activity after exposure to genotoxic stress. These two characteristics indicate a potential role for PA28γ in the signaling pathways that control both cell survival and facilitate stress responses. In order to better understand the role of PA28γ in these signaling pathways we chose to characterize the p53, Akt, and p38 signaling pathways, all of which are vital for determining cell fate. MEFs were induced with camptothecin which causes double stranded breaks. The MEFs lacking PA28γ have increased Akt activation, increased expression but not increased activation of p53, and a trend of elevated p38 activation corresponding to increasing doses of camptothecin. These results indicate that PA28γ plays an important role in the negative regulation of Akt and potentially p38, and p53 activation. Many cancer cells show over expression of Akt and p38 which could explain why some cancers also over express PA28γ.

Faculty Director: Lance Barton
Student Oral Presentations
Block II
10:45 a.m.–12:15 p.m.
Scarborough Roundtable Discussion:
Research at Austin College in the Humanities and Social Sciences

Moderator: Dr. Robert Cape
Block II: 10:45 a.m.–12:15 p.m.
Wright Campus Center 254

Student-Faculty Teams:

Evelyn Mitchell & Don Rodgers
Jason Kirkwood & Greg Kinzer
Meagan Hair & Bob Cape
Nicole Holland & Jennifer Randles
Social Science II:
Examples of Quantitative Studies

Moderator: Dr. Nathan Bigelow
Block II: 10:45 a.m.–12:15 p.m.
Wright Campus Center 231

Student Presenters
(In Order of Presentation Time):

Eristeo Perez
Lauren Hill
Joe Goldman
Ashley Fitzpatrick
Congressional Member Organizations and
the Presentation-of-Self

Eristeo Perez
Political Science Department, Austin College
Abstract #55

In 1974, David Mayhew wrote that members of Congress are motivated primarily by the desire to be reelected. In pursuit of this “electoral connection,” he finds members working in a variety of ways to present themselves favorably to their constituents. Over the past 20 years, a notable change on Capitol Hill involves the growth of Congressional Member Organizations (CMOs), sometimes referred to as “caucuses.” These voluntary associations are made up of members of Congress wishing to join together in pursuit of common legislative objectives. The 112th Congress saw members join together in creating 371 CMOs. Some of these were exceedingly partisan and strongly ideological (e.g. the Congressional Progressive Caucus and the Congressional Constitution Caucus). Others were notably moderate (e.g. the Civility Caucus). In keeping with Mayhew, I theorize that members strategically join CMOs to produce a desirable presentation-of-self to their constituency. As such, I hypothesize that district conditions, especially electoral competitiveness and homogeneity, help to explain the ideological orientation of a member’s CMO affiliations. The findings support these hypotheses.

Faculty Director: Nathan Bigelow
In this research, I examine the factors that contribute to the success of communities such as Sugarland, Frisco, and Roundrock, Texas, in terms of economic growth and community development. These cities are recognized as successful models of growth and development based on their financial stability, budget reserves, and quality of life indicators. They have spurred economic development through the utilization of sales tax benefits from the State of Texas and other incentive programs. The State of Texas levies a 6.25% sales tax. Communities have the option to levy an additional two percent for the purposes of community development, totaling 8.25%. Those additional percentages can provide monies for expenditures such as economic development, street maintenance, and support of local programs contributing to the overall community development. Through an analysis of municipal tax and demographic data and interviews of economic development officers, I attempt to determine to what degree sales tax utilization contributes to economic and community developmental success. I will focus on specific areas in which Sherman and Denison can learn from the examples of more successful cities and suggest policy solutions for Sherman and Denison.
Tax Morale and Tax Compliance in 21st Century Europe

Joe Goldman
Economics Department, Austin College
Abstract #57

Utilizing data from the World Bank, the European Values Study, and the European Union, I hope to illustrate a model to assess the impact of a number of dynamic cultural variables on tax evasion in Europe. The growing structural budget deficits of many European nations has led to drastic austerity measures and encouraged national governments to tackle corruption and the presence of an underground economy. Using econometric analysis, I intend to discover exactly what aspects of a culture accompany a strong underground economy and look into the measures that some states have taken to introduce a more favorable climate for revenue collection.

Faculty Director: Melanie Fox
Winning the Popularity Contest: Association between Peer Popularity and Extracurricular Activity Participation among Adolescents

Ashley Fitzpatrick\textsuperscript{1} & Antonius H. N. Cillessen\textsuperscript{2}
\textsuperscript{1}Psychology Department, Austin College
\textsuperscript{2}Radboud Universiteit Nijmegen

Abstract #58

Research has shown that certain extracurricular activities, specifically male athletics, student government, honors societies, and cheerleading are associated with popularity among adolescents (Kinney, 1993; Holland & Andre, 1995). The relation between popularity and athletic participation has been shown to be larger for males than females, and females who participate in gender appropriate sports are more popular than females who participate in gender inappropriate sports (Kane, 1988; Lindstrom & Lease, 2005). Research has also shown that adolescents who participated in a greater number of extracurricular activities are more popular (Kinney, 1993; Kinney & Eder, 1995). 530 11th grade students from a high school in New England were given a list of same-grade peers and asked to identify an unlimited number of peers who were considered “most popular.” Yearbooks were used to code each student’s participation in every extracurricular activity offered by the school. As expected, popularity was positively correlated with number of extracurricular activities for participants. Adolescents who participated in athletics, student council, and national honor society were significantly more popular than non-participants in these activities. No significant results were found with cheerleading participation or female participation in gender appropriate versus gender inappropriate sports. Implications and directions for future research are discussed.

Faculty Director: Peter Marks
Research Highlights from the Science Division II

Moderator: Dr. David Aiello
Block II: 10:45 a.m.–12:15 p.m.
Ida Green 112

Student Presenters
(In order of Presentation Time):

Amy Harvey
Saman Najmi
Aryn Hays
In an effort to create more effective sensitizers for a dye sensitized solar cell (DSC), we report the combination of a porphyrin and terpyridine-platinum(II) acetylide compounds to generate a redox-stable supramolecular complex with intense and broad absorption. The syntheses and full characterization of a series of bis (terpyridineplatinum(II)) complexes bridged by either diethynyl benzene, or trans-A2B2-diethynylporphyrin is reported. The target porphyrin-bridged complex exhibits broad absorption into most of the visible region and multiple reversible reductions from -0.85V to -1.20V.
Altered Ca\(^{2+}\) Homeostasis in \textit{gal7}\(\Delta\) and \textit{gal10}\(\Delta\)
Mutants of \textit{Saccharomyces cerevisiae}

Saman Najmi
Biology Department, Austin College
Abstract #60

Galactosemia is a condition in which patients are unable to metabolize galactose properly when deficient in an enzyme in the Leloir pathway. Specifically, lack of the gene products encoded by \textit{GAL7} or \textit{GAL10} causes accumulation of galactose-1-phosphate in their tissues. Similarly, \textit{gal7}\(\Delta\) and \textit{gal10}\(\Delta\) mutant strains of \textit{Saccharomyces cerevisiae} also exhibit an accumulation of galactose-1-phosphate. Previous studies have suggested that galactose-1-phosphate is a competitive inhibitor of phosphoglucomutase, encoded by \textit{PGM1} and \textit{PGM2}. Strains lacking the major isoform of phosphoglucomutase, or \textit{pgm2}\(\Delta\), accumulate high levels of glucose-1-phosphate when metabolizing galactose as carbon source. This accumulation results in an imbalance of the relative levels glucose-1-phosphate to glucose-6-phosphate in the cell that has been shown to be directly correlated with altered Ca\(^{2+}\) homeostasis phenotypes. The current working model for the mechanism by which \textit{pgm2}\(\Delta\) strains exhibit altered Ca\(^{2+}\) homeostasis predicts that the imbalance of glucose-1-phosphate to glucose-6-phosphate leads to hypersequestration of Ca\(^{2+}\) into the vacuole by Pmc1p, the vacuolar Ca\(^{2+}\) transporter. This hyperactivity of Pmc1p ultimately results in depletion of lumenal ER Ca\(^{2+}\) stores and a corresponding induction of the Unfolded Protein Response. Current work presented here examines the hypothesis that \textit{gal7}\(\Delta\) and \textit{gal10}\(\Delta\) strains have inhibited phosphoglucomutase resulting from the high levels of galactose-1-phosphate present in those strains. If this inhibition is occurring, then \textit{gal7}\(\Delta\) and \textit{gal10}\(\Delta\) strains should accumulate high levels of glucose-1-phosphate and display altered Ca\(^{2+}\) homeostasis phenotypes similar to \textit{pgm2}\(\Delta\) strains. Interestingly, it was found that when grown in galactose, \textit{gal7}\(\Delta\) and \textit{gal10}\(\Delta\) strains do not accumulate high levels of glucose-1-phosphate as seen with the \textit{pgm2}\(\Delta\) mutant, but they do exhibit a high total cellular Ca\(^{2+}\) phenotype. Current directions are to examine whether the altered Ca\(^{2+}\) homeostasis phenotypes of the \textit{gal7}\(\Delta\) and \textit{gal10}\(\Delta\) strains result from similar or differing mechanisms as seen in the \textit{pgm2}\(\Delta\) strain.

Faculty Director: David Aiello
Determination of Telescope Specifications for the New Austin College Observatory

Aryn Hays & Graham Crannell
Physics Department, Austin College
Abstract #61

Austin College’s new science building – the IDEA Center – will house an astronomical observatory with a research-grade 0.61 m Ritchey-Chrétien telescope. This project provides recommendations for specifications for the telescope and associated hardware. We analyzed strengths and weaknesses of different focal ratios, CCD cameras, spectrographs, and eyepieces. We determined that the optimum telescope system should have the following features: a focal ratio of F/8 (or focal length of 4880 mm); an Apogee U16M camera; an eShel multi-order echelle spectrograph; and three eyepieces with focal lengths of approximately 8, 22, and 37 mm and fields-of-view of 100°.

Faculty Director: David Baker
Bailes De Salón
(Ballroom Dances):
Gracia Morales

Saturday, March 2
Block II 10:45 a.m.–12:15 p.m.
Ida Green Theatre
Directed by Lourdes Bueno
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<tr>
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<tr>
<td>Hombre 1/Man 1</td>
<td>Javier Berrones</td>
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<td>Hombre 2/Man 2</td>
<td>Edgar Rodriguez</td>
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<th>Arañazos / Scratchings</th>
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<td>Mujer/Woman 1</td>
<td>Connie Herrera</td>
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<td>Mujer/Woman 2</td>
<td>Yanela Montoya</td>
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<th>Nos miran / They are watching us</th>
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<tr>
<td>Chica 1/Girl 1</td>
<td>Leticia Pilar</td>
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<tr>
<td>Chica/Girl 2</td>
<td>Marimar Hernández</td>
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<td>Mujer 2/Woman 2</td>
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<td>Edgar Rodríguez</td>
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<td>Hombre mayor/Old Man</td>
<td>Julio Malave-Torres</td>
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<td>Leticia Pilar</td>
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<td>Hijia/Daughter</td>
<td>Marimar Hernández</td>
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<tr>
<td>Muchacha/Girl</td>
<td>Araceli López</td>
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<th>Libertad / Freedom</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Muchacho 1/Guy 1</td>
<td>Julio Malave-Torres</td>
<td></td>
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<tr>
<td>Muchacho 2/Guy 2</td>
<td>Edgar Rodríguez</td>
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<tr>
<th>Una botella de vino / A bottle of wine</th>
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</thead>
<tbody>
<tr>
<td>Mujer/Woman</td>
<td>Connie Herrera</td>
<td></td>
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<tr>
<td>Hombre/Man</td>
<td>Javier Berrones</td>
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</tbody>
</table>

<table>
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<tr>
<th>Subconsciente / Subconscious</th>
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</thead>
<tbody>
<tr>
<td>Hombre/Man</td>
<td>Julio Malave-Torres</td>
<td></td>
</tr>
<tr>
<td>Mujer/Woman</td>
<td>Yanela Montoya</td>
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</table>
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