Kaleidoscope

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Summer Research and Creativity Grants

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Summer Research and Creativity Grants

The following abstracts were submitted by the students who received Research and Creativity Awards for the summer of 2007. They are not final reports, because the projects were in process when the submissions were due. Rather, they are progress reports. However, these abstracts provide a clear and wonderfully diverse picture of the broad range of scholarly activities being undertaken by undergraduates at the University of Kentucky.

Phi Alpha Gamma: Homophobia in College Fraternities

Daniel L. Bernitt

Theater/Humanities

Since starting the research for my thesis, I've started to look at men differently. Two young men sitting together at lunch, talking to one another without words: head nods, half-smiles. A high school student I taught this summer gets frustrated, says "F*ck this!" as he huffs in his seat. Another young man recounts a story about when he had too much to drink: "I hit her. Like, I didn't mean to; I really didn't, man. It was like I wasn't in my body anymore. I feel so bad, because what I did was really, really, really, really bad." Men so physically nuanced without the full vocabulary to express and articulate how they feel.

A hand gesturing conviction; the nervous fidget with a beer bottle; a quick swig after letting loose a description of an emotion, a weak spot: a constant dressing and redressing of wounds only makes them more obvious. I cannot help but wonder if some men — men typically blamed for sexism, for homophobia, for racism, for oppression — are not also oppressed.

I used to scoff when asked: "So, if there's a campus production of The Vagina Monologues, when is there going to be The Penis Monologues?" Guys who said they were victims of heterophobia, of sexism, too. It hasn't been until recently that I have noticed that there is truth in what I once ridiculed. Scapegoating is an easy way out, but problems are so much greater than one person or group.

As a gay pro-feminist, I am not advocating insensitivity toward victims of oppression, nor condoning oppression. But instead my research is shifting to find the source of these warped ideas: how do these men get to this point where " —isms" are options — where their vocabulary lacks the words they need most?

A Novel Interaction of cyclic-AMP dependent PKA Regulatory Subunit Type 1-alpha with Cardiac Troponin T

Catherine Bozio

Biology

Cardiac muscle function occurs as a result of interactions between protein filaments that bind and slide together. In order for the filaments to bind together and, thus, muscle contraction to occur, the protein complex troponin must be activated. Troponin (Tn) is composed of three subunits: cardiac troponin C (cTnC), cardiac troponin I (cTnI), and cardiac troponin T (cTnT) (see Figure 1).

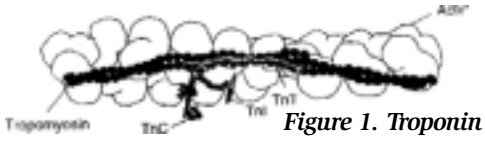

Figure 1. Troponin

cTnI and cTnT associate together in muscle contraction and in myofilament remodeling. The primary goal of myofilament remodeling is to preserve the heart pump function in diseased states. Cardiac remodeling processes are initially beneficial to heart function. However, specific modifications in cTnI and cTnT alter cardiac myofilament properties; these alterations affect the remodeling process and may become maladaptive, leading to heart failure. Though past research indicates that cTnI and cTnT associate together in muscle contraction and remodeling processes *in vitro*, the connection between these proteins has not been strongly shown *in vivo*.

The goal of our research is to determine which other proteins interact with cTnI and cTnT, allowing muscle contraction to occur. We use cTnT in a specific *in vivo* experiment that tests for an interaction between two proteins. We then screen a human heart DNA library for proteins that interact with cTnT. One of the protein-protein interactions identified from this screening is between protein kinase A (PKA) and cTnT. The protein products from an *in vitro* procedure show this interaction exists, rather than solely depending on the *in vivo* system.

Our finding suggests that cTnT serves as an anchor for PKA close to cTnI. This observation could explain the rapid activation of cTnI by PKA. In heart failure, PKA activation of cTnI is decreased and, as a result, the muscle relaxation is prolonged and the body receives an insufficient supply of blood, nutrients, and oxygen. Therefore, an understanding of how PKA anchors onto cTnT close to cTnI could prove to be important in designing new drugs to treat heart failure. To better understand the binding between PKA and cTnT, we are currently trying to identify the specific region of cTnT that interacts with PKA. We create fragments of cTnT and test them with PKA to see if they associate together.

Experiencing the Viennese Hand Horn: Performance Practice and Historical Insights

John-Morgan Bush

Music

The University of Kentucky School of Music offers a wide variety of studies for young student musicians. Among these however, there is little emphasis on the early performance practices of musicians of the 18th and 19th centuries. As both a Horn Performance (BM) and Music Education (BMME) major, I felt that the opportunity to study a topic so intrinsic to the history and literature of my own instrument, the horn, would expand significantly my own performance ability and understanding of a composer's intent in the music that I play. These main elements of my project go hand in hand with one another, and as I am increasing my understanding of 18th and 19th century performance practice by learning to play the hand horn, I am also developing a deeper insight into the compositional techniques of the composers of the Classical and early Romantic eras.

Both academic study of hand horn history and creativity through actual performance are the primary motivators of this research. The main focus of the research is to learn the lore and technique of playing the Viennese hand horn through study of primary sources and current scholarly research coupled with hands-on playing experience. The greater part of my findings in this research comes from private study with an experienced player and public performance. The public performance aspect will be a display of my findings in the form of a public lecture recital to be given in October of 2007. Additionally, I am learning how early horn performance practice affects the modern valve horn player's approach to the works of Mozart, Beethoven, Schubert, and Brahms. This specific form of an undergraduate research project is unique to the School of Music in the College of Fine Arts.

Role of Interleukin-17 in Intestinal Inflammation

Patrick Craft

Agricultural Biotechnology

Graft-versus-host-disease (GVHD) is a common complication of a genetically different or allogeneic bone marrow transplantation (BMT) in which graft cells elicit an immunological response that destroys host tissue. To inhibit the development of GVHD following allogeneic BMT, immunosuppressive agents such as cyclosporine A (CsA) are administered. Interestingly, CsA is also used to induce a GVHD-like disease in mice that have received a syngeneic or genetically identical bone marrow transplant. Syngeneic GVHD (SGVHD) is induced following lethal irradiation, reconstitution with syngeneic bone marrow, and treatment with a 21-day course of CsA. The clinical symptoms of SGVHD are characterized by weight loss, runting, hunched posture, and severe diarrhea with target organs being the liver and colon. This model is utilized to study immune regulation and intestinal inflammation.

Syngeneic GVHD is thought to be driven by the enhanced expression of specific pro-inflammatory cytokines. Cytokines are a group of proteins and peptides that are used in organisms as signaling compounds, allowing one cell to communicate with another. The complex differentiation pathway of the naïve CD4+ T-helper cells involves a number of cytokine interactions. Until recently, it was thought that only two subsets of effector T-helper cells existed. However, recent studies have demonstrated the discovery of a third helper T-cell population, T_H17, that produces the cytokine interleukin 17 (IL-17). IL-17 producing T-cells can drive various pathologies including intestinal inflammation. Preliminary studies in Dr. Scott Bryson's laboratory have suggested involvement of T_H17 T-cells in the pathology associated with SGVHD. Furthermore, recent proteomic and molecular studies have demonstrated a marked increase in the cytokine IL-17, associated with a T_H17 Immune response. Together these data enhance our understanding of the mechanisms underlying the pathology associated with SGVHD and point to a potential role for T_H17 cells in the pathology of SGVHD.

Iron Works
Walter Early
Fine Arts

I am working with Pam Brown, the Director of the Ironbridge Open Air Museum of Steel Sculpture in Coalbrookdale, England, to organize a traveling exhibition of cast iron sculpture. We invited five American and five British sculptors to attend the Museum's 7th annual summer Workshop series and produce original works for this exhibition.

The exhibition is well on its way. All of the pieces are cast and seven are completed and in storage waiting patiently for the first date. The other three only require a minor amount of fettling and patination.

My grant monies have been used mainly for travel expenses during my six weeks in England. While here, I have helped the participating sculptors in the production of their finished products. Ms. Brown and I also visited the three participating venues and paid a visit to a potential fourth. The exhibition will travel to the Shire Hall Gallery in Stafford; the Museum of Iron, in Ironbridge, as part of their 300th anniversary celebration of Abraham Darby's historical innovation that sparked the Industrial Revolution; and the Royal British Society of Sculptors will host it at their London gallery. Another exhibition of large-scale, outdoor sculpture will be produced next summer in conjunction with the Museum of Iron exhibition.

With the support of the Henry Moore Foundation, work has also begun on a book of sculptor's drawings to be published in time to accompany the exhibition. Jon Wood from the Henry Moore Foundation will write the introductory essay and Sam Cornish will be doing the text for us. Mr. Cornish visited the Museum three times to interview the participating sculptors regarding the use of drawing in their working process.

The search for the successful psychopath
Natalie G. Glover
Psychology

"Psychopaths" are social predators who charm, manipulate, and ruthlessly plow their way through life … Completely lacking in conscience and in feelings for others, they selfishly take what they want and do as they please, violating social norms and expectations without the slightest sense of guilt or regret" (Hare, 2003, p. xi). Quite a bit of research has been conducted on psychopaths within prisons (Patrick, 2006). However, throughout the history of psychopathy research there have been repeated references to a "successful psychopath" — persons who presumably share the personality traits of the inmate psychopath (e.g., callousness, lack of empathy, and a remorseless exploitation of others) but are largely succeeding in their remorseless exploitation of others (Hall & Benning, 2006).

Being a prison inmate implies a fundamental degree of failure as a psychopath, because the person was unsuccessful in avoiding arrest and must now spend a considerable amount of time incarcerated. In contrast, anecdotal descriptions exist of psychopathic businessmen, lawyers, professors, and politicians (Cleckley, 1941; Hare, 2003), but there has never been a compelling systematic study of the personality structure of these supposedly successful psychopaths or even an adequate documentation of their existence, despite their importance to theory and social welfare (Hall & Benning, 2006). The major difficulty has been the cost in finding them and obtaining their willingness to participate. It would be a very expensive project to sample enough lawyers or politicians to find the rare psychopath, and, once found, it is possible, if not likely, that the psychopathic person would not participate or be forthright.

My present study used an alternative methodology. This idea grew out of meetings last year with Dr. Donald Lynam, a professor of psychology at the University of Kentucky, whose primary focus of research was psychopathy (e.g., Lynam & Derefinko, 2006). Dr. Lynam is now a professor of psychology at Purdue University. However, the further development of the methodology for the study continued through conversations with Dr. Thomas Widiger, whom I approached to be my mentor for an Honors Thesis in psychology (PSY 495) during the academic year of 2007-2008.

The key feature of this study (actually a series of studies) was the use of "informant reports" (Vazire, 2006). Although a successful psychopath is too rare and unwilling to participate in research, it is possible that persons who were (or are) closely familiar with him or her would be able to provide useful information

concerning personality structure. It was hypothesized that criminal lawyers, forensic psychologists, and self-identified criminals will have known at least one person whom they would describe as a "successful psychopath," and that this person would share most (but not) all of the traits that have been identified by psychopathy researchers as being characteristic of the prototypic psychopath.

Drs. Widiger and Lynam developed a description of the prototypic psychopath in terms of what is referred to as the five-factor model (FFM) of general personality structure (Widiger & Lynam, 1998). At the broadest level, the FFM consists of five broad domains (i.e., extraversion, agreeableness, conscientiousness, emotional stability, and openness). Each broad domain has been further differentiated into more specific facets (e.g., agreeableness versus antagonism includes facets of trust vs. mistrust, straightforwardness vs. deception, altruism vs. exploitation, compliance vs. aggression, modesty vs. arrogance, and tendermindedness vs. callousness).

The FFM has substantial support as a dimensional model of general personality structure and has been previously successful in describing and understanding personality disorders (Widiger & Trull, in press). It has been predicted that the successful psychopath, as experienced by persons who have known him (or her) well, would have most of the core FFM personality traits of the prototypic psychopath (e.g., deceptive, exploitative, arrogant, and callous). The prototypic psychopath has also been found to be low in deliberation, dutifulness, and self-discipline, consistent with being irresponsible, lax, and impulsive (Miller & Lynam, 2003). However, it has been predicted that the successful psychopath would be high rather than low in deliberation, dutifulness, and self-discipline, a finding that could go far in understanding the distinctive features of the personality structure of the psychopath who is successful.

Prospective participants were first given a brief description of a psychopath (e.g., the quotation provided in the first sentence above). They were then asked if they have ever known someone who had these traits and was actually quite successful in his or her psychopathic endeavors. Those with affirmative responses were then asked open-ended questions regarding why they considered the person to be psychopathic and successful (to document that they understood the concepts) and to then to complete two brief questionnaires that assess for psychopathy and the FFM.

Forensic psychologists across the United States (obtained from membership in the respective division of the American Psychological Association) have been surveyed. We plan next to include samples of University of Kentucky law professors, criminal lawyers from the state of Kentucky, and self-identified criminals sampled through an advertisement placed in the Lexington *Herald Leader*. It is predicted that comparable findings will be obtained across each of these populations. The summer of 2007 project was devoted to the sampling of the forensic psychologists. Approximately 800 forensic psychologists were sampled to obtain a goal of at least 100 participants. So far, 70 completed surveys have been returned, which is a much higher response rate than is normally found in studies of this nature. Once all of the data has been collected, we will analyze it and provide a summary of our findings.

Experience with regard to the methodology and results of this project served as pilot and initial data for my 2007-2008 Honors Thesis project, which will include the sampling of lawyers, law professors, and self-identified criminals. I intend to present the results of this project at the Annual Meeting of the Kentucky Psychological Association, and Dr. Widiger has indicated that the results will likely be publishable in a scientific journal.

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The Impact of Multi-Walled Carbon Nanotubes on the Swelling Properties of UCST Hydrogel Systems

Kristen Goodman

Chemical Engineering

Hydrogels are crosslinked hydrophillic polymers that have extensive applications in the fields of tissue engineering, diagnostics, and drug delivery systems. Responsive hydrogels are intelligent materials that change in response to environmental stimuli such as magnetic field, pH, or temperature. Temperature-responsive hydrogels demonstrate temperature dependent swelling properties. The area of temperature responsive hydrogels is of special interest in the study of drug delivery in which internally regulated drug delivery is desired. My research will focus on temperature-responsive hydrogels having an upper critical solution temperature (UCST); meaning, the hydrogel network has increased solution absorption, or swelling, at temperatures above the UCST and decreased solution absorption at temperatures below the UCST.

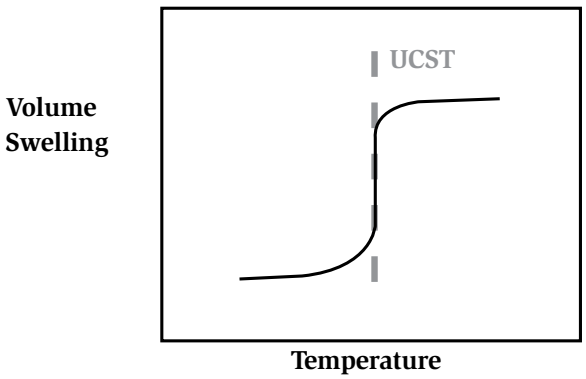

Figure 1: shows how Volume swelling increases with increasing temperature above UCST and decreases with decreasing temperature below UCST.

Hydrogel composites can be formed with the addition of materials such as magnetic particles and nanoparticles. These added materials have the ability to enhance structural stability, mechanical properties, and the rate at which hydrogel systems respond to environmental stimuli. Multi-walled carbon nanotubes (MWCNTs) are one such composite material. MWCNTs are hexagonal networks of carbon atoms that have been rolled up to make seamless concentric cylinders. These nanostructures display unique electronic and mechanical properties on their own.

The purpose of this project is to discover the implications of adding MWCNTs to a UCST hydrogel network and to determine whether the variation of MWCNTs allows for controlled swelling of such systems.

So far in my research I have prepared several hydrogel networks. The first few networks were composed of acrylamide and either HEMA (hydroxy ethyl methacrylate), acrylic acid, or 2-methacryloxyethyl O-glucopyranocide and crosslinked with methylene bis-acrylamide. These hydrogels were polymerized by UV radiation, washed in deionized water and allowed to dry.

Swelling studies were performed on these three networks in which a sample of each was placed in a phosphate buffer solution in both a twenty-five and forty-five degree (Celsius) water bath. The swelling for each sample was compared after a period of twenty-four hours. While the data showed the positive swelling at increased temperatures for both the acrylic acid and 2-methacryloxyethyl O-glucopyranocide systems, swelling was not adequate enough to support the study into MWCNT impact.

A second set of hydrogel systems was prepared. Two methacrylic acid/acrylamide systems were prepared with five or ten percent tetraethylene glycol dimethacrylate as the crosslinker. Two sets of interpenetrating networks (IPNs) were also prepared. In the making of these systems a simple acrylamide hydrogel is first prepared using methylene bis-acrylamide as the crosslinker. The acrylamide systems were polymerized, washed, and dried as previously described. The dried systems were then saturated, for about twelve hours, in a second polymer solution of either methacrylic acid or acrylic acid and methylene bis-acrylamide crosslinker and once again UV polymerized.

These hydrogel networks are undergoing a washing process and will also go through a trial swelling study. Once the swelling data has been collected I hope to find a suitable hydrogel network that will support the addition of MWCNT composites and thereby study its affects. It is my desire that this project will provide information pertinent to the application of controlled drug release.

Behavioral Modification: The Effects of Peer Victimization History on Verbal and Nonverbal Behavior in Young Adult Interactions.

Andrew Hancock

Psychology

This study investigated the consequences of peer victimization in young adults, specifically in verbal and nonverbal cues of behavior. College undergraduates (N = 122) were placed into same-sex dyads to participate in a 2 (victimization history: victim vs. nonvictim) x 3 (power manipulation: boss vs. employee vs. equal status individuals) design to explore the effects of a history of childhood victimization on performance in a power role, and in particular the verbal and nonverbal cues displayed by individuals while interacting.

Sixty-one participants pre-selected for a history of childhood victimization were randomly assigned to boss or equal status roles and

then videotaped while group problem solving with a same-sex peer who did not have such a history. The videotapes of the interaction were then coded for a variety of verbal and nonverbal cues. Analyses revealed that even a mild history of victimization early on in childhood might affect performance in a position of power in adulthood. As expected, victims appeared most threatened when assigned to the boss role and appeared least threatened when assigned to an equal status role. Participants also sat closer together when assigned equal status roles than when assigned to the boss or employee condition.

Interestingly, results showed that victims who were assigned to the employee role sat significantly farther apart than when assigned to boss or an equal status position. Analyses of sex differences showed that male victims also had more head nods than male non-victims, perhaps indicating greater submissiveness.

Asperger's Syndrome at Kentucky's Universities: Assessing the Needs of a Hidden Population

Bev Harp

Social Work

Asperger's Syndrome is an autism spectrum disorder, one of a distinct group of neurological conditions characterized by a greater or lesser degree of impairment in language and communication skills, as well as repetitive or restrictive patterns of thought and behavior. More than a decade has passed since the introduction of Asperger's syndrome (AS) into the American Psychiatric Association's Diagnostic and Statistical Manual (DSM-IV). Since that 1994 publication, the number of individuals identified with the disorder has increased significantly each year. The proposed study will investigate the presence of Asperger's syndrome at four Kentucky universities. Interviews with students and resource providers will examine perceptions of services available, needs, and factors that may prevent students from disclosing the disability or seeking services. Ultimately, the information gained may be used to implement programs designed to enhance the independence, employability, and quality of life for this population.

Students from the University of Kentucky, Eastern Kentucky University, and the University of Louisville are participating in qualitative interviews throughout the summer months. Data will also be collected from the Kelly Autism Program at Western Kentucky University, early in the fall. Questions are directed toward availability of resources and accommodations, self-identified needs of the group, other sources of support available, and general knowledge regarding Asperger's syndrome.

A second phase of the study incorporates data collected from service providers at disability resource centers at the same universities. The two sets of data will be compared, along with information obtained from the literature review, and analyzed to identify knowledge and service gaps. The study findings will be presented in a seminar at UK's Interdisciplinary Human Development Institute in the fall of 2007, and will also be made available for use in other forums. Information gained may be useful in meeting the needs of this growing population at the university level.

Effects of MMP Induction or Inhibition in the Ovulatory Follicle

Brian Kelty

Biology

Ovulation is the process in which an oocyte is released from its ruptured ovarian follicle to later be fertilized. The pathway is set into motion by luteinizing hormone (LH) that initiates and synchronizes a series of biochemical events that increase proteolytic enzyme activity. The matrix metalloproteinase (MMP) family is a 28-member group of enzymes that include gelatinases and collagenases and have been proposed to degrade connective tissue at the apex of the follicle, allowing the oocyte to be released. One focus of the Curry lab is to understand the process of ovulation and the role that the MMPs may play in it.

Currently I am developing a method for rat ovarian follicle culture in the lab. Follicle size and maturity can vary greatly depending on the age of the rat and whether the rat has been pretreated with PMSG, a hormone that acts like follicle stimulating hormone (FSH), which would speed up follicle maturity. In addition to studying MMP action in ovulation, I am studying the significance of follicle size in culture by comparing growth and survival in different sized follicles at the start of culture. Results thus far show larger follicles (350-400µm) tend to grow very little and do not survive very long, whereas smaller follicles (250-350µm) grow at a higher rate and survive longer. Smaller follicles (100-200µm) are also being studied.

Along with follicle starting size, differing FSH levels in the culture media also seems to have an effect. While culturing with an FSH concentration of 1 IU/mL, follicles would often rupture and release the oocyte prematurely or the granulosa cells of the follicle would darken, two definite signs of follicle death. By scaling back the FSH concentration to 100mIU/mL, early data shows the follicles remain healthy for a longer period of time.

The goal of this study is to successfully induce ovulation of the ovarian follicle in vitro. Once in vitro ovulation is reliable and repeatable, we will be able to induce or inhibit MMP activity and observe the physiological effects it has on ovulation. The study may also shift from a 2-D culturing system of a 96-well plate to a 3-D culturing system using calcium alginate, which would mimic the 3-D support system of the ovary.

"What does the damned bird have to say this week?" Political Satire and the 2007 French Elections

Andrew Klein

Political Science, French

One is tempted to define satire as an art form of the "I know it when I see it" variety, but this of course ignores how often subtle satire goes unnoticed by a large percentage of its audience. A better definition might be a work whose intentions for a target fall somewhere between gentle ribbing and wanton scorn. Satire's aim, to mock without necessarily destroying, makes it an excellent vehicle for social critique when authors do not wish to broach their subject directly. Regardless of the setting, political satire is always able to find plentiful material with which to work; because, if life is filled with hypocrisy, foolishness, and pretension, politics are only more so. Political satire is a voice against complacency, which fights the toleration of injustice by suggesting ideals and accepting the world as it is reported by presenting old news in new ways. Successful political satire is a dissenting voice that inspires new modes of thinking.

Not well known in the United States, *Le Canard enchaîné* is a French satirical weekly. Founded in the years preceding WWI, *Le Canard enchaîné* (literally "The Enchained Duck," a play on its contemporary, *L'Homme Libre*) developed a reputation for unfailingly dissecting the news in the most serious of circumstances and critiquing and poking fun at anyone in power, while reserving a slightly sharper stick for those on the right. If one looks beyond the irreverent smirk, the *Canard* can still be relied on for piercing analysis and even stories and scandals that the "unchained" press has failed to uncover.

In May, 2007, French voters went to the polls after an often bitter campaign that pitted Nicholas Sarkozy, the candidate of the incumbent conservative party and advocate for major reforms, against Segolène Royal, the Socialist Party candidate and first woman to be competitive for the French presidency, who was urging restraint. The importance of the election and the strong personalities involved offered a wealth of material for the *Canard* and the rest of the satirical press with which to work. But nearly one hundred years after its first issue, the proud duck's readership, while still strong, is aging. Like France as a whole, the *Canard* is confronting challenges to its relevance in an evolving world.

My research has focused on coverage of the 2007 French presidential election and the ensuing legislative elections by *Le Canard enchaîné* and, to a lesser extent, other sources of political satire. I am spending the summer in France to examine the satirical coverage and also to be immersed in the environment in which regular media coverage and the public's reception of news can be weighed appropriately. The Bibliothèque de France-François Mitterrand has provided me with archived copies of the *Canard* and I am in the process of critically reading issues for such topics as the choice of news stories, the literary techniques employed, and the intentions of the authors. The goal of this analysis is twofold: to explore how satire affects or attempts to affect the fashion in which events are remembered, and to understand how the *Canard* itself has managed to stay relevant (and popular) for so long. I am investigating the idea that by offering alternative ways of thinking about subjects that initially appear unambiguous, satire encourages competing narratives that undermine a monolithic memory of events.

Monopole Catastrophe

Ben Drewry

Johannes Kohler

Art, Design

Ben Drewry

Johannes Kohler

> Painting is a thundering collision of different worlds, destined to create a new world. Technically, every work comes into existence as the universe comes into existence, namely through catastrophes.
>
> -Kandinsky

As a conclusion to our summer research project, we present the digital animation titled "Monopole Catastrophe." This title refers to a scientific theory that proposes that we live in a false vacuum. Upon decay of this vacuum, caused by a lower energy vacuum, the earth would be instantly destroyed, and a new vacuum would emerge at light speed with fundamentally new constants of nature. Some theorize that this event may even be triggered by experiments using high energy particle accelerators. Such an event seems to be highly unlikely, though as a possibility open for consideration, it points to the vast transformable underpinnings of reality.

In relation to our work, we considered this notion not in a destructive sense, but as a way to be open to the awareness of the infinitesimal conditions that our existence is dependant upon. Since the first moments after the big bang, it appears the universe has followed a narrow path eventually leading to life emerging on this planet. Whether we consider this to be the work of a Creator, higher intelligence, or simply random processes, it is hard not to be in awe of our place in the universe in view of all that our existence is founded upon. In our day to day lives, we live unaware of this foundation as we attempt to secure our existence and meet the demands of our self-image.

In primitive times, myths and rituals were created out of the wonder of the life-giving aspect of reality and the terror of the destructive aspect of reality, providing a space for directly being in tune with the flow and rhythm

of creation. Progressively in modern times, as myths and rituals fade from our attention, we are becoming atomized, fragmented into specializations, and led by a partial segment of our self. Our elementary schools and universities are increasingly driven by measurable interpretations of retained knowledge and arbitrary ranking systems. How devastating this has been to those qualities of self that can not be measured! An over emphasis on rankings by outside agencies is reflected in students' lack of self awareness. This approach is as doomed to fail as individuals who base their understanding of themselves on the opinions and credentials of others. To be sure, curiosity, creativity, originality and vision have not been completely suppressed, but rather than being used as instruments to gain deep insights into the nature of oneself and reality, they are twisted to manipulate oneself within the technocratic system. It is no wonder that this lack of curiosity and depth is reflected in some of the nation's foremost leaders.

The point we are making here is that as we are increasingly becoming detached from the interdependence of reality, we become excluded from the creative depths of reality that make available both fundamental physical transformations and psychical transformations. For a monopole catastrophe can also be seen as a metaphor for an inner spiritual or self-catastrophe.

Just as the limitless abundance of physical reality from the quantums to the chemicals that compose our being in the world evades the narrow scope of our conscious interaction with the world, the depths and components of our inner psychical reality that form our viewpoints go undiscovered, ignored, or concealed. There is a discernable anesthetic effect that credential-centered society produces in relation to ancient human enigmas and the rawness and vitality of life lived without obstruction. Subtle barriers are erected through body language, inflection, and what goes unsaid that guide a world view in which the invisible, numinous qualities of reality are placed out of bounds, or studied in the form of powerless and distant representations. In turn, hidden aspects of the self are left stagnant, thus eroding the connection to the inexhaustible depths of mind. As this connection is minimized, creative potentials ready to be awakened within one's self command little attention, and the mist of pervasive diversion clouds our inner vision.

As artists, there is no more a vital impulse than to reconnect our selves with the original life giving nature of reality in its fullness of spirit and eternal unity. This has been one of the primary missions of art throughout the ages, although now, when the disconnection to the numinous is growing, it seems to be an all the more needed yet increasingly insurmountable task. As products of this modern era, we can not separate ourselves from it, or simply revert to earlier modes of expression. We must face this apparent disconnect head on, and create ways to reunite with reality through re-envisioning and recycling the outputs of our technologically immersed society.

The visual material for "Monopole Catastrophe" originated from abstract acrylic paintings. Portions of the paintings were digitally photographed and manipulated on a computer. The program *Studio Artist* was acquired with our grant funds and allowed us to animate the painting manipulations. We then composed the animation with original music using *Final Cut Pro*.

Through an interweaving of digital processing, the initial paintings took on utterly new forms, expanding and contracting within various levels of abstraction. The world of the paintings collided with the realm of the digital, creating a new totality not reducible to the two. As a result of this impact, the images were brought back to life, surging forward rhythmically moment by moment. The viewer is left grasping at the images as they inextricably flow by. Memory, conceptualization and anticipation fail to take in the fullness of the movement. One may however, if one chooses to open oneself, step into the stream of experience, letting the transformations of light and sound surround him or her.

Rather than side-stepping the issue, this film takes on the modern day atmosphere of disjointed reality directly, bringing it to its logical conclusion in catastrophic terms. Whether the dynamism of movement and the surplus of color merely mirror the excesses of our times, or break free toward an exuberant beauty, it is hard to say. The film poses not as an answer to the dilemma, but highlights what is at stake. As we find ourselves searching for the lost connections and hidden dimensions of human experience, the fragments of the self may need to be broken free from their rigid enclosures rather than simply rearranged. In seeing through the transitory nature of forms, exterior identifications, images and labels, a remembrance of interdependence with the world may emerge. Freed from the limitations placed upon one's self, and out of closeness to creative reality, unified being and true individuality may be possible. It is our hope that this may be brought to the fore in the realm of art, for otherwise, the unity of reality, and of our dependant existence within it, may make itself known through outer catastrophe.

We both would like to express our gratitude to eUreKa! for the opportunity that this grant has provided. The present film is our initial attempt at digital animation, and is a first step toward hopefully many more creative projects applying the skills and insights we have learned from this experience. We also would like to thank our faculty sponsor, Professor Rozenberg, for his support and critical views along with the time he was able to share with us. Overall, we feel that we learned a great deal and have grown as a result of this project and hope that you may find it of some value.

Associative Learning Assays of Drosophila Melanogaster Larvae

Justin Kolasa

Biology

The determination of the relationship between neural function and behavior is the underlying challenge faced by the entire field of neuroscience. In order to effectively assess this relationship, associative learning serves as the animal's basis for lifetime preparation of major events, just as in humans. However, the functionality of the *Drosophila melanogaster* is much simpler and more reasonable for assessment. With the progression in biological integration between fields, *Drosophila* are not limited to behavioral assays only, but can be examined via genetics and molecular biology in relation to behavioral results.

At present, particular olfactory paradigms are developed for associative learning in assessment of larvae. The assays of chemosensory function in relation to behavioral function have just recently become a primary focus in the field. As recent as this January, 2007, the first review of literature was published on chemosensory learning in *Drosophila* larvae. This literature provides a means to the first mechanistic understanding of reception of olfactory and gustatory sensory neurons related to learning in larval Drosophila. Insights such as these provide a bridge in the gap between behavior and physiology.

Another bridge to cross is that between flies and humans. To many it may seem remarkably distant, but upon further investigation, *Drosophila melanogaster* is a wonderful basis for understanding more complex species. It is not only that humans share many of the same genes, but also share numerous metabolic and cell signaling pathways at a cellular level. Most interesting is the consistency between behaviors of organisms. It is this basis for investigation that must be held in mind to understanding the underlying question of relationship between cellular level mechanisms and behavioral responses conserved throughout increasing echelons of species.

The development of this project stems from previous work in this laboratory. I am conducting research as part of Dr. Cooper's Lab in the Department of Biology, but with novel methodology and more precise theory. Previous published works were indicative of respectable learning that provided further insight in developing more precise means of addressing larval learning in Drosophila. The supportive preliminary evidence obtained has opened endless areas of experimentation. At present, the approach published in the literature is lacking the proper thought to best assess learning in larvae due to what I view as an experimental design flaw.

The novel design of dark and white strips instead of pie shaped quadrants allows light versus dark preference to be more readily available to larvae being tested for light or dark preference. The width of the strips is twice the body length of 3rd instar larvae. This method allows for the larvae to be more readily exposed to the different environments, and thus eliminates any spatial bias of being in the middle of a pie shaped quadrant.

During the assessment of learning assays, the specimens experience three specific preparation processes. Assessment of impartiality is examined within control groups to determine if the *Drosophila* has a prior preference to light or dark environments. Next, the animals undergo positive and negative reinforcement training conditions with fructose (FRU) and Quinine (QUI) paired specifically with dark and light environments respectively. Evidence for learning can then be assessed by the new preference to areas of the Petri dish. In particular, a preference for dark (+)/light (-) is expected to format an obvious partiality to the areas of darkness located along the strips where light was unable to penetrate the dish. These results are compared to the quadrant systems used in previously published experimental assays.

Due to the ongoing nature of this project the results are pending peer review in a scientific journal so I am unable to discuss the specific results. In summary, the direct comparison between the previous works that were conducted with the quadrant assay, the new strip assay results appear to be indicative of a more efficient method to examining learning and to collect meaningful data. The prominent issue that is being addressed is not the question of learning, but if the new assay will provide a more opportunistic environment for the larvae to choose between light and dark. The data being collected is supportive of this hypothesis, but more statistical analyses will need to be completed in order solidify these observations. The learning assessments interestingly show a level of learning in these larvae that is even higher than expected. The hope is to continue this project and further investigate other areas within learning to understand more completely the ever-present gap between neural function and behavior.

The focal point of this research is to assess learning and retention in *Drosophila* larvae. Much work has been done in the area of adult fly learning and retention, but minimal work has been done in the pre-pupation larval stages.

Summer Research and Creativity Grants (CONT.)

A Comparative Analysis of Germany and America: Patterns of Substance use in Adolescents

Ashley A. McFarland

Sociology

Adolescent drug use, particularly with alcohol, tobacco, and marijuana, is an international problem. Cross-national comparisons allow for the investigation of such health-risk behavior in different cultural contexts and can aid in the creation of educational and policy measures to curb adolescent substance use globally. While extant studies have focused on North American adolescent populations in their quest for finding patterns and correlates of adolescent substance using behavior, only a few studies have widened the net to include other countries and cultures. Germany, a country with many similarities as well as differences to the United States, falls into the category of understudied populations with regard to empirical analysis and cross-national comparison. The present study uses 2003 self-report data from the *Monitoring the Future* (MTF) study as well as data from the *European School Survey Project on Alcohol and Other Drugs* (ESPAD) to analyze similarities and differences in adolescent substance use in Germany and the United States. In particular, social and contextual factors typically associated with substance use between German and American adolescents are discussed.

The Kentucky African American Encyclopedia: Black Life and Culture in the Commonwealth

Grant Mills

History

> *Kentucky — Not the oldest nor yet the youngest state; not the richest nor yet the poorest; not the largest nor yet the least; but take it all and all, for men and women, for flocks and herds, for fields and skies, for happy homes and loving hearts, the best place outside of Heaven the good Lord ever made.*
> *--Ermina Jett Darnell*

Before and since the Commonwealth of Kentucky's inception in 1792, African Americans have made significant contributions to the life, culture, and history of the Bluegrass state. As builders of Kentucky, the fifteenth state in the Union, it is hard to grasp how such a rich and diverse history has been pushed aside. Kentuckians of African American descent have played major roles in many facets of life in local Kentucky communities, as well as on state and national levels.

The Kentucky African American Encyclopedia will serve as a comprehensive study of black life in Kentucky as well as a major reference tool for those interested in studying Kentucky and southern history. This summer I have been given the opportunity to conduct research with University of Kentucky professor Dr. Gerald Smith and the other co-editors of *The Kentucky African American Encyclopedia* Project. Dr. Smith has served as an excellent mentor and instructor guiding me in my research with proper research methodology and also with enhancing my knowledge of the African American experience in Kentucky. I have explored the political, social, and economic impact African Americans have had on the Commonwealth of Kentucky. In my research I have reviewed several primary and secondary sources, including past newspaper articles, microfilm, listening to oral histories on tape, watching interviews on film, and reading journals, among countless other sources. The knowledge I am gaining will serve as a solid base for me as I continue my history research while at UK.

My primary focus this summer, beyond general office work on the *Encyclopedia*, has been to perform extensive research in order to write my own entry for the encyclopedia. I am researching Cynthiana, Kentucky, native Louis Stout, one of Kentucky's leading administrators, educators, and coaches. Mr. Stout has received numerous accolades and honors in his lifetime. He was inducted into the 10th Region Basketball Hall of Fame, the AAU Hall of Fame, the KHSAA Hall of Fame, and the National High School Athletic Hall of Fame.

Beyond these prestigious honors, Stout is most proud of the impact he has had on students' lives. After playing college basketball at Regis College in Denver, Colorado, under the guidance of one of the University of Kentucky's past great coaches Joe B. Hall, Stout returned to Kentucky to become a high school basketball coach. He coached Lexington Dunbar High School and Tates Creek High School. He became the assistant commissioner of the KHSAA in 1971. In 1994, he was named the commissioner of the KHSAA, becoming the first African American to head a high school athletic association in the United States. He also worked twenty-seven years as a high school and college umpire and referee for basketball, softball, and baseball, working on the college level in both the Ohio Valley Conference and the Southeastern Conference.

Since his retirement in 2002, Mr. Stout has published a book, *Shadows of the Past*, chronicling the history of African American high school athletics in the state of Kentucky. He also hosts a high school sports radio show and the *Scholastic Ball Report*, a television program dedicated to honoring students who excel in the classroom as well as in athletics.

My research experience has fulfilled and surpassed all my expectations. I love Kentucky history and especially enjoy the opportunity to do research on people, places, and events that have not been researched extensively.

Screening for Glycerol Metabolic Mutants of Arabidopsis thaliana

Thomas Muse

Plant Pathology

At the half-way point, my project has yielded numerous results, not all of which have been as expected. I have screened more than fifty lines or thousands of M2 generation *gly1* plants and have identified only a handful showing wild type-like levels of hexadecatrienoic acid (16:3). Upon reconfirmation in the M3 generation, some of these samples failed to express a *gly1* mutation possibly due to contamination during growth, seed collection, or sewing. The samples displaying positive *gly1* mutations and wild type levels of 16:3 have been coned and await seed collection and reconfirmation. It is expected that suppressor mutations in *gly1* plants that restore fatty acid profiles for 16:3 will also have restored levels of glycerol-3-phosphate (G3P). Thus far, I have not measured levels of G3P in any samples but will do so once suppressor mutations have been confirmed. If this connection is established, I will go ahead with testing *gly1* suppressor mutation plants for resistance to pathogens and further study the link between G3P and plant defense.

Isolation of Lines Carrying Homozygous Knockout Mutations in Target Genes

Lev Orlov

Plant Pathology

Seeds for *Arabidopsis thaliana* lines carrying T-DNA insertions in target genes were ordered from the Arabidopsis Biological Resource Center (ABRC, OH). These lines were screened for T-DNA insertions in the target locations in the genome. Genotypic screening was carried out using primers that anneal in regions spanning the putative site on T-DNA insertion (LP and RP), as well as a T-DNA-specific primer (Lbb1). DNA from wild type plants with no insertion (wt) yields an ~900 bp PCR product with primers LP and RP, and no product with primers Lbb1 and RP. If insertion is in both copies of the target gene (Hm), then PCR with LP and RP primers do not amplify any product, while PCR with Lbb1 and RP primers yields an ~ 500 bp amplicon. Plants carrying insertions in a single copy (Hz) yield both the 500 bp product with Lbb1 and RP as well as the 900 bp product with LP and RP.

Genomic DNA from approximately 60-80 plants for each line was extracted and used for PCR analysis with the corresponding LP and RP primers along with Lbb1. Thus far I have screened a total of 400 plants with putative T-DNA insertions in three different genes, using this strategy. All three genes instruct for proteins that participate in the fatty acid metabolic pathway of *A. thaliana* and have been designated 1, 2 and 3. I have isolated two plants in line #1, and nine plants in line #2 that appear to be Hm for the target genes. These plants will be further screened for T-DNA insertions by RT-PCR/Northern analysis of RNA. No Hm plants were obtained for line # 3, however 11 Hz plants were isolated based upon DNA analysis. These plants have been coned to allow self-fertilization. Seeds obtained from these Hz plants will be sown to obtain seedlings, which will be screened using the above described method for Hm plants, followed by RNA analysis.

Bad Luck

William C. Santen

Art

The resources generously provided through Eureka's *Summer Research and Creativity Grant*, combined with matching funds from Transylvania University, initiated the second phase of my project: to curate an invitational art exhibition at Transylvania's Morlan Gallery. Scheduled for November, 2007, the exhibit will host seven national and international artists. The featured mediums will be video art, ceramics, photography, and painting.

The second phase of the project began in June and has involved finalizing the artist roster, discussing submissions, and ongoing investigations into the concept of the exhibit. Visits to the New Museum of Contemporary Art in Louisville, KY, the Carl Solway Gallery in Cincinnati, Ohio, and the Monique Meloche Gallery in Chicago, Illinois, have all provided a wealth of information.

A large portion of my proposal consisted of an exhibition catalog. In June, a graphic designer was selected and interviews with printing houses began.

Dr. Robert Jensen agreed to compose the catalog essay, as well as deliver a lecture at the Gaines Center. In August, artists will deliver images for the catalog as the final phase of my project begins.

Summer Research and Creativity Grants (CONT.)

You Are Here
Rebekah Schaberg
Design

Lily pads of land float on top of the North Sea, bumping into each other gently, greeting other lily pads with light kisses before separating again … slowly … serenely. This is not the image that every newcomer to Holland recalls, but it was my very first impression of the country. The Netherlands offers a unique setting, one continually growing and changing, a setting of codependence between land and sea. It seems that this initial cooperation of natural elements inspired the Dutch to create a society of interdependent systems. It is this collaboration that has given birth to one of the most enjoyable way-finding systems in the world.

American cities are comprised of destinations. This is not as true of Dutch urban spaces. In a place such as Rotterdam — a city that seems to have more building icons than trees — you cannot travel from point A to point B without passing through an enjoyable space. This is most important to understand: for the Dutch, *the journey is as significant as the arrival*.

What makes the journey so enjoyable? It could be as simple and as broad as consciousness: the Dutch are aware of the spaces in-between spaces. Each of these zones is designed with a sense of scale that we in America so often neglect. For us, the scale of the vehicle is the measure of space. For the Dutch, the vehicle is a less important way to travel. It is, more importantly, not the *only* way to travel. The measure of space must happen in multiple volumes.

Analyzing the section of a normal urban street begins to tell a story about the city and how its inhabitants use the space. Starting from the left, a building creates a boundary. The space next to the building provides a buffering zone, usually furnished with a precise line of trees that create the sense of repetition within the city. It is here that the human scale can become significant. Appropriately situated next to this buffer is the pedestrian zone, indicated by specific pavers in the sidewalk. Jumping down a short curb, we move into the bike lane. This is the busiest and (perhaps) most important mode of transportation within Rotterdam. Again, the zone is indicated by specific paving patterns, and is almost always painted the color red. Jumping up another short curb, we encounter another buffering zone between bike traffic and vehicular traffic. This zone is also usually furnished with a line of trees, and uses the same paving pattern as the pedestrian zone. It is used as intermediate sidewalk territory by people on foot. Passing through this barrier, you truly feel that you are leaving the place for people and entering the place for machines. Down another short curb, we now enter the roadway. Vehicles and street cars (trolleys) function in this zone of the street.

These modes of transportation function quite differently than the norm in the U.S. Instead of the car having almost total right-of-way, bicycles seem to have the greatest claim to the system. After bicycles, pedestrians have privilege, after pedestrians, cars. The systems have understood responsibilities toward one another. They work. Because the individual person is put before the machine, the street becomes a place to experience. People live their lives outside of buildings.

This sets the stage for the Dutch phenomenon: a sense of ownership and of a personal moment in the public and busy realm. If you are in route, you are forced to experience the city. You exist in a network that is larger than your own transient. Thus, the experience of the journey is gauged by the passing of time: time is not meant to be saved by short-cuts and conveniences; time is meant to be enjoyed. You know that *you are here*; you are in a city of design, a city with culture, a city with life. In this city, you become aware of the rhythm of passing trees and street furniture, the colorful flecks of fabric and graphics that catch your eye and draw attention to things you may not have noticed if you had been in a hurry, the smells wafting from snack stands and the sounds of people amusing themselves. You can't help but enjoy the journey to your destination.

Synthesis and Characterization of Biocompatible Hydrogel Nanocomposites
Mehul Suthar
Chemical Engineering

Modern medicine has found revolutionizing roles for polymers and, in particular, hydrogel polymers have found many applications. Currently, the medical field uses hydrogels for contacts, artificial dental components, and in implants. These hydrophilic polymer networks hold unique properties of biocompatibility, controlled solute diffusivity, and pH and thermal responsiveness.

Poly(N-isopropylacrylamide) (PNIPAAm) is a commonly studied biocompatible polymer and holds particularly unique thermal characteristics. In aqueous environments and under low temperatures, this polymer hydrogel has a strong affinity for water, resulting in significant swelling. At higher temperatures the polymer has decreased affinity for water and resists swelling.

Iron oxide nanoparticles have also gained interest in the medical field. These unique nanoparticles have been studied for cancer targeting, MRI tracers, and hyperthermia treatments. A particular interest in these studies is the superparamagnetic property of the particles. Under an alternating magnetic field, these particles are capable of creating tremendous heat.

By creating PNIPAAm based hydrogels loaded with nanoparticles, this study aims to utilize the temperature responsive properties of PNIPAAm hydrogels in combination with heating capabilities of

iron oxide nanoparticles. This nanocomposite hydrogel system will be capable of being externally heated, and the change in temperature will result in shrinking of the polymer system. The eventual goal is to create a nanocomposite hydrogel capable of being externally actuated for implantable remote controlled drug delivery applications.

Because various properties must be observed in such a drug delivery system, this research employs two critical studies in characterizing necessary properties of PNIPAAm/TEGDMA hydrogel nanocomposite systems for drug delivery applications. The studies will observe heating and biocompatibility of various synthesized hydrogels.

Fibronectin Function in Articular Cartilage

Marlene Tremblay
Veterinary Science

Articular cartilage is a connective tissue located on the surface of two or more adjoining bones within synovial joints. Its major functions are to assist joint motion by minimizing the coefficient of friction, to provide strength to resist shear stress between bone surfaces, and to provide a cushion that reduces weight-bearing compressive stress. The unique biomechanical properties of articular cartilage are a function of molecules in the extracellular matrix and how they are structurally organized. The focus of my project is a large matrix glycoprotein called fibronectin found at high levels in cartilage.

In 1995, my sponsor, Dr. James MacLeod, identified and characterized a unique isoform of fibronectin restricted to the cartilaginous tissues of mammals. Designated $(V+C)^-$ fibronectin, this glycoprotein has a cartilage-restricted expression pattern, which implies that it has an important role in cartilage function and possibly in chondrocyte differentiation. I have been participating in experiments designed to test the hypothesis that the unique structure of $(V+C)^-$ fibronectin produces alterred binding affinities for some cell surface receptors leading to differential regulation of chondrocyte gene expression.

My current experiments use a technique called quantitative polymerase chain reaction (qPCR) to evaluate changes in the expression of targeted genes that were initially identified using microarray-based transcriptional profiling screens. The first set of target genes include Syndecan-4, MMP-3, VCAM-1 and BOC. MMP-3 is an enzyme in the matrix metalloproteinase family that catalyzes the degradation of certain extracellular matrix molecules. MMP3 is involved in normal matrix turnover as well as diseases including arthritis. The Syndecan-4 gene encodes a protein involved in intercellular signaling and VCAM-1 is linked to cell adhesion and signal transduction. A new gene of interest in the MacLeod lab, BOC (Brother of CDO) is a cell surface receptor that has been studied for its role in myogenic differentiation.

Specific primers and fluorescent-labeled probes for each targeted transcript are developed based on the primary nucleotide sequence and structural annotation of the gene being studied. Primers are designed to span adjoining exons and the probe sequence is centered over an exon-exon junction in order to avoid amplification and detection of any contaminating genomic DNA in the sample. Controlled experiments are used to test the quality of these primer-probe sets.

Total RNA samples isolated from articular chondrocytes cultured for 24 hours in the presence of different fibronectin preparations such as plasma and cartilage first have to be reverse transcribed into their complementary DNA (cDNA) with a DNA polymerase enzyme. I am then able to evaluate gene expression changes in the cDNA samples on a 7500-Fast quantitative "real-time" PCR system (Applied Biosystems). The amplification of the cDNA takes place over 40 cycles each set for 3 seconds at 95˚C to separate DNA strands and 30 seconds at 60˚C to anneal the primer to its matching segment and for the DNA polymerase (Taq polymerase) to synthesis the complementary DNA strand.

Our preliminary data have not indicated consistent differences in gene expression of Syndecan-4 between biological replicates. Our current priority in this reseach includes running more qPCR experiments with the other genes mentioned above.