2002

Summer Research and Creativity Grants

UK Office of Undergraduate Research

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One of the special benefits of a large research university is the opportunity it provides undergraduates to study in a wide variety of disciplines and to work under the personal supervision of nationally recognized scholars. As a means of promoting such educational experiences for students, the Office of Undergraduate Studies offers Research and Creativity Grants each semester and during the summer term. The grants are intended to take advantage of the rich resources available through the libraries, the laboratories and, most especially, the academic personnel at the University of Kentucky. Undergraduates in all areas of intellectual inquiry are eligible, and students at many different levels of matriculation have received support. Both individual projects and joint ventures have been endorsed by the selection committee, which is particularly interested in funding interdisciplinary efforts. During the summer of 2002, a total of twenty awards were made. Of these awardees, the following students had progressed far enough to be able to supply a description of their research in time for publication in this issue of Kaleidoscope:

Chris Barbee
Department: School of Music
Mentor: Prof. Peter Simpson

Music in the Making

My Research and Creativity Grant project is a composition written for a jazz saxophone quartet with rhythm section that is heavily influenced by different world music genres. I attended the Kentucky Institute for International Studies program in Salzburg, Austria from May 28th to July 1st 2002, to study “Classical and Romantic Styles,” “Music of the World’s Cultures,” saxophone, and composition. I am using the knowledge I gained from that experience as a resource for composing a piece that will draw upon music from cultures not often considered in the creation of jazz music. My research in Salzburg contributed toward the addition of African, Middle Eastern, and Asian instruments in the rhythm section and as substitutes, or doubles, for the saxophones. From the saxophone ensemble I will also demand many different sounds and tonal concepts, some of which will have a non-western influence. I have had the assistance of Richard Burchard of Bellermine College (the teacher of “Music of the World’s Cultures”), and Peter Simpson (my Faculty Sponsor, who also taught courses with the program) in constructing a logical piece that shines a new light on the realm of possibility for the standard jazz saxophone ensemble.

Richard Burchard’s “World Music” course provided me with the opportunity to hear many world musicians speak and perform on their various instruments. The most inspirational of these to me was an Austrian Didgeridoo player named Klaus Wintersteller. Klaus spoke about and performed on this aboriginal Australian instrument and I was so taken by the sound that I have based my work around this instrument’s fundamental sound. Professor Burchard’s class also provided an opportunity for everyone to get hands-on experience with the djembe, an African drum, under the instruction of Jamike, a native South African djembe virtuoso. This experience taught me about standard playing styles for African percussion instruments. The knowledge I gained in the world music class and the opportunity I had to explore instruments in a Salzburg “world instruments” shop also opened my eyes to numerous possibilities for inclusion of various wind instruments in my composition. I have since tried different combinations of Armenian, Persian, and Indian flute instruments in conjunction with our standard western saxophone sound in my writing.
Outside of the class and the world music store, I was often enamored by many different veins of world music being performed on the streets and in the clubs of the European cities. I heard examples ranging from Bali throat singing to Italian traditional instrumental music to Turkish stringed instruments ensembles, but the most relevant performance I heard was a world music “crossover” ensemble featuring Klaus Winterstellar, called Didgegroove. The ensemble was able to put a world music twist on contemporary Western-style grooves using various African and Asian percussion instruments, a guitar, and the droning sound of the didgeridoo. This sound has become the greatest influence in the style that I am creating.

This project will be performed by the University of Kentucky Mega-Sax quartet this fall, and could potentially be recorded on the next “UK Mega-Sax” release, directed by Professor Miles Osland. The previous two recordings by this ensemble have received Four Stars in the Downbeat jazz magazine, and this summer’s release “Profound like Gumbo” has already received a Four Star review from allmusic.com.

Alex Brooks  
Department of English  
Mentor: Prof. Jane Vance  

Florence, Italy, July 8th 2002  

I am here in Florence, Italy, to write a book. Or more precisely, I am here to imagine the book I need to write and then attempt to get it down on paper. You could say that I am living with this book. Even when I am not physically writing I am thinking about scenes or characters or sentences or words. I do not choose to do this; it just comes naturally to me. When I read a book I compare it to what I am working on. When something happens to me here I ask myself how it fits into my book. I joke with myself by saying that I am not traveling alone because my characters come with me. I am always asking myself how they would react to a situation, what they would think or do.

To write about traveling, you must travel, in one way or another. To write about adventures you must have had adventures, and to write about dreams you must dream. So that is what I am doing. Traveling, adventuring, dreaming, and then writing about it all.

My work here is very simple. First of all I write in a journal. I record things that happen every day, people I meet, conversations, things I see and do. I write about the books I am reading, about how I am feeling and about my emotions — all of this a mishmash of confused writing with no direction at all. Together with this I write down many memories and all kinds of dreams. But I have a definite goal in mind, a definite book with a definite set of characters and a story. I work writing these stories and characters, trying to figure out how I can make a book out of them and make sense of it all together.

Besides this, I write about the problems I am having with writing. I write about my confusions and clarieties, my difficulties and successes.

My second major occupation here is reading. I read other traveling authors like Melville, St. Exuperey, and Moitessier. I read the mystic poetry of Rumi. These books take me traveling with them. I feel as if the writer were sitting next to me and telling me the story. I try to think about how they wrote, what they were doing and thinking about as they made their books.

Thirdly, I do lots of living, perhaps the most important of all. I examine myself in my new surroundings and situations, examine my dreams. I stare a lot at the ocean or at mountains. I watch people, listen to them, and speak with them. I ride trains, catch buses, walk for hours through the different cities. Once, in Hungary, I was walking down a back street when I came upon a fenced in yard where a few men were sculpting huge pieces of rock. The yard was littered with large heads and arms, just scattered around randomly, and I just watched them for a while. I drink tea. I think about home and what I will do when I get home. These are not really adventures I am having; Melville would agree with me that most adventures are really nine parts hardship and unhappiness. It is just life. I will decide later which part of my life, real, dreamed, imagined, or made up, needs to be in a book.

Charles Max Brown  
Department of Physics  
Mentor: Prof. Suketu Bhavsar  

The Void Distribution: A Study of Nothing  

The Universe is rich in structure. In fact, the galaxies are arranged in a string-like, filamentary structure that can be statistically measured. Because galaxies form by drawing together all the mass in the surrounding space, there are large empty regions, voids, that should also have structure. We computationally defined voids as polygons whose vertices are galaxies and are applying this two dimensional construct to the Las Campanus Redshift Survey to determine the voids’ distribution, their maximum size, and their eccentricity. This information is vital in the study of both the current and primordial Universe.
Christina Colby  
Department of Psychology  
Mentor: Prof. Elizabeth Lorch  
The Development of Story Recall and Attention in Children with Attention-Deficit Hyperactivity Disorder (ADHD) and Comparison Children  
The current study investigated how salient distracters, such as toys, affect attention to televised stories. Furthermore, this study examined how differences in attention related to story comprehension in younger and older children with ADHD as compared to nonreferred children. Each child watched two “RUGRATS” episodes with two viewing conditions, toys and no toys. After each episode an experimenter asked the child to answer 35-38 questions about the show. Children with ADHD showed a significantly greater decrease in visual attention in the toys condition compared to the nonreferred children. Children with ADHD comprehended discrete factual events as well as comparison children in the absence of toys. However, in the presence of toys, older but not younger children with ADHD decreased performance on factual questions. Although both older groups answered more causal questions than younger children, older comparison children did better at understanding causal relations than older children with ADHD. By knowing more about how the attention of children with ADHD affects their ability to encode cohesive stories, the more we will understand about the development of difficulties faced by these children. With such knowledge, programs can be implemented to help alleviate the social and academic problems that affect children with ADHD.

Bruno deHarak  
Department of Physics  
Mentor: Prof. Dan Dale  
Optical Properties of Lead Tungstate Crystals  
The PrimEx collaboration has the goal of performing a high precision measurement of the lifetime of the neutral pion (p0). The hybrid calorimeter (HYCAL) will perform the essential function for this experiment of detecting the two photons emitted when the pion decays. The HYCAL, will utilize lead tungstate scintillating crystals (manufactured by the Shanghai Institute of Ceramics) and lead glass Cherenkov shower counters. A study of the optical properties of each of the individual lead tungstate crystals to be used in the HYCAL has been performed. The results of this study as well as the details of the techniques used will be presented in this paper.

In order to perform an analysis of the optical properties (primarily transmittance and reflectance for wavelengths of approximately 300 to 800 nm) of all of the lead tungstate crystals for use in the HYCAL, a single crystal was first studied. This was done to develop and proof the equipment and techniques being used. This initial analysis has been performed and some of the specific results are as follows:

- The index of refraction for the crystal was measured using two techniques, the first by using a laser to directly measure the angles of incidence, reflection, and refraction; the second by polarizing a laser and determining Brewster’s angle. The index of refraction differs somewhat from those values published in various journal articles. The index of refraction is needed to determine the reflectance and transmittance of the crystal.
- The CCD detector being used provides a linear response, which is necessary to perform the planned transmittance measurement.
- Filtering of the light source is necessary to eliminate contamination by higher as well as lower order wavelengths while measuring the flux of a particular wavelength.

The initial study of a single crystal has been completed and the project is now in the design phase. Equipment and software is being designed to automate the measurement of all the lead tungstate crystals for the HYCAL. The equipment will consist of a translation platform with a small elevator and associated circuitry, a light source with collimator, a spectrophotometer with a CCD detector, and a computer acting as a control station for the spectrophotometer and CCD. Once a set (approximately 20) of crystals has been installed on the platform, no further manual intervention will be required.

Once the design is complete it is expected that construction and troubleshooting will take an additional 1 to 2 weeks. Data acquisition and analysis will follow immediately. The timeframe for this final phase of the project is largely dependent on the variations found in the crystals as they are studied.

Ryan Gabbard  
Department of Computer Science  
Mentor: Prof. Jerzy Jaromczyk  
Multiple Views of XML Documents  
Extensible Markup Language (XML) is the standard format for the interchange of structured data by computers. This project explores data structures and algorithms for provid-
Layered XML has many possible applications: the entire historical development of a document could be stored within it, versions of the same document prepared or revised by multiple people could be stored together, or the same document could contain layers with differing levels of complexity (useful for software users’ manuals, reference works, or even, applied to formats like the Mozilla XUL, entire user interfaces).

We designed and implemented prototypical tools to experiment with the above tasks. The tools seek to be as generic as possible and are configured through user-editable XML and XSL files, allowing them to be easily customized for specific applications.

The implemented prototypes display data in three forms. These views are continually synchronized, allowing the user to switch quickly among them according to which is most useful for the task the user wishes to perform. Information used for linking can be easily added to a suitably formatted XML file. A tool based on our idea of incorporating and storing layers in an XML document was created for both viewing and editing multilayered XML documents. Additionally, a Java class for multilayered XML documents was developed that allows access to their data through normal Java XML procedures.

As a small illustration of potential applications, we encoded in our experimental framework various historical versions of the Pledge of Allegiance and of sections of the Books of Common Prayer of the Anglican Communion. The latter text combines both historical change with the existence of multiple, related versions in many different countries, so it provides a perfect example of a tree of variants that is more than one layer deep. The user can select a desired version of the documents, which is then extracted from one common XML description of all of the versions and rendered to the screen.

Lester Miller  
Department of Geography  
Mentor: Prof. Susan Roberts  
Land Tenure in Rural México from 1910 to the Present

It has often been written that the best indicators of development are not such factors as roads, electricity, or even running water, but rather the ability to fulfill basic human needs such as nourishment and shelter. Certainly, roads, electricity, and running water can make it easier to procure food and likely demonstrate that housing exists, but they are all three culturally specific luxuries that really say little as to a person or family’s ability to lead a fulfilling existence. Of much greater worth to any sort of practical analysis of a nation’s well being is a basic, yet holistic examination of that nation’s food system and its approach to providing shelter to its populace. The goal of my research is to undertake one small portion of that holistic examination and explore the history and present state of rural land tenure in México and how it has been affected by national and international influences.

The turn of the twentieth century found México under the military control of Porfirio Díaz. Under Díaz, the state had privatized roughly ninety percent of once-communal, indigenous lands. With campesinos (Méxican peasants) uprisings lead by Emilio Zapata and Pancho Villa, along with the presidential nomination of Francisco Madero, the Mexican Revolution began in 1910 to challenge Díaz’s rule. In 1917, a new constitution was drafted. Article 27 of this constitution allowed eminent domain for the government to distribute the land and waters within national borders in the interest of public welfare. This article allowed for seventy-five years of state-facilitated land distribution and returned much of the land taken from the campesinos under Díaz. Many of these concessions took the form of ejidos, a special type of land arrangement wherein the actual property was not returned to the community but rather the community was granted the right to tend the land. Thus, ejidal lands remained under the control of the government and neither the individual communities nor the farmers themselves could officially buy, sell, or rent the right to cultivate the land. Gradually, amendments were made to the constitution to allow individuals and foreign investors to sidestep
Social and Temporal Patterns of Vocalization Among Colobus Guereza, The Black-and-White Colobus Monkey

Alyssum Pohl
Department of Biology
Mentor: Prof. Craig Sargent

The aim of this study was to glean a deeper understanding of the vocalization patterns of the black-and-white Colobus monkey, or Colobus guereza, and to compare the patterns of vocalization between wild and captive troupes. The study took place near Ngare Sero Mountain Lodge in the montane forests of Mt. Meru, Tanzania and at the Primate Rescue Center in Nicholasville, Kentucky. The guereza in each location were monitored for a total of 96 hours over a two-week period, giving 8 full 12-hour days of data (6am-6pm in Tanzania, 7am-7pm in Kentucky). It was found that the vocalizations of the wild guereza peak in the late morning and continue at high levels until midday, and that small peaks in vocalizations also occur in the early morning, and again an hour or so before the troupe settles for the night. Also of interest and possible use for future studies is the result that they vocalize significantly more frequently than the wild guereza. Also, while the dominant male is almost exclusively the only member of the troupe to make the croaking roar, it was observed that he is not the only member capable of this vocalization.

Robert Prather
Department of Educational and Counseling Psychology
Mentor: Prof. Sharon Rostosky

Psychosocial Correlates of the Execution of Legal Documents by Gays and Lesbians

Same-sex couples and families lack the legal rights intrinsic to heterosexual marriage. Gay, lesbian, bisexual and transgender (GLBT) individuals may form relationships not recognized by their legal (biological) families. Therefore, these individuals and families need to take pro-active steps, such as drafting wills and other legal documentation, to secure rights in their chosen relationships. Without establishing legal rights in same-sex families, the most important relationship in a person’s life can be treated as if it never existed in the event of death. Within a same-sex family, a life-long companion inherits none of his or her partner’s assets in the absence of a will and often encounters trouble in keeping custody of the couple’s children. In short, GLBT individuals and families need to put documents into place to assure legal recognition of their wishes.

Hesitation in taking these legal steps may be exacerbated by intrapersonal and interpersonal characteristics. Intrapersonal characteristics that may deter individuals from securing these legal protections include high levels of internalized homophobia, and lack of disclosure of sexual orientation. Interpersonal characteristics may include perceived relationship quality, the current length of the relationship, and the presence of children. Each of these factors may be significantly related to GLBT individuals’ hesitation or motivation to initiate protective documents.

Because previous studies have neither examined the prevalence of documentation nor the factors associated with the execution of documentation among GLBT individuals, we designed a Web-based study that would allow us to explore these questions. Participants were recruited via email lists for various GLBT organizations and issues. Individuals responded to the email and were given access to the survey. We have obtained a sample of approximately 400 gay, lesbian, bisexual, and transgender persons. Participants responded to demographic and disclosure of sexuality items, items about relationships and length, children,
and family relationships. They also filled out scales assessing internalized homophobia (IH) and knowledge about legal documents. Finally, they answered questions about the execution of several different types of legal documents. Now that the data has been collected, I plan to generate descriptive statistics showing prevalence rates for the different forms of documentation among different demographic groups, and possible causal factors related to the execution of these documents. I plan to present these findings at a national conference in the coming academic year and then submit a manuscript to a peer-reviewed journal for possible publication. With the accomplishment of these goals, I will have completed the research process from inception of the research question, to survey design, participant recruitment and data collection, to analysis and publication.

Phillip Sauerbeck  
Department of Classics  
Mentor: Prof. Ross Scaife  
Translation Research

Translators translate because of their love for the original poem and because of their desire to honor that poem. When a translator engages in that honoring, the act of translating becomes sacred. The translator participates in a miraculous transfer of beauty. What the original poet saw, the translator attempts to see, and he/she does his/her best to transfer that vision from personal experience of the poem through his/her own vernacular.

Of course, when speaking of the translator’s experience, the question of the importance of objectivity arises. A translator cannot but interpret the poem in terms of his or her own experience, and should not be criticized for this. A characteristic of translation is that it also tells the translator’s story; it will (hopefully) have the flair of something new. Therefore, translation can broaden the scope of the original, offer another view of the same thing. Translation is not a technical feat only, but also an art form, more than just a re-creation.

A translation is not worse or better than the original. It is an attempt to create an experience that is similar to that of the original poem. It is important, though, to note that a translation is not the original. One does not read the original poet or the translator only, but both at the same time.

Translation is possible because language does not point to itself, but to objects, ideas, emotions, or the Platonic forms. If I write the word moon, a reader will think of a moon, perhaps a full moon on a clear sky, whatever is his or her general “moon” picture. If language referred to itself, then comprehension would be impossible. A reader could sound out the word moon, but that would be all. If a critic of translation were to say that translation is impossible because of semantic differences in words, he or she would be promoting the idea that language refers only to itself, which is impossible.

Plato speaks of the role and function of language in everyday life in The Cratylus. When referring to names, he says that the name of a person is not that person. Two people in separate cities have the same name, but they are still completely different from each other.

In translation, some intellectual characteristics of the original poem are inherently lost; whether meter, rhyme, or a whole image. These things are done for the sake of the translation as a whole, done for something greater. One should think of the poet too. Although he or she loses part of what has inspired him or her, the poet does the world a great justice by writing. The poet honors his or her sources of inspiration by writing. In turn, the translator honors the poet’s inspiration, and he or she too does the poem and the world a great justice.

Christopher (Matt) Smith  
Department of Psychology  
Mentor: Prof. Michael Bardo  
Individual Differences Predict Novelty-Induced Disruption of Amphetamine Self-Administration in Rats

A potential protective factor for drug abuse might involve exposure to nondrug, alternative reinforcers. Previous research in laboratory animals has shown that drug self-administration is reduced by nondrug alternative reinforcers such as food or sweetened water. Work in our laboratory has also shown that novel-enriching (rewarding) stimuli decrease amphetamine self-administration in rats (Klebaur et al., Experimental and Clinical Psychopharmacology, 2001, 9:372-379). Because rats have shown individual differences in their response to novelty (Piazza et al., Science, 1989, 245:1511-1513), the present experiment determined if these individual differences would predict the magnitude of novelty-induced disruption of amphetamine self-administration.

Rats (n = 12) were first screened for response to novelty and activity using three different novelty tests (inescapable-induced novelty, novel-object recognition and novelty-induced conditioned place preference) and two ac-
tivity tests (free-choice or no-choice wheel running). Following the initial screening phase, rats were trained in an operant chamber on a fixed-ratio 5 schedule to self-administer amphetamine (0.1 mg/kg/infusion) in 60-min sessions.

When responding stabilized, dose effect curves were established for each rat in the presence and absence of novel stimuli in the operant chamber. In order to conform to a procedure that yielded a novelty-induced disruption of amphetamine self-administration (Klebaur et al., 2001), novelty consisted of the following stimulus combinations: (1) a novel odor (orange, coffee, cinnamon or anise extract); (2) a novel object (one of four different hard plastic “toys”); (3) a novel visual black-and-white pattern (checkerboard pattern, zig-zag pattern, swirling pattern, or dotted pattern); and (4) a novel floor insertion having a distinct tactile texture (hardware cloth, mesh screen, flattened sheet metal, or Plexiglas).

A different set of novel stimuli, randomly determined, was introduced into the chamber on each of four separate sessions. On each of these novelty sessions, a different dose of amphetamine (0.003, 0.01, 0.03 or 0.1 mg/kg/infusion) was available. Responding for these same doses of amphetamine was also determined during separate sessions in which no novelty was presented. The order in which doses were tested in the presence and absence of novelty was determined using a Latin square design. Intervening between each test session, rats were maintained on the training dose of amphetamine (0.1 mg/kg/infusion, with no exposure to novelty) for 2 sessions in order to maintain stable responding.

Although our experiment is still ongoing, preliminary results indicate that novelty during the session disrupts amphetamine self-administration. With regard to the effect of individual differences on the novelty-induced disruption of amphetamine self-administration, we predict that rats with a greater response to the novelty tests will show a greater novelty-induced disruption in responding for amphetamine. This effect should be observed only at the lowest unit dose of amphetamine (0.003 mg/kg/infusion). If the predicted results are substantiated, then such results will provide pre-clinical evidence that exposure to novel environmental stimuli may serve as a protective factor against drug taking among high novelty-seeking individuals.
better understand the development of, and ultimately treat, neuropathic pain, we have begun a series of basic experiments in a rat model of neuropathic pain. A peripheral mononeuropathy was produced with chronic constriction injury (Bennet & Xie, Pain, 87-107, 1988). The sciatic nerve on the left side was ligated while a sham operation was performed on the right side. Drugs acting at mu (fentanyl), kappa (U50 488H), and mu/kappa (morphine) opioid receptors were tested for their ability to affect the development of neuropathic pain. Specifically, rats were treated once daily for 28 days (IP, vol=1ml/kg) with morphine (0.02 mg/kg), fentanyl (5ng/kg), U50 488H (0.025mg/kg) or saline (control). Analgesia was assessed by applying increasing levels of pressure to the ligated and sham-operated paws of the rats. Paw pressure testing was conducted on days 3, 7, 10, 14, 21, and 28 post surgery. Rats treated with saline developed neuropathy in the left side (ligated) by day 3 and completely recovered by day 21. Rats treated with morphine developed neuropathy to a significantly lesser degree. The time courses of neuropathy development were similar in male and female rats. Ongoing experiments indicate that fentanyl completely blocks the development of neuropathy while U50 488H does not affect neuropathy in female rats. Testing of male rats is in progress. Neuropathy was not observed in the right side (sham) in all groups of rats. The results suggest that chronic treatment with low-dose (sub-analgesic) opioid analgesics acting predominantly at mu opioid receptors inhibit the development of the nerve injury-induced neuropathy. Opioid analgesics acting at kappa receptors do not appear to affect the development of neuropathy.

Laura Walker
Department of Special Education
Mentor: Prof. Kristine Jolivette

Great Leaps
Great Leaps, a systematic and individualized reading program, focuses on students’ phonics, sight phrases, and oral reading skills. This program aims to increase reading fluency by providing achievable goals measured through oral reading accuracy with one minute reading probes. Great Leaps was implemented in both school and home environments for a third grade student with learning disabilities and concurrent behavioral problems whose educational goals focused on reading fluency. A multiple probe across academic areas design was used.

Reading passages from the student’s science and social studies text were also used. The student’s reading fluency was measured in terms of the rate of words read correctly and words read incorrectly in one minute for the Great Leaps’ passages, science passages, and social studies passages. The data suggest that the Great Leaps program improved the student’s reading fluency above baseline rates across all three types of passages. Limitations of the study are discussed. Future research is warranted to replicate these data across environments and academic areas. Future directions are provided that outline such research.

In addition, the following students received summer research and creativity awards for summer, 2002:

Ryan Ball
Department of Biology
Mentor: Prof. Robin Cooper

Hutchinson, Mary (Beth)
Department of Landscape Architecture
Mentors: Prof. Karl Raitz, Geography
Prof. Christy Cassady, Horticulture
Prof. Ned Crankshaw, Landscape Architecture

Pey Lian Lim
Department of Computer Science
(Research Performed in the Department of Physics)
Mentor: Prof. Suketu Bhavsar

Jason McClure
Department of Forestry
(Research Performed in the Department of Entomology)
Mentor: Prof. Lynne Rieske-Kinney

Julie Rogers
Department: School of Music
Mentor: Prof. Ron Pen

Seth Vatt
Department: School of Music
Mentor: Prof. Dale Warren