SURE 12

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Book of Abstracts
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Covalent Equilibria of Acylhydrazone Formation

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All organic molecules are made up of atoms joined by covalent bonds. These bonds are generally static, geometrically well-defined, and persistent. When covalent bonds break and form, the process is usually irreversible, and takes some activation energy to begin. Dynamic covalent chemistry is a branch of chemistry involving molecules with reversible covalent bonds. These bonds, like intermolecular forces, will preferentially occupy the most stable arrangement. Because external stimuli can alter the stability of certain arrangements, and because covalent bonding changes often give rise to dramatic changes in the properties of a substance, research into these molecules could be used to generate "smart" materials that reversibly undergo optical or mechanical changes in response to controlled stimuli, such as temperature, acidity, or electrical potential. In this research, equilibrium constants for the acylhydrazone condensation reaction were measured for a series of ten benzaldehydes of systematically varied structure, reacting reversibly with acetic hydrazide. Using both NMR and UV-Vis spectroscopy, reagent solutions were standardized, and values of the equilibrium constants of the reactions were determined. A correlation was drawn between the electronic structure of the aldehyde and the equilibrium constant of the reaction, with more electron-deficient aldehydes yielding higher equilibrium constants.

Designing Toys: An Exploration of Digital Fabrication Technologies

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Digital technologies have long been used in industry to efficiently design objects. By designing an object in the digital arena the time involved in altering and creating iterations is significantly reduced. Recently, these technologies have become more affordable and therefore more available to artists. These tools have many advantages including precision and design fluidity. The 3D scanner in particular is now widely available and offers new possibilities for artists. Using the scanner requires a particular technical skill set, that is more challenging for students to learn.

The purpose of this project is to explore the application of the 3D scanner which is commonplace in industry, and apply it to a contemporary art practice. The application of this technology includes the use of hardware and its accompanying software. In this project in particular, I’m investigating the material culture of toy design within my art practice.

The methods employed for this research includes selecting objects of interest, scanning the objects to digitize their information, combining aspects of several files to design new toys, developing and integrating modular parts, and working through several iterations before using the 3D printer to output the final design.
Working in this way has resulted in a series of objects that illustrate a type of results that can be generated between the fields of industrial manufacturing and fine art in the form of toy design. During my work I have also developed a detailed user manual that will allow other artists to utilize this equipment more readily and expand the connection between these two fields.

Researching this valuable tool has provided me with a new process for making art, one that invites an exciting bridge between the areas of industrial design and fine art.

Effects of accented speech backgrounds on speech perception

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1 Bio-psychology
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Typically during speech perception, speech signals compete with other background signals. The manner in which such backgrounds disrupt speech perception, a phenomenon known as masking, can be studied to provide greater understanding of the complex processes which underlie speech perception. The current study investigates masking effects of different kinds of background speech. For instance, Van Engen & Bradlow (2007) demonstrated that background foreign language speech produce lower disruption (less masking) than native language backgrounds - an effect known as release from masking. This release is reduced for bilinguals who speak the target and the distracter languages (Brouwer et al., 2012). In the current study, we propose to investigate how foreign-accented English speech backgrounds affect the speech perception of monolingual and bilingual English speakers. In our study, three groups of listeners (monolingual English, Spanish-English bilingual, Mandarin-English bilingual) will monitor target monolingual English speech under Mandarin-accented, Spanish-accented, and unaccented background conditions. The listeners will be given the task of transcribing the sentence spoken by the target speaker which will then be coded for accuracy (percentage words correctly transcribed). Specifically, we will examine whether accented speech serves as a greater distracter and whether this depends on our listener (native or non-native).

Exposition of Murskiĭ’s Theorem

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Universal algebra is a mathematical study in which numbers and operations are examined in an abstract, generalized fashion. Murskiĭ’s Theorem is a result in the field of universal algebra, proven by V. L. Murskiĭ in the Russian language, first published in 1975. It has since been quoted by a number of mathematicians and books, but nothing resembling its proof has been translated to the English language until early 2012. Clifford Bergman gave an outline of the proof in his text “Universal Algebra”. As his outline is incomplete and glosses over a few details, this project is devoted to a step-by-step logical proof of Murskiĭ’s Theorem. Using the tools of universal algebra, probability, and combinatorics, it is shown that a property once thought to be rare, is in fact exhibited nearly ubiquitously.
Increased Productivity in Lake Minnewaska by Trophic Cascade

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Located in the Shawangunk Ridge near New Paltz, NY, Lake Minnewaska is a historically acidic, oligotrophic (low-nutrient), fishless lake. However, Golden Shiner minnows (Notemigonus crysoleucas) were introduced in 2008. With the fish introduction, there have been concurrent ecosystem changes. For example, the pH has become neutral and the water has become more turbid. Lake Minnewaska seems to be in the process of eutrophication, which poses a danger to organisms within the lake such as the extensive matt of Sphagnum trinitense and behaviorally unique population of two-lined salamander. These changes appear to be associated with introduction of the fish. I hypothesize that the lake is undergoing a trophic cascade due to the Golden Shiner introduction, resulting in greater algal production. I tested dissolved oxygen, pH, conductivity, total dissolved solids, water clarity at shallow, medium, and deep sites at Lake Minnewaska. Chlorophyll a concentrations were quantified via spectrophotometry. Values for the Trophic State Index (TSI) were calculated based on secchi depth and chlorophyll a data. The resulting TSI indices show that Lake Minnewaska is a mesotrophic lake from early June to mid August. This research serves as a reminder that eutrophication of aquatic ecosystems is not only caused by nutrients, but other factors such as trophic interactions that may affect productivity as well.

Is paxilline a human Estrogen Receptor alpha?

Cody Saraceno

Nuclear receptors are cytoplasmic proteins that are used primarily to regulate gene expression. As such, this is a property that is used to inform new drug development by developing and discovering compounds that can interact with endogenous human nuclear receptors as a means of disease treatment. A seemingly unrelated class of compounds, known as the "big potassium" (BK) channel blockers, have been shown to be able to interact with certain human nuclear receptors, such as the human Liver X Receptor (hLXR) as well. Preliminary evidence based on previous experiments suggests that Paxilline, a known BK channel interactor, also has the ability to interact with human nuclear receptors, specifically human Estrogen Receptor alpha (hERalpha). Over the summer, we were able to confirm that Fulvestrant, also a known BK channel interactor and hERalpha antagonist does indeed have the ability to bind to hERalpha. Using this data as well as data from previous experiments, we have tried to show that paxilline interacts with hERalpha as well. Currently, we have not been able to show that paxilline interacts with hERalpha at all.

New Modes of Visualizing the Human Form: DICOM Digital Technologies and the Arts

Bri Murphy
Traditionally, DICOM (Digital Imaging and Communications in Medicine) software was used exclusively in the medical field. This type of program provides the groundwork upon which the storing, transmitting, and editing of medical images is built. More recently, developments of this type of software have given those working in the field of medicine the ability to generate 3-dimensional models based on volumetric data sets (MRI, CT, etc.). In 2004, a project was launched that ultimately resulted in the release of the open source OsiriX Imaging Software. This program, available for download online, now gives anyone the ability to exploit the functions of DICOM software. The specific function of OsiriX that is of particular interest to the artist is the interpolation of data points throughout a set of medical images in order to render a 3D model called a mesh. Additionally, OsiriX can be used to export meshes into various file types compatible with a variety of mesh-editing softwares. In these programs, the models can be cleaned, edited, and manipulated to meet the needs of the artist. Using prototyping and 3D printing technologies, these models can be brought from virtual space into reality, thus giving the artist a working prototype that can then be casted and replicated. This research bridges the disciplines of science, technology, and art, while presenting new methods for artists interested in generating 3D models from the human body.

Overcoming “Man”: The Great Health & Nietzsche’s Zarathustra

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With the rise of science, a new picture of the universe has come into focus, complete with new narratives to explain humanity’s existence and purpose; however, Nietzsche warns, with the death of God – the guarantor of intrinsic value – all “purposes” have become arbitrary, and all striving has been reduced to pointless activity. In a world in which people feel weak and lack the willpower to live with conviction, “higher” individuals will cease to exist and history itself will stop. Though the death of God culminates in an age of nihilism, it also opens up the possibility for new ways of being. In the character Zarathustra, Nietzsche creates a living model for a new, heroic form of life affirmation. To understand the Zarathustra type, Nietzsche says, one must first understand his “physiological precondition” – i.e. “the great health”.

By following Nietzsche’s hints in The Gay Science, The Genealogy of Morals, and Ecce Homo, this paper aims to shed new light on the great health and its connection to Zarathustra, as well as to show how this health might generate new narratives that enable nobility and heroism. In seeing ourselves in a romantic light as wanderers, seafarers, and knights out to harvest the greatest fruitfulness from existence, we become the heroes of our own life-story who simultaneously prepare the “soil of man” for something greater, i.e. for a future humanity, beyond good and evil, that laughs and plays in the search for knowledge like a child – or a god.

Preparation and study of planarian tissue exposed to BPA

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Planaria are flatworms, many of which have the ability to regenerate entire worms from mere fragments. Prior work in our lab has documented the disruptive effects of xenoestrogenic compounds such as BPA on planarian regeneration. The present study begins to correlate the histology of the regenerating tissue with the gross anatomical pathology induced by BPA. We examined several different protocols for fixing, embedding and staining planaria to optimize preservation of morphology, including the use of different types of mucous removing agents as well as pre and post fixative relaxants. Our work demonstrates that standard tissue fixation protocols require modification to successfully preserve planarian tissue for histological preparation. Very preliminary results using H&E suggest that the blastemas of worms exposed to 10 µM BPA have histological abnormalities relative to control worms. Further study is planned to confirm these findings.

Second language learning in late bilinguals: an ERP study

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The N1 is an Event-Related Potential (ERP) component occurring between 120 and 170 ms over posterior scalp sites. Its amplitude is modulated by orthographic properties of visually-presented letter strings. In expert readers, the N1 has been found to be larger over left than right sites. The N1 is also more left-lateralized for the second language in experienced bilinguals (Grossi et al. 2010). The present study will investigate potential changes in N1 left-lateralization associated with learning a second language (L2); furthermore, it will determine whether the amplitude of the N1 elicited by Spanish stimuli is influenced by how closely these stimuli resemble English (L1) words. Grossi et al. (2010) found that the N1 to L2 words was larger for words with a low number of similar words in L1. These words were also characterized by letter combinations that are uncommon in English (low cross-language bigram frequency, CLBF). As this effect was larger in inexperienced bilinguals, its decrease in more proficient participants might reflect the learning of orthographic regularities in L2. CLBF will be manipulated to further investigate this possibility. Three groups of participants (advanced L2, intermediate L2, monolinguals) will perform a lexical decision task in both English and Spanish; stimuli will have either low or high CLBF. ERPs to L2 stimuli will help determine the degree of lateralization of the N1 and whether the N1 amplitude is modulated by CLBF.

The Emergence of Converso Identities in Late Medieval Spain

Elizabeth Koza

The emergence of converso identities in late medieval Spain, Christian leaders and missionaries developed conversion campaigns to bring Jews into Christianity. Some converts appear to have fully assimilated with their new religion. Those who did not effectively assimilate are known as conversos, members of a group whose beliefs and actions grew increasingly suspect. Historians disagree about conversos. Did conversos want to
become Christian despite continued Jewish practices, or were they “secret Jews” who knowingly engaged in the practice of their former religion? Despite all of their disagreements, Yitzhak Baer, Benzion Netanyahu, and Anna Ysabel d’Abrera and others scholars make one thing clear: in thought and practice conversos had many options open to them. My research exploits the following premises: converso identity was complex; there was no single identity; converso identity was contested even among conversos. Following these foundations laid in the historiography, the research I conducted recognizes a difficult position of intermediacy and indeterminacy. Christians and Jews made sure that conversos suffered a “no win” situation. The devolution from New Christians, to conversos, to marranos (pigs) meant that generations of people were treated as neither fully Christian nor as fully Jewish. Moreover, the intermediate converso caste created a wedge between Jews and Christians which became the cause of increased animosities. My research helps show how the changing nature and increasing complexity of converso identities complicates the story that eventually leads to the purity of blood paranoia and Jewish expulsion from Spain in 1492.

The Four Prentices of London and the Conquest of the Modern Stage

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When Thomas Heywood’s play The Four Prentices of London was first produced in the 1590s it was wildly popular, performed numerous times, and was printed twice during the playwright’s lifetime. Modern critics, however, often dismiss the play as being one of the playwright’s immature works. But understanding what made this play popular in its time and translating that onto a modern stage not only draws connections across the histories of both English literature and Theatre, it proves that the stories and words used in those traditions exist without an expiration date. The purpose of this research is to learn what made Four Prentices popular, as well as to prepare critical and adapted scripts for modern productions that translate the play’s previous popularity into the modern world. Our adaptation transposes the play from the Crusades and the Conquest of Jerusalem to the 2003 Battle of Baghdad.

Heywood’s episodic journey in Four Prentices transported his audience and entertained them in the foreign setting of war. Much of the dialogue, on which the plot depends, is grounded in a language of war that hasn’t changed. While the gears of war have been replaced, the basic machine and mechanics have not. By adapting the script away from the language of the crusade, which can lock readers into the past, we expose the ideas of loyalty, duty, honor, and conquest that prevailed during the crusade and are still present in modern warfare.

Our research will culminate in a critical and an adapted text. We will also produce a concept statement and research for set designs and other production elements. This research will prepare the groundwork for a possible campus production of our adaptation. We hope to build a bridge between the cultures of Literature and Theatre traditions.

The interactions of DNA in the presence of CTAB

Kathleen Westervelt

1 Chemistry
This research involves the relationship between oligonucleotides of 20 to 100 bases in length and the surfactant, CTAB (cetyl trimethylammonium bromide). Past studies have shown that genomic DNA and CTAB interact electrostatically to form aggregates. The interaction is believed to occur between the negatively charged phosphate group on DNA and the hydrophilic head of CTAB. We would like to determine if similar aggregation occurs when short strands of DNA or oligonucleotides are in the presence of CTAB. UV spectroscopy was used to monitor the absorbance of single or double stranded oligonucleotides as a function of temperature and CTAB concentration. The results indicate that light is scattered by the sample, beginning at a ratio of CTAB to DNA concentration of about 0.5. This implies the formation of aggregates. Similar solutions made with DNA and TAB, an ammonium salt with no hydrophobic tail, did not scatter light. In addition, we have used electrophoresis to compare the mobilities of DNA with and without CTAB. We have also used atomic force microscopy to obtain a topographical view of the aggregates. Images were collected in fluid of DNA-CTAB solutions containing aggregates that were dried on single crystal silicon and reconstituted in water. The aggregates in solution were apparent in optical images, and both optical and atomic force microscope images showed that the aggregates were non-spherical and that they varied in size from nanometers to microns.