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## Complete Issue of Volume 7

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*A sculpture of Vice President Barkley and a campaign button, University of Kentucky, M.I. King Library. See Alben W. Barkley: Harry S. Truman's Unexpected Political Asset, page 75.*

## Kaleidoscope

The *University of Kentucky Journal of Undergraduate Scholarship* is a refereed journal published annually by the eUreKa! Office of the University of Kentucky. The journal is dedicated to the advancement of knowledge through the publication of the results of the intellectual pursuits of undergraduate students. The journal accepts reports of all forms of creativity and scholarship by undergraduate students including, but not necessarily limited to, artistic and musical creations, creative writing and poetry, and reports of studies and research in the humanities, the social, natural, and medical sciences, agriculture, business, architecture, and engineering. The journal is published in a traditional print format and as a Web site. The Web site may include creative materials, such as performances and art work, that cannot be reproduced on paper.

< [www.uky.edu/kaleidoscope](http://www.uky.edu/kaleidoscope) >

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*The Perfect Machine: The Reason behind the Anatomical Studies of Leonardo da Vinci, see page 20.*



## Upcoming Undergraduate Scholarship Events and Deadlines

### **Kaleidoscope, Volume 7**

*The University of Kentucky Journal of Undergraduate Scholarship* is published once each year, at the beginning of the fall semester. All contributions to the journal are refereed by a standing editorial board and guest referees and editors. Articles, reports, and other creative works may be submitted by any undergraduate student at the University of Kentucky. All submissions must be accompanied by an endorsement by a University faculty member who has agreed to attest to the scholarly quality of the work and to serve as faculty mentor for editing and final submission of the work. Detailed guidelines for submission are available at [www.uky.edu/kaleidocope](http://www.uky.edu/kaleidocope).

### **Deadlines**

#### **for Volume 8, Fall, 2009:**

##### **January 9, 2009:**

Optional electronic letter of intent to submit, including a brief description of the nature and contents of the proposed submission sent to the editor. ([rst@uky.edu](mailto:rst@uky.edu))

**April 10, 2009:** Complete submission prepared according to the guidelines delivered electronically to the editor. ([rst@uky.edu](mailto:rst@uky.edu))

**June, 2009:** Notification of acceptance/rejection and instructions for suggested/required revisions.

**July, 2009:** Final, revised submission delivered electronically to the editor.

### **National Conference on Undergraduate Research**

"The mission of the National Conferences on Undergraduate Research (NCUR®) is to promote undergraduate research scholarship and creative activity done in partnership with faculty or other mentors as a vital component of higher education."

**The 2009 NCUR conference will be held April 16-18, 2009**, at the University of Wisconsin, La Crosse. Visit the NCUR Web site at <http://ncur.org/basics/index.htm> for general information on NCUR; visit <http://www.uwlax.edu/ncur2009/> for details and deadlines for the conference.

### **Oswald Research and Creativity Awards**

All current UK undergraduate students are eligible to submit a paper or other creative work to be considered for an Oswald Research and Creativity award. The competition categories in which papers and projects may be submitted include: (1) Biological Sciences; (2) Design (architecture, landscape architecture, interior design, etc.); (3) Fine Arts (film, music, painting, sculpture, videotape, etc.); (4) Humanities: Creative; (5) Humanities: Critical Research; (6) Physical and Engineering Sciences; and (7) Social Sciences. **The deadline for submission is March 16, 2009.** Visit the eUreKa! website at: [www.uky.edu/eureka](http://www.uky.edu/eureka) for details, application forms, and official rules. See pages 136-38 for winning submissions from last year's Oswald Awards program.

### **Office of Undergraduate Studies Research and Creativity Awards**

As a means of promoting educational experiences for students, the Office of Undergraduate Studies offers Research and Creativity Grants 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. **The Deadline to submit applications is February 26, 2009.** For details regarding eligibility, and application forms visit the eUreKa! website at: [www.uky.edu/eureka!](http://www.uky.edu/eureka!)

### **UK Undergraduate Research Program**

The University of Kentucky Undergraduate Research Program (UKURP) creates research partnerships between first- and second-year students and faculty researchers. The program offers students the opportunity to work and learn along side a research faculty member. Undergraduate students are given the real-life experiences of working in laboratories and other scholarly settings; developing a research abstract; presenting their projects at symposiums and professional conferences; publishing their findings; and meeting others in the international community of scholars. In other words, students are given a jump-start on their career. For more details and deadlines for applications, visit [www.uky.edu/eureka!](http://www.uky.edu/eureka!)

### **Additional Information**

Additional information regarding undergraduate scholarship and creativity programs, conferences, competitions, and opportunities is posted on the Web site of the Office of Experiences in Undergraduate Research and Creative Activities, eUreKa! at [www.uky.edu/eureka!](http://www.uky.edu/eureka!)

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**Lee T. Todd, Jr.,  
President**

**A**t the University of Kentucky, undergraduate scholarly inquiry has always been important. However, over the past five years, such studies have been growing significantly, both in quality and in quantity. The number of students participating in the abundant opportunities formally and informally supported by many individual faculty members, departments, colleges, and the University through the many programs of its *eUreKa!* office is increasing rapidly. The number of UK students applying and accepted to present at the National Conference on Undergraduate research has grown each year, placing UK ahead of all of our peer institutions in this important measure of undergraduate research. And the size and quality of UK's Journal of Undergraduate Scholarship, *Kaleidoscope*, has also been growing. This year is no exception.

Once again, the range of interests and inquiries reported in *Kaleidoscope* is astonishing. This issue contains reports of studies in the humanities, the social sciences, the natural sciences, and fine arts and business. It is also noteworthy that the authors include first-year students, seniors, and those in between. The fact that scholarly inquiry begins for some students as soon as they come to UK is wonderful. Such inquiry should not be thought of as limited to capstone or departmental honors projects. It is clear from many educational research studies that engaging in undergraduate scholarship as early and as often as possible has an extremely beneficial impact on a student's education. The benefits include, among others, increased retention, higher grades, better learning, better placements in jobs and graduate schools, and closer relationships with faculty members that yield more personal advising and mentoring. I urge every undergraduate to take advantage of the mentored scholarly opportunities at UK.

One article in this issue especially caught my attention, because it directly relates to Kentucky. John Ghaelian's submission on native son Alben Barkley interests me, not only because it is such well-written original research, but also because it bears witness to a point that I have made many times: UK is an extraordinary resource for the Commonwealth. The research that is conducted here is of value to the entire state; it is not esoteric or unrelated to all of our interests. As John so ably explains, Barkley was of enormous importance to President Truman and to the nation as a whole, but his contributions have been largely forgotten. Now, thanks to John, we can have a much better understanding of that crucial time in our history and the role that a Kentuckian played in it.

Research such as John's would not be possible without the dedication and support of the many faculty members who mentor undergraduates in their scholarly inquiries, and who serve as referees, judges, and editors of our various competitions and publications. These opportunities are what make the undergraduate education available at UK so valuable, and I thank again all of the faculty members who make these experiences both possible and beneficial.

This is the seventh volume of *Kaleidoscope* and I never fail to be impressed by the quality of the scholarly contributions of our students. The breadth and depth of the interests and inquiries of our students continues to astonish me. Although editing a journal always entails hard work, I find that editing *Kaleidoscope* is also highly enjoyable. The joy comes from learning from the students and what they have written, and it comes from the pleasure of seeing our students excel. A university can only be as great as its students, and ours are outstanding.

The creation of a journal of this magnitude and quality is the result of the contributions of many individuals. Mine is only one part of the overall effort. Of course, the primary contributors are our students who have engaged in scholarly inquiries of the highest professional quality, and then put forth the hard work required to write publishable accounts of their results. As we all know, writing is hard work and the student authors have devoted themselves to this task admirably, learning and polishing their writing skills in the process of providing us with such wonderful reading. For every student author, there is a faculty member who has devoted countless hours first guiding the student's scholarly inquiry and then to mentoring the writing and editing of the article. The enormous value added to a student's education by these mentors is incalculable. The reward to the mentors is seeing their protégées grow and succeed. Many additional faculty members contribute by serving as anonymous referees who judge whether a submission is, indeed, of the high caliber we have come to demand for publication in *Kaleidoscope*.

In addition to the students, their mentors, and the faculty referees, there are two individuals who contribute mightily to the creation of each volume of *Kaleidoscope*. Evie Russell is the organizer and coordinator of all of the technical aspects of this journal. It is she who works directly with each of the students and their mentors. She arranges for the peer reviews of all submissions and summarizes the results. She coordinates the process of obtaining copyright permission for the use of images and other material. And, she arranges all of the business and technical details of final design and printing of the journal. In all of these and many other endless tasks, Ms. Russell is ably assisted by Kathy Logsdon, whose many contributions also are gratefully acknowledged.

I am sure that you will learn much from this issue and I hope that you will be inspired to become or remain active in undergraduate scholarship. Your education does not end when you leave the classroom. On the contrary, the classroom should be only the beginning. Engaging in and then writing about your own scholarship is the way we make the most of our educations and at the same time educate others.



**Robert S. Tannenbaum,  
Editor**



I am a senior from Nashville, Tennessee. I am majoring in Agricultural Biotechnology and conduct research in the Department of Molecular and Cellular Biochemistry, University of Kentucky College of Medicine. Throughout my career at the University of Kentucky, I have received scholarships from the Gatton School of Business and the College of Agriculture as well as multiple Dean's List awards.

I am a member of the Alpha Lambda Delta academic honorary and have completed a research fellowship with the Biomaterials and Tissue Engineering Laboratory, University of Kentucky Biomedical Engineering Center.

I plan to enter the Biotechnology industry, with a focus on drug design and development, while continuing my education. My project, "Role of cytoskeletal dynamics in platelet Arf6 activation," has helped me to develop the necessary skills and interest to become a successful scientist in the competitive arena of Biotechnology. Designing this project with Dr. Sidney W. Whiteheart has been an enjoyable and invaluable experience. Dr. Whiteheart has not only taught me the basics of approaching scientific questions, but also a unique way of thinking about them.

I have been a member of a student group [CAUSE (College Alcohol Use Student Educators)], devoted to teaching students responsible alcohol use, for over two years. In my limited time outside of school and research, I enjoy reading, movies, music, guitar, and Keeneland in the spring.

I have presented this work at the Showcase of Undergraduate Scholars, University of Kentucky, in 2007 and 2008. I have also presented this work at the annual Agricultural Biotechnology Seminars.



**Faculty Mentor: Prof. Sidney W. Whiteheart**  
**Department of Molecular and Cellular Biochemistry**

Platelets are critical to blood clotting and represent the first responders to blood vessel damage. A striking feature of platelet activation is their transition from the discoid resting cell to the stimulated "spider" that first attaches to the damaged site and then to the "fried egg" that spreads over the wounded surface. These morphological changes are thought to be reliant on cytoskeletal elements such as actin filaments and microtubules. While much is known about how actin affects platelet responses (and Brett confirmed these effects), less is known about the role of microtubules. Specifically, are microtubules important for platelet function? Brett's data begins to address this question. Using microtubule stabilizing and destabilizing drugs, he showed that microtubule assembly had no role in platelet function. Treatment with vinblastine and nocodazole had no effect on shape change, aggregation, or secretion. Microtubule disassembly was necessary for some aspects of platelet function, because treatment with paclitaxel (a microtubule stabilizer) inhibited aggregation and secretion, but not shape change. Additional studies focused on the role of the cytoskeleton in activation of the small GTP-binding protein Arf6. Arf6 has been shown to be a key control element during aggregation and has been suggested to affect actin cytoskeletal changes upon platelet activation. Both paclitaxel and latrunculin A (an actin depolymerizer) treatment blocked Arf6 activation in thrombin and convulxin-stimulated platelets. These results show that dynamic changes in the platelet cytoskeleton are required for function and suggest a feedback mechanism from the cytoskeleton may control Arf6 activation.

## Role of Cytoskeletal Dynamics in Platelet Arf6 Activation

### Abstract

Platelets undergo morphological changes upon activation, such as shape change and aggregation. These changes are known to be the result of actin remodeling, whereas the role of microtubule remodeling has been controversial. The objective of this study was to re-examine the role of actin and microtubule dynamics in platelet function. We used aggregometry to measure the effect of cytoskeletal inhibitors on platelet shape change, aggregation, and dense core release. Microtubule assembly was found to have no role in platelet function, because treatment with vinblastine or nocodazole had no effect on shape change, aggregation, or secretion. Microtubule disassembly was necessary for some aspects of platelet function, because treatment with paclitaxel inhibited aggregation and secretion, but not shape change. Actin assembly was confirmed to be an essential event in platelet activation. We then assessed the role of microtubule disassembly and actin assembly in ADP-ribosylation factor 6 (Arf6) activation, because Arf6 is a key signaling component in platelet activation. Using GST-GGA3, we monitored Arf6-GTP levels over time in paclitaxel and latrunculin A-treated platelets. Paclitaxel and latrunculin A treatment blocked Arf6 activation in thrombin and convulxin-stimulated platelets, respectively. These results suggest that microtubule disassembly and actin assembly are important for Arf6 activation in platelets.



## Introduction

Platelets are responsible for maintaining the integrity of the vascular system. They seal off vascular injury by adhering to lesions, aggregating, and secreting their granule contents. These processes are all aspects of platelet activation, which is initiated by physiological agonists generated at a lesion site such as exposed collagen (Barnes et al., 1998) and locally activated thrombin (Brass, 2003).

Resting platelets circulate in the bloodstream in their native, discoid shape and undergo a rapid shape change upon activation of various surface receptors. This shape change is the result of cytoskeletal remodeling. The role of actin filaments in cytoskeletal transformation has been well characterized (Hartwig, 2006; Lefebvre et al., 1993; Natarajan et al., 2000; Torti et al., 1996; White, 1984; Winokur and Hartwig, 1995), whereas the role of microtubules is still a subject of interest, because previous studies (Bouaziz et al., 2007; Cerecedo et al., 2002; White and Rao, 1982; White and Rao, 1983; White and Sauk, 1984) have yielded conflicting results.

ADP-Ribosylation Factor 6 (Arf6), a small G protein of the Ras superfamily, has been known to affect cytoskeletal dynamics in eukaryotic cells (Boshans et al., 2000; Donaldson, 2003; Donaldson and Honda, 2005; D'Souza-Schorey and Chavrier, 2006; Gillingham and Munro, 2007; Myers and Casanova, 2008; Song et al., 1998) and platelets (Choi et al., 2006). Recently, it was found that Arf6 behaves unlike the other small GTPases in platelets; the active form, Arf6-GTP, is present in resting platelets and rapidly decreases upon activation with primary agonists (Choi et al., 2006; Karim et al., 2008). The decrease was shown to display a biphasic profile; an initial decrease through primary surface receptors, i.e., protease activated receptor (PAR) and glycoprotein VI (GPVI) receptor, and a secondary phase initiated by the outside-in signaling of activated  $\alpha_{IIb}\beta_3$  integrins (Kasirer-Friede et al., 2007; Shattil, 1999) during the later stages of platelet activation (Karim et al., 2008).

In this report, I have re-investigated the physiological role of cytoskeletal dynamics in platelet activation. In addition, I have sought to determine the role of specific cytoskeletal remodeling events in the control of Arf6-GTP levels.

## Results and Discussion

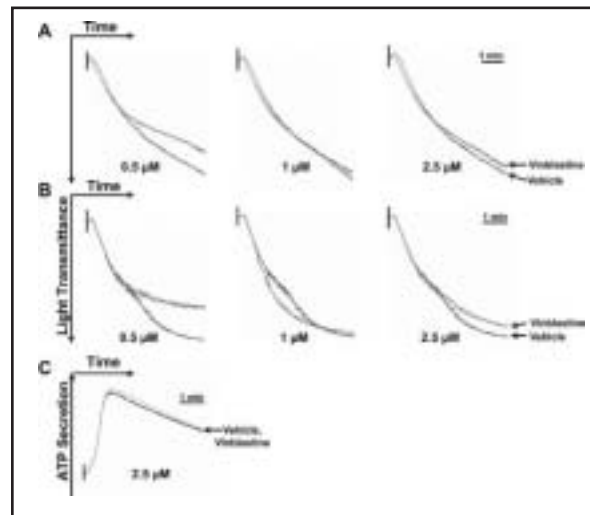
### Role of microtubule remodeling in platelet function

Platelets undergo a morphological change, mediated by the cytoskeleton, upon stimulation with primary agonists. The first objective of this study was to determine the role of microtubules, if any, in platelet function. To accomplish this, we treated platelets with microtubule

inhibitors known to disrupt the dynamic instability of microtubules. By inhibiting specific events in microtubule remodeling, we were able to assess their importance in platelet function, i.e., shape change, aggregation, and dense core granule release.

We assessed the role of microtubule assembly by treating platelets with microtubule destabilizers, vinblastine or nocadazole, prior to activation. Each drug binds and stabilizes free tubulin dimers to prevent their incorporation into microtubules. Vinblastine treatment had no effect on shape change, aggregation, or dense core granule secretion in thrombin and convulxin-stimulated platelets (Figure 1: A-C). Nocodazole treatment also had no effect on any aspect of platelet function (Figure 2: A-C). Although both destabilizers appeared to affect aggregation at low concentrations, they were unable to display a dose-dependent response.

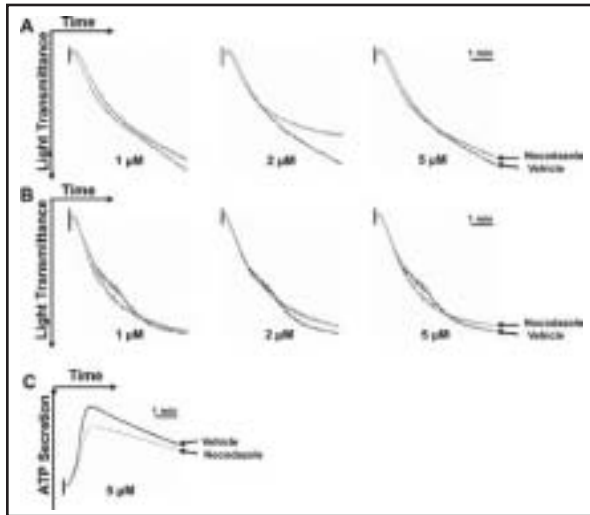
Microtubule disassembly is thought to be the mechanism of remodeling in the early stages of platelet activation (Hartwig, 2006). To assess the role of microtubule disassembly, we treated platelets with paclitaxel, a microtubule stabilizer that prevents disassembly, prior to activation. Paclitaxel treatment had no effect on shape change, but aggregation was partially inhibited, at higher



**Figure 1. Effect of vinblastine on platelet aggregation and dense core granule release.**

**A,B)** Washed platelets were pre-incubated with the indicated concentration of vinblastine or equivalent volume of DMSO (vehicle) for 5 minutes prior to stimulation. Platelets were stimulated with (A) thrombin (0.3 U/mL) or (B) convulxin (0.1  $\mu$ g/mL) and monitored for shape change and aggregation over 5 minutes.

**C)** Washed platelets were pre-incubated with 25  $\mu$ L luciferin-luciferase (Chrono-Lume) and 2.5  $\mu$ M vinblastine or equivalent volume of DMSO (vehicle) for 5 minutes prior to stimulation. Thrombin (0.3 U/mL) was used to stimulate the platelet solution to monitor dense core granule ATP release.



**Figure 2. Effect of nocodazole on platelet aggregation and dense core granule release.**

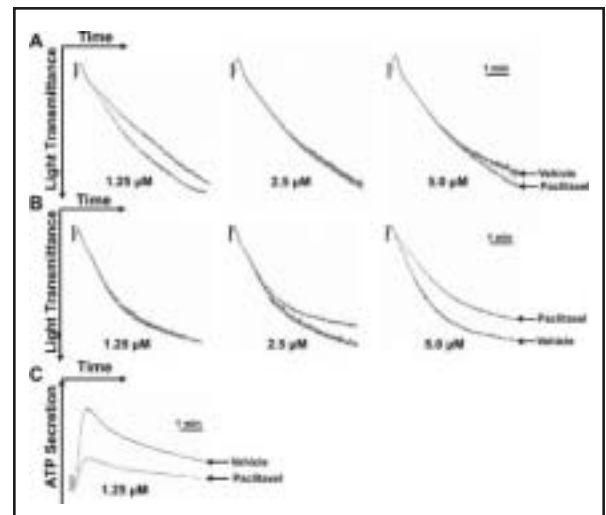
*A,B) Washed platelets were pre-incubated with the indicated concentration of nocodazole or equivalent volume of DMSO (vehicle) for 5 minutes prior to stimulation. Platelets were stimulated with (A) thrombin (0.3 U/mL) or (B) convulxin (0.1 μg/mL) and monitored for shape change and aggregation over 5 minutes.*

*C) Washed platelets were pre-incubated with 25 μL luciferin-luciferase (Chrono-Lume) and 5 μM nocodazole or equivalent volume of DMSO (vehicle) for 5 minutes prior to stimulation. Thrombin (0.3 U/mL) was used to stimulate the platelet solution to monitor dense core granule ATP release.*

concentrations, in convulxin-stimulated platelets (Figure 3: A,B). Interestingly, aggregation was unaffected at 5-fold higher concentrations of paclitaxel, up to 25 μM, in thrombin-stimulated platelets (data not shown). Dense core granule release was inhibited at low concentrations of paclitaxel (Figure 3C). Taken together, these data suggest that microtubule assembly has no major role in platelet function, whereas microtubule disassembly may play a role in platelet aggregation and secretion, but not shape change.

### **Role of microtubule remodeling in Arf6 activation**

Because we observed an important role for microtubule dynamics in platelet function, we sought to examine whether microtubule remodeling is necessary for Arf6 activation (decrease of Arf6-GTP). Previous studies (Choi et al., 2006; Karim et al., 2008) showed that Arf6-GTP decreases upon stimulation with primary agonists and that the decrease in Arf6-GTP is necessary for full platelet activation. We monitored Arf6-GTP levels in vinblastine, nocodazole, or paclitaxel-treated platelets following stimulation with thrombin or convulxin.



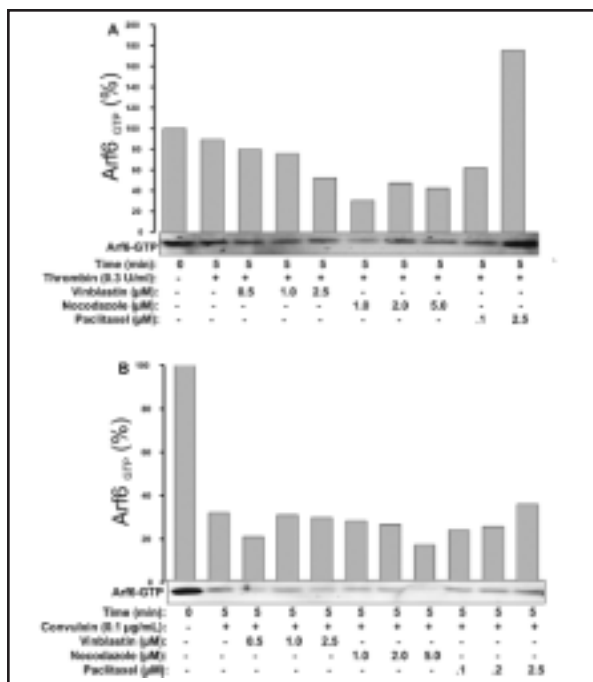
**Figure 3. Effect of paclitaxel on platelet aggregation and dense core granule release.**

*A,B) Washed platelets were pre-incubated with the indicated concentration of paclitaxel or equivalent volume of DMSO (vehicle) for 5 minutes prior to stimulation. Platelets were stimulated with (A) thrombin (0.3 U/mL) or (B) convulxin (0.1 μg/mL) and monitored for shape change and aggregation over 5 minutes.*

*C) Washed platelets were pre-incubated with 25 μL luciferin-luciferase (Chrono-Lume) and 1.25 μM paclitaxel or equivalent volume of DMSO (vehicle) for 5 minutes prior to stimulation. Thrombin (0.3 U/mL) was used to stimulate the platelet solution to monitor dense core granule ATP release.*

Vinblastine and nocodazole treatment had little effect on Arf6 activation, whereas paclitaxel treatment blocked the Arf6-GTP decrease (Figure 4A). The ability of paclitaxel to disrupt Arf6-GTP levels further supports microtubule disassembly as an integral event in platelet activation. Interestingly, the Arf6-GTP decrease was inhibited by paclitaxel in thrombin-stimulated platelets, but not convulxin-stimulated platelets (Figure 4B); this finding is most likely a reflection of the unique signaling events involved in the PAR and GPVI signaling pathways, but could also be indicative of a larger role for microtubule disassembly in PAR-mediated activation.

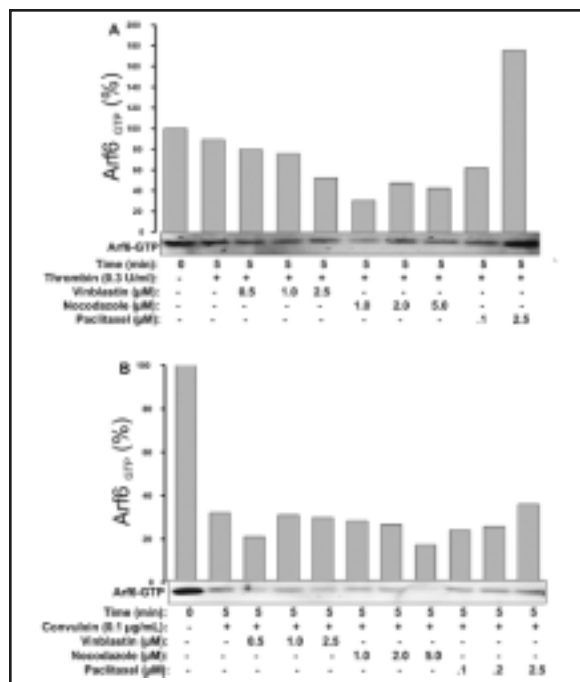
One interpretation of the inhibition of the Arf6-GTP decrease by paclitaxel is that microtubule disassembly is a necessary and upstream event of Arf6 activation in PAR-mediated platelet activation. Because Arf6 is upstream of the outside-in signaling of activated  $\alpha_{IIb}\beta_3$  integrins (Choi et al., 2006), this would place microtubule disassembly upstream of  $\alpha_{IIb}\beta_3$  integrin activation as well. Although paclitaxel treatment could have a global effect on multiple primary signaling events, this is not likely because Arf6 activation would be disrupted in both PAR and GPVI-mediated activation.



**Figure 4. Effect of microtubule inhibitors on Arf6-GTP levels.**

A, B) Washed platelets were pre-incubated with the indicated concentration of vinblastine, nocodazole, or paclitaxel for 5 minutes prior to stimulation. Platelets were stimulated with (A) thrombin (0.3 U/mL) or (B) convulxin (0.1 µg/mL) and allowed to aggregate for 5 minutes. Platelets were lysed at the end of the aggregation reaction and the clarified supernatants were assayed for Arf6-GTP, using GST-GGA3. Arf6-GTP was identified using SDS-PAGE/Western blot analysis. The data points are normalized to the amount of Arf6-GTP in resting platelets (100%).

Because we established a role for microtubule disassembly in Arf6 activation, we further defined the relationship by monitoring Arf6-GTP levels over a time course in paclitaxel-treated platelets. In DMSO-treated platelets, thrombin stimulation induced an Arf6-GTP decrease that was maximal (~70% decrease from resting state) in fully aggregated platelets (300 sec). In paclitaxel-treated platelets, thrombin stimulation did not induce a similar Arf6-GTP decrease; Arf6-GTP levels initially declined (10 sec), but remained at a similar level (~40% decrease) for the remainder of the time course (Figure 5A). Paclitaxel treatment did not affect the Arf6-GTP decrease at any time point in convulxin-stimulated platelets (Figure 5B). These data support a role for microtubule disassembly in Arf6 activation, which may be upstream of Arf6 in PAR-mediated platelet activation.



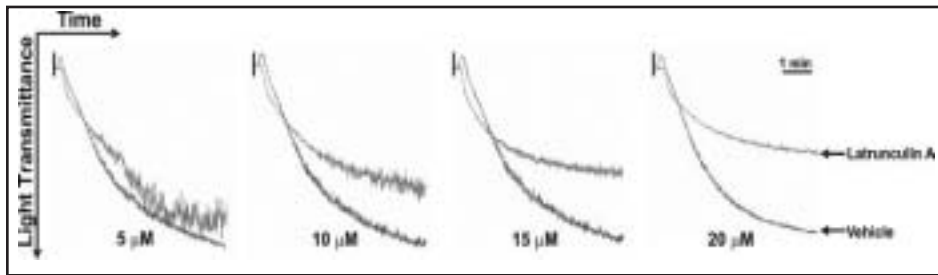
**Figure 5. Time course of Arf6-GTP in platelets pre-incubated with paclitaxel.**

A, B) Washed platelets were pre-treated with 2.5 µM paclitaxel for 5 minutes prior to stimulation. Platelets were stimulated with (A) thrombin (0.3 U/ml) or (B) convulxin (0.1 µg/mL) and allowed to aggregate for the indicated times (10, 30, 60, 120, or 300 sec). Platelets were lysed at the indicated time points and the clarified supernatants were analyzed for Arf6-GTP, using GST-GGA3, and Arf6-Total. Arf6 was identified using SDS-PAGE/Western blot analysis. Data points are represented as a ratio of Arf6-GTP to Arf6-Total and are normalized to the Arf6-GTP/Arf6-Total ratio in resting platelets (100%).

## Role of actin assembly in platelet activation and aggregation

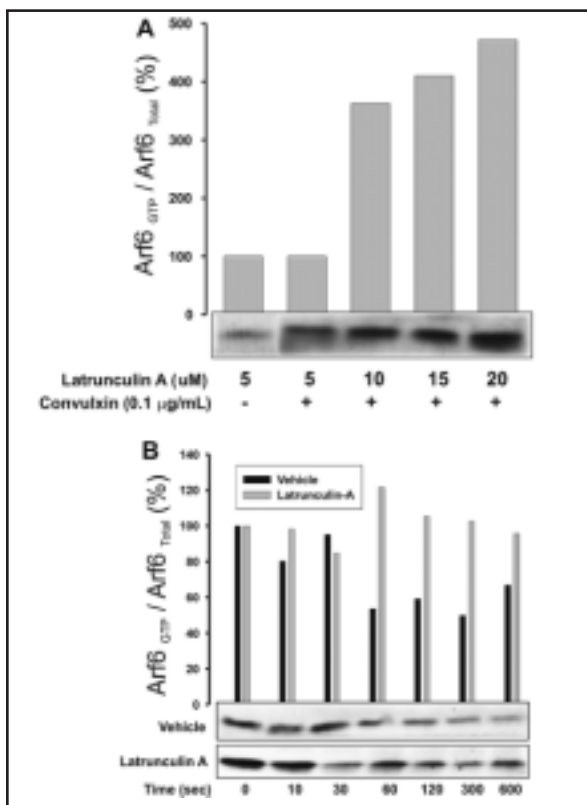
Actin filaments make up the majority of the platelet cytoskeleton and are responsible for the morphological changes seen in platelet activation (Hartwig, 2006; Lefebvre et al., 1993; Natarajan et al., 2000; Torti et al., 1996; White, 1984; Winokur and Hartwig, 1995). Aggregometry was used to re-examine the role of actin assembly in platelet activation and aggregation. We used latrunculin A, an actin destabilizer that binds and stabilizes free actin monomers, to inhibit actin assembly. Latrunculin A treatment blocked platelet shape change at low concentrations, and showed a dose-dependent inhibition of aggregation (Figure 6). These data confirm the importance of actin assembly in platelet activation and aggregation.





**Figure 6. Effect of latrunculin A on platelet shape change and aggregation.**

Washed platelets were pre-incubated with the indicated concentration of latrunculin A or equivalent volume of DMSO (vehicle) for 5 minutes prior to stimulation. Platelets were stimulated with convulxin (0.1  $\mu\text{g}/\text{mL}$ ) and monitored for shape change and aggregation over 5 minutes.



**Figure 7. Effect of latrunculin A on Arf6-GTP levels.**

Washed platelets were pre-incubated with the indicated concentration of latrunculin A or equivalent volume of DMSO (vehicle) for 5 minutes prior to stimulation. Platelets were stimulated with convulxin (0.1  $\mu\text{g}/\text{mL}$ ) and monitored for shape change and aggregation for the indicated times [(A) 300 sec] or [(B) 10, 30, 60, 120, 300, or 600 sec]. Following lysis at the indicated time points, clarified supernatants were assayed for Arf6-GTP, using GST-GGA3, and Arf6-Total. Arf6 was identified using SDS-PAGE/Western blot analysis. Data points are represented as a ratio of Arf6-GTP to Arf6-Total and are normalized to the Arf6-GTP/Arf6-Total ratio in resting platelets (100%).

## Role of actin assembly in Arf6 activation

A previous study (Choi et al., 2006) has shown that isoform-specific inhibitors of Arf6 disrupt actin dynamics in platelets. We sought to further characterize this relationship by determining whether actin assembly is upstream of Arf6 by treating platelets with latrunculin A and monitoring Arf6-GTP

levels following convulxin stimulation. Latrunculin A treatment caused a dose-dependent block of Arf6 activation (Figure 7A). Using the lowest concentration of latrunculin A shown to block Arf6 activation, we examined a time course of Arf6-GTP levels in convulxin-stimulated platelets. Latrunculin A treatment blocked the decrease in Arf6-GTP at nearly every time point (Figure 7B).

These results suggest that actin assembly may be upstream of Arf6 activation in the GPVI-mediated signaling pathway. Because actin remodeling is known to play a role in the inside-out activation of  $\alpha_{IIb}\beta_3$  integrins (Falet et al., 2005), the effect of latrunculin A on Arf6-GTP could be from integrin-based outside-in signaling or actin remodeling is acting both upstream and downstream of Arf6 activation, as previously proposed (Choi et al., 2006). Nonetheless, these data support a role for actin assembly in Arf6 activation.

## Conclusion

In this report, we defined a role for integral cytoskeletal remodeling events in Arf6 activation. Using inhibitors, we established the cytoskeletal remodeling events necessary for full platelet function. Paclitaxel treatment inhibited aggregation and dense core granule release, supporting a role for microtubule disassembly in platelet function. Latrunculin A treatment blocked shape change and inhibited aggregation, confirming the role of actin assembly in platelet activation and aggregation.

We then determined a role for these cytoskeletal remodeling events in Arf6 activation. Both paclitaxel and latrunculin A treatment disrupted Arf6 activity, suggesting that microtubule disassembly and actin assembly, respectively, are necessary events for the Arf6-GTP decrease in stimulated platelets. Microtubule disassembly may be upstream of Arf6 activation and actin assembly could be upstream and downstream of Arf6 activation in PAR and GPVI-mediated activation, respectively. This marks the first report to link specific cytoskeletal remodeling events to Arf6 signaling in platelets.

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I graduated in May, 2008, with a Bachelor of Arts degree in psychology. This chapter is part of a larger thesis for the Gaines Fellowship in the Humanities. While an undergraduate student, I was involved within the Gaines Fellowship Program and the Honors Program. This work was presented as part of a panel at the 2008 Southwest Texas Popular Culture and American Culture Associations conference in Albuquerque, New Mexico, and as the 2008 Breathitt Lecture in the Humanities at the University

of Kentucky. While at the University of Kentucky, I was actively involved in research in several different areas. Working with my thesis committee, the interim director of the Gaines Center, and my psychology research mentor, I attempted to research and put forth information that is relevant to today's society but is not actively explored by members of academia. My experience with this Gaines thesis resembles what I believe to be the thesis process for Master's degree students; it was by far one of the most rigorous yet intellectually stimulating efforts I have completed in my undergraduate tenure. In the fall, I will begin a doctoral program in social psychology at Indiana University. The psychological issues that I discuss within this submission are issues that I will continue to explore in my research within the area of stereotyping and prejudice. I am interested in gaining a better understanding of the processes that we undergo in order to categorize other people and ourselves and the emotional and cognitive effects (i.e., increase or preservation of self esteem) of these categorizations.

#### Faculty Mentors:

**Dr. Ron Pen, Professor, School of Music**

**Dr. Lisa Broome-Price, Acting Director, The Gaines Center**

Katie Bruan has her finger firmly pressed on the pulse of the United States during the opening years of the twenty-first century. Observing attentively, she discerned that the juggernaut television "reality" show, *American Idol*, is a manifestation of our human condition revealed in the tripartite interactive relationship of contestants, judges, and audience. Katie documented the way that *Idol* reflects our aspirations and disappointments, our delusions and triumphs; and then she demonstrated the way in which we negotiate these sentiments through public reinforcement and humiliation. In particular, it is the public humiliation of the contestants that serves to validate our own personal self-worth and darkly feeds our *shadenfreude*, even while posing as wholesome, popular entertainment. I am delighted to see Ms. Braun's Gaines thesis transformed into this article for publication in *Kaleidoscope*. Her keen observation, articulate analysis, and engaging narrative postulated a cogent rationale for *American Idol*'s remarkable popular reception and tenure. She is clearly "steak" in a world of "hamburger."



## "In a Competition Full of Hamburgers, You're a Steak:" American Idol and the Role of Reality Television in the Maintenance of our Egos

### Abstract

Over the past decade, reality shows have ascended to the top of the Nielsen rating charts and have assumed a dominance that is difficult to cast aside. One such reality show, *American Idol* has grown in popularity over its last six seasons. This chapter discusses one of the main arguments of a larger honors thesis that examines the underlying motives that keep American viewers watching. As a cultural commodity, *American Idol* can be viewed as a product of American values and holds a societal purpose for its viewers. Therefore, the arguments within this chapter propose that the great popularity enjoyed by *American Idol* is due to its ability to psychologically involve its viewers. More specifically, the psychological purposes of this show may lead to the amplified depiction of the humiliation of performing candidates. Current research within the field of media psychology suggests that the motives for viewing reality television can be explained by the uses and gratifications perspective, which includes the concept of social comparison, and by other more sociological means. The ability of social comparison to provide viewers the opportunity to protect and amplify their self-esteem is discussed. The potentially intensified emphasis on humiliation will be demonstrated through the aforementioned motives, due to their abilities to urge viewers to protect or increase their self-esteem.



## Analysis

“You have invented a new form of torture,” “Shave off your beard and wear a dress. You would be a great female impersonator,” and “If your lifeguard duties were as good as your singing, a lot of people would be drowning” are a sampling of the brutal, and often quite accurate, comments that *American Idol* contestants and viewers have grown accustomed to hearing from one of the judges of the show, Simon Cowell, over the past six seasons. The seventh installment of the show opened earlier this year, as promised, with more outrageous and horrendous auditions by contestants with little singing ability; a majority of these contestants arrogantly asserted that they were the next *American Idol* and usually performed with the apparently sincere belief that they could sing well.

As in previous seasons, a large television audience, about 33 million people, tuned in for the first several episodes of the seventh season ready to view horrible auditions and to be a witness to the honest criticism and evaluation given to contestants ([www.nielsenmedia.com](http://www.nielsenmedia.com)). Although contestants and viewers have become more acquainted with the personalities and judging styles of the three judges with each passing season, they are still shocked by the blunt, and sometimes controversial, comments made by the judges. Over the past two seasons, these biting, personal critiques appear to be an intentionally, intensified focus of the show, thereby suggesting that humiliation may operate as part of the show's popularity.

*American Idol* has been successful in many ways that other reality television shows have not. Not only has the show continued to dominate in its time slot no matter which day and time it is scheduled, the show has successfully launched the singing careers of its contestants and spawned 34 versions in other countries ([www.americanidol.com](http://www.americanidol.com)). Undoubtedly, there are many aspects of *American Idol* that make it a satisfying, entertaining show to watch. As viewers, we are shown the interactions between the judges and the behind-the-scenes preparations, and we are given the opportunity to vote for our favorite contestants. We wait for the few performances that are so sublime that we are drawn to tears or are so awful that we try to contain our laughter. It is a fantastically successful formula, one that has many of us devoting two or three nights of each week to it.

By offering viewers the opportunity to witness the entire audition process, *American Idol* presents a novel format to its viewers and advertizes itself as a true look into the music industry. The process begins at massive open auditions, where thousands of contestants arrive days in advance in order to camp out in the extensive audition line. Due to the large numbers, many of the contestants do not make it to the final three-judge panel,

which includes Paula Abdul, Randy Jackson, and the notorious Simon Cowell. The show's producers choose who will get the chance to perform in front of the celebrity trio (Cowell, 86). Undoubtedly, the producers deliberately push forward the craziest and worst performers while passing over the somewhat talented contestants. Why? With each progressing season, the number of viewers who watch the opening episodes and those who watch the season finale grow closer ([www.nielsenmedia.com](http://www.nielsenmedia.com)). The beginning stage of the audition process, in which the worst performances and the harshest comments are given, has become almost as popular to watch as the crowning of the contest's new star.

*American Idol's* depiction of the audition process is not always popular. After criticisms that are deemed to be unjustifiably cruel, viewers and the media community denounce this element of the show, as if the show, in their judgment, has crossed the fine line between what is entertainment and humiliation to them. A recent example includes one of season six's opening auditions in which Simon Cowell made ridiculing comments about one contestant who appeared, and was later confirmed, to have a developmental disorder. Kenneth Briggs was stopped quickly into his audition and told that he couldn't sing. Cowell deepened the blow by comparing Briggs' face to that of a bush baby (Kelleher and Alexander, 1).

The day after the aforementioned controversial audition, *American Idol's* audition process was fiercely debated. Although the judges responded that their comments were not meant to be insensitive, personal attacks, the long-standing discussion about the negative aspects of reality programming re-emerged. For those who refuse to watch reality television, their boycott received greater credibility, and more people, including Larry King, became attracted to their cause. Humiliation was charged as the driving force behind the show. Interestingly, critics claimed that the humiliation does not end in the first round of the auditions but is present throughout the whole process. Although the process of revealing which of the finalists will be sent home each week is purposefully prolonged and ends with the contestant's repeat rendition of the song that has sent him/her packing, audiences do not react to this subtle form of humiliation as they did when Simon called someone a bush baby. Has *American Idol* truly gone too far? Or have we, as viewers, finally realized that the elements that draw us to our favorite shows are not so innocuous? In order to satisfactorily answer these questions, we must first understand how reality television emerged as a dominant, stand-alone genre.

Television programming is sensitive to changes within its interdependent relationship with the American viewing populace; the entertainment industry

changes when there are dramatic shifts in audiences' viewing preferences or drastic changes in the world that television attempts to mirror. Therefore, when the first "reality programs" hit prime-time television, the emergence of reality television as a genre appeared inevitable. Reality television, as the genre exists today, first appeared as the MTV hit series *The Real World* in 1992. By filming, for an extended amount of time, ordinary people in a novel environment with a group of diverse strangers, the producers Bunim and Murray were able to capture the pulse of a changing preference in television programming.

Unlike earlier examples of reality television, such as *Candid Camera* and *Cops*, *The Real World* offered a complete narrative for viewers and a greater opportunity for viewer involvement (Baker, 58). *Candid Camera* and *Cops* both offered a real sequence of events, but the shows did not provide the viewers with the information necessary to become psychologically close to the portrayed individuals. Viewers did not know who the people were, what they were thinking, and why they acted the way they did by the end of the program. The desire for the real has been satiated, but the longing for intimacy and inclusion were left unfulfilled by these examples of montage-like reality programming (Friedman, 273-275).

After the success of *The Real World*, major networks began investing time and money in exploring the new possibilities within reality programming. The major networks were at first anxious about devoting much of their efforts to reality programming because the use of ordinary people as characters was viewed as a risky business venture. Additionally, contemporary reality shows, such as *Cops* and *America's Funniest Home Videos*, were low budget productions that showcased video footage from family home videos, wild police chases, and vicious animal attacks. These shows were not appointment viewing shows; instead, viewers chose them by default after checking the shows available on other channels. Nonetheless, the success of *The Real World* in reaching out to the elusive, young adult audience persuaded the major networks of NBC, ABC, CBS, and FOX to try their luck at reality television.

In the early years of the twenty-first century, *Survivor*, *Big Brother*, *The Apprentice*, and *American Idol* made their entry onto the small screen. Across networks, producers and writers attempted to duplicate the success of these shows with their own versions, but the producers soon found that the original series held the greatest success. Because reality shows require smaller production costs and could penetrate different demographic areas of the viewing public, the networks were willing to throw out ideas without completely contemplating the shows' potential impact or problems. In 1999, only

four percent of prime-time shows were reality programs. By the 2003-2004 season, thirteen percent of prime-time shows were reality programs; twenty-one shows were on the six major networks alone (Andrejevic, 20).

Through reality television's dominance in the Nielsen ratings, its popularity is apparent, but less is known about the pleasure and enjoyment received by viewers, which motivate them to continue watching. Although there is not a large base of existing research on this topic, several early findings offer insight into the motives that draw us to subject our ears to horrible singers. Reiss and Wiltz offer the sensitivity theory as a possible means to understand the motives that draw us to watch. Sensitivity theory asserts that there are sixteen basic desires that motivate our behaviors. We are pushed to satisfy the basic motives that are most relevant to each of us by paying attention to the things that can lead to the satisfaction of the motives we value most. We act on these motives to experience the corresponding joy. For example, we may be motivated to physically exercise in order to feel the joy of vitality, or to seek or maintain a certain level of status in order to feel the joy of self-importance (Reiss and Wiltz, 363-366).

Reiss and Wiltz state that these motivations can be experienced through vicarious experience. Although the joys that result are subdued in intensity and short-lived, vicarious experience is still a useful way in which we are able to satisfy our basic motivations. Television emerges as a perfect medium for this process because it allows viewers to conveniently experience the sixteen joys repeatedly without having to expend more than minimal effort. Additionally, they found that "status is the main motivational force that drives interest in reality television" (373). This finding is not too surprising considering that a big draw to reality television is the fact that the characters are average people like the viewers who watch. When motivated by status, viewers can therefore receive the gratification of self-importance by perceiving that they hold a status similar to the ordinary people on the show; we may even fantasize that we can gain celebrity status like them. When the viewers perceive themselves as being of higher status than the ordinary person portrayed, viewers may feel an increased level of self-importance, especially so if the ordinary person is described as holding a lower-status occupation such as a pizza deliveryman.

Although the sensitivity theory may pinpoint specific motives that are at work within reality shows, the theory does not suggest what specific elements of reality programming allow for the complex gratifications we receive. Nabi et al (2006) have expanded the understanding of the psychological needs that reality television fulfills through the uses and gratifications perspective. This theory holds that a wide range of gratifications

exist for viewers. This perspective contends that we are aware, at some level, of our own needs and that we try to find media forms that will provide the gratifications we seek.

Specifically, concerning talent or competition reality programs, Nabi et al. found that these shows promoted the "judging others" gratification, and talent programs additionally supported parasocial relationships. We would expect shows that choose an eventual winner, especially those who have talent as the judging criterion, to satisfy the desire to judge others. In addition, talent shows can expectedly induce viewers to pick a favorite contestant with whom they will identify and form a relationship despite never having met or spoken with him or her. Although these programs did not show an effect specifically for comparisons made between the viewer and the shows' characters, this subgenre of reality television offers the gratification of judging others, a prerequisite for a social comparison to occur. Therefore, it is possible that, as viewers, we are comparing ourselves to reality television characters in order to maintain or evaluate our egos, without our full awareness.

Within the area of social psychology, there is an extensive literature concerning social comparisons. These judgments we make on a daily basis may appear to be trivial, but research has shown that they are a major factor in shaping our self-concepts. For example, how do you know if you are a good singer? You listen to recordings of your own singing, and you compare your singing with people who are of the same perceived age and ability as you. From a social comparison perspective, *American Idol* can provide this kind of social comparison that may enhance a person's self-evaluation or ego. This perspective assumes that we prefer a positive, self-evaluation and that we will seek the comparisons in a way that flatters the self (Tesser, 446). Although it is a statistical impossibility for each of us to be above average, we like to believe we are. We achieve the creation and maintenance of this self-concept through two prominent processes: reflection and comparison. The determination of which process we use is based upon three variables: the closeness of the other person we are comparing ourselves to, the outcome of the task, and the relevance of the task for us when making our self-evaluation (Tesser, 446-448).

During the first rounds of the show, all three variables involved in making social comparisons exist. The contestants are perceived to be psychologically close to us because good, mediocre, and poor singers are all showcased. All of the contestants want to become music stars, so they share the relevance for the task of obtaining a greater level of personal status that most of us share. Lastly, the judges decide whether or not each

contestant will continue on in the competition based upon his/her performance and perceived talent. When a contestant's audition is horrendous, our self-evaluation is maintained and even possibly enhanced. For example, you may know that you are an okay singer, but after a couple of bad auditions on *American Idol*, you may begin to see yourself as having greater talent than previously believed, when compared to the average singer. The beauty within *American Idol* is that, unless you have competed on the show, your own talent is not publicly compared against the contestants. Therefore, you may be the worst singer in the world, but by watching *American Idol*, you perceive your singing ability to be better than those who are rejected. In these instances when our positive self-evaluations hold, we feel positive emotions such as happiness and pride.

Conversely, when a contestant does amazingly well in his/her first audition, our self-evaluation may be challenged. As with the progressing rounds of the competition, one would expect the best of the group to continue on to the final round. How can the continued viewership be explained once the opening episodes are over and the bad singers are dismissed from the competition? Although the opening rounds of auditions solicit greater viewership than the rounds between the beginning of the selection process and the season finale, *American Idol* continues to top the Nielsen ratings throughout the whole season ([www.nielsenmedia.com](http://www.nielsenmedia.com)). Therefore, viewers must have found a way to reconcile the acceptance that some average people have greater talent than they with their positive self-evaluations.

When others perform better than we do, we may distance ourselves from the contestants in one of two ways. When we perceive that a contestant is better than we are, we can decrease our identification with that contestant, possibly switching allegiances to another contestant who may not be as vocally strong. This possibility can explain how several of the contestants, who experience an early departure from the show, have the most successful careers in the music industry. We may distance ourselves from the contestants who are too good and become closer to contestants who have faults and appear more like us in order to maintain our positive self-evaluations. The most likely strategy is for us to decrease the relevance of the competition by considering the show to be only a singing competition and not one to establish a higher level of status.

With this possibility, we can still remain close with our favorite contestants by utilizing reflection processes instead of comparison processes. If our favorite contestants perform well, we can now reflect in their success without the distress of feeling inferior to them. In fact, we may even intensify our allegiances by viewing a success for them as a success for both us and them. Cialdini



(2001), a social psychologist, describes this particular process as BIRGing, basking in the reflected glory of others. Viewers could act much like the participants in his studies; individuals show open support for those they reflect with after victories by using language such as “we won.” If the reflected others lose or fail, individuals are more likely to describe the loss as a loss for “them” (Cialdini, 168).

Although *American Idol* may provide opportunities for both reflection and comparison, the show features mostly the comparison processes through large and small examples of humiliation. Comparing better with others not only boosts our egos, but it also may add to the enjoyment of the show. The producers have found that the structure of the show provides a double opportunity for us to feel good about ourselves. When others who are like us do not do well, we can feel good. When others with whom we reflect do well, we also feel good. In the attempt to maximize the pleasure of ego inflation, producers have walked the fine line between entertainment and humiliation by allowing the humiliation of contestants who are arrogant and appear deserving of such feedback.

Even a habitual viewer of *American Idol* may find that it is sometimes difficult to hold off cracking a smile or laughing out loud when observing the horrible auditions that characterize the opening episodes. For many of us, there is at least one contestant toward whom we knowingly feel happiness when he or she fails. These common experiences allude to the presence of the social emotion of *schadenfreude*, the feeling of pleasure experienced upon someone else’s misfortune or failure. Psychologists have isolated two factors that help in the determination of the expression of *schadenfreude*. If the person deserves the misfortune and is perceived to be similar to us, *schadenfreude* is likely to emerge (Feather and Sherman, 2002; Van Dijk et al., 2005). Deservingness is established when the individual foresees the potential misfortune but does not act to stop its occurrence or arrogantly dismisses the possibility of failure. With this knowledge, we can understand how *American Idol* provides us the opportunity to feel *schadenfreude*. Although this emotion is considered to be a socially undesirable feeling to openly express, we can feel free to be happy when an extremely arrogant contestant declares to the judges and the audience that he or she will be the next *American Idol* and then performs dreadfully; the sense of comeuppance is an intense sentiment to experience.

Viewers of *American Idol* can potentially feel *schadenfreude* when humble contestants fail, but the expression of *schadenfreude* will most likely be reduced in intensity. This may occur when viewers have their own similar outcomes upon which they can draw. If a

viewer has received negative criticism pertaining to his or her singing ability or to his or her overall ability to be successful, the viewer may be more likely to feel a degree of *schadenfreude*, even if the contestant is perceived as humble and undeserving of the failure. It is tempting to assert then that a part of us enjoys watching others fail, but we should be reminded of the backlash from the “bush baby” audition.

When the audition aired, members of the media were not the only group upset; viewers were outraged too. Part of the viewers’ response may be dictated by social norms because individuals attempt to conform to what is accepted behavior and fear being personally implicated in any action that breaks a social norm, such as humiliating an undeserving individual (Asch, 277; Chekroun and Brauer, 863). Although overt humiliation has a long history of acceptance, the society of the twenty-first century considers humiliating someone as an action that goes against social norms; the only apparent exception is when the humiliation is exacted as part of the punishment for some criminal act (Baumeister, 17-18). This argument cannot be the sole influence for the distress and uncomfortable feelings that viewers feel when a contestant on *American Idol* is humiliated. Viewers are upset on more levels than this social one. Individually, they recognize that pleasure is exchanged for pity and sympathy extended toward the contestants. Therefore, failing may not be as entertaining as first thought, unless deserving and arrogant contestants, who are not easily pitied, are the contestants involved.

Although our present society exhibits a highly individualistic, and often competitive, nature, we rely upon interpersonal relationships to gain a sense of where we stand among our peers not just in regard to talent but to acceptable behavior. In this globalized world, we are more aware of the behaviors and beliefs of others. Most instances of humiliation do not occur in private, therefore there are witnesses “who observe what happens and agree that it is disparagement” (Klein, 113). We, as witnesses, are in the position to determine, even if by gut feeling, the boundary between what is entertainment and what is humiliation. We should be reminded that the entertainment industry is dependent upon us to watch. Therefore, shows that we choose not to watch will likely be cancelled, and producers will have to find new or resurrect old elements to keep viewers watching.

There have been fewer reality television programs on the major networks in the past couple of years with the exception of the months following the recent writers’ strike (Friedman, 28). Although the decrease can be attributed to viewers’ potential boredom with this genre of television, it is possible that viewers have established a mental rubric, which can assist in determining the shows that have gone too far. *Superstars USA*, a talent

show that borrowed *American Idol's* format, attempted to find America's worst singer but left the contestants completely unaware of their purpose. When the media became aware of the great lengths to which the show tried to disguise this purpose, going as far as telling the audience that the contestants were terminally ill and to perform on stage was their life-long dream, the show was boycotted by the small numbers who were watching, and later cancelled. As the reality television boom was begun by viewers like us, the evolution of shows like *American Idol* into a tool for humiliation can be stopped by us when we stop watching.

To view videos that exemplify some of the points made in this article, go to: [www.youtube.com](http://www.youtube.com) Keywords: "Kenneth Briggs American Idol 6," "Simon Cowell Insults at His Best Part I and Part II," "The Worst American Idol Auditions Ever," "Kristy Lee Cook 'Forever' Elimination American Idol Season 7," "WB's Superstar USA Mario Rodgers vs. Jamie Duet Finally"

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I am a senior graduating Magna Cum Laude with a B.S. in Nursing. I am an Honors Student and a member of Sigma Theta Tau International Honor Society for Nursing and The National Society of Collegiate Scholars. During my undergraduate education, I received the University of Kentucky's Presidential Scholarship, the Pamela Riggs Peter Scholarship, and the Gorman Foundation Scholarship. In addition, I have been on the Dean's list for five semesters. After

graduation, I plan to work as a pediatric or neonatal intensive care nurse. I intend to pursue further graduate education in the fall of 2009.

As an undergraduate student, I became involved in the College of Nursing Research Intern Program. It was through this opportunity that I joined Dr. Patricia Burkhart's child asthma research team. Over the past five semesters, I have worked with Dr. Burkhart on many aspects of the research process and learned valuable information. During my internship, I developed a research poster, entitled *Factors Related to Quality of Life for U.S. and Icelandic Adolescents with Asthma*, that I presented at multiple conferences. Recently, I gave my first podium presentations on this literature review at the College of Nursing's Student Scholarship Showcase and at the University of Kentucky's Showcase of Undergraduate Scholars. This literature review is the culmination of my work as a research intern.

## Social Disruption and Physical Limitation Related to Quality of Life of Adolescents with Asthma

### Abstract

During adolescence, teenagers experience many physical, emotional, and social changes. Teenagers with chronic conditions, however, may face challenges in normal adolescent development because their illness can impact body image, independence, and peer socialization. Little is known about the effect of asthma on adolescent quality of life (QOL). In this paper, I review the existing literature on social disruption and physical limitations related to asthma and the subsequent impact on adolescent asthma QOL. In addition, adolescent issues leading to poor control of asthma symptoms and interventions to improve asthma QOL for adolescents are addressed.



### Faculty Mentor:

**Dr. Patricia Burkhart, Director of the Undergraduate Nursing Program and Associate Professor  
College of Nursing, University of Kentucky**

One aspect of my program of research focuses on how asthma affects quality of life for adolescents living with this chronic condition. Jennifer Baumgardner joined my child asthma research team five semesters ago as an undergraduate research intern. She has been actively involved in the development and implementation of our research projects, including an exploratory study entitled "Factors Related to Quality of Life for U.S. and Icelandic Adolescents with Asthma." Results of that study suggested that adolescents with a diagnosis of asthma experience social disruption, physical limitation, and depressive symptoms. Ms. Baumgardner wrote the current paper to summarize the literature regarding social and physical aspects of asthma quality of life supporting our research findings. I feel that this paper is quality work for an undergraduate student, and it is my pleasure to endorse its publication in *Kaleidoscope*.

## Introduction

Currently in the United States, asthma is the leading chronic childhood disease and a major cause of childhood disability (Akinbami, 2006). Children and adults with asthma suffer from wheezing, breathlessness, chest tightness, and nighttime or early morning coughing. Approximately nine million U.S. children under the age of 18 (14%) have been diagnosed with asthma (CDC, 2007). Review of the current prevalence data shows that asthma occurrence increases with age, yet health care use for this chronic disease is the highest among the youngest children (Akinbami, 2006). This disparity might stem from issues with emerging autonomy as children move into adolescence. Mortality rates have risen in the adolescent asthma population, a number much higher than the declining rate of asthma deaths in young children (Akinbami, 2006).

With chronic diseases such as asthma that not only impact a person's livelihood but threaten it, quality of life must be taken into account. Quality of life (QOL) is defined as a multidimensional assessment of an individual's current life circumstances encompassing physical, psychological, social, and spiritual dimensions (Haas, 1999). Nursing, a holistic based profession, must become more aware of issues facing those with chronic illness and the impact the illness has on QOL, especially in adolescents. Implications for the nursing profession include examining not only the medical consequences of the disease, but also the psychosocial disruption and physical limitations and the underlying cause of these factors. CINAHL and Medline were used to search for asthma QOL literature between 2003 – 2008, with keywords including: quality of life, social disruption, physical limitation, adolescence, teen, and asthma. The purpose of this paper is to examine the current literature of the physical and social dimensions of adolescent asthma QOL and to apply these findings to nursing care through the implementation of appropriate interventions.

## Social Dimension of Asthma QOL

The social dimension of QOL in adolescents with asthma is extremely important. The influential psychoanalyst, Eric Erikson, describes the achievement of identity as one of the main psychosocial tasks of the adolescent years. Erikson (1968) states that adolescent interactions with others allow for the creation of their adult identity. Striving to fit in during puberty, a time when significant changes in both body and mind are occurring, can be quite challenging. Teenagers with chronic conditions, such as asthma, may face challenges to normal adolescent development because their illness can impact body image, independence, and peer socialization.

Perceptions of the physical and social impact of various chronic illnesses were assessed in adolescents (Wirrell et al., 2006). Of the adolescents ( $N = 149$ ) surveyed in this study, 63% ( $n = 24$ ) of the 38 adolescents with asthma and 58% ( $n = 64$ ) of the 111 adolescents without asthma rated their peers with asthma as experiencing restriction of activities, yet they did not feel that this affected their social functioning. In addition, asthma was not correlated with other areas of social impact of chronic disease including popularity. Adolescents report that "chronic diseases that are 'purely physical' appear to have less impact on social functioning than those associated with mental and/or emotional handicaps" (p.158). Because asthma affects the lungs of the adolescent and not necessarily the appearance, adolescents are able to feel a part of the peer group — a common theme of 'fitting in.'

Ayala et al. (2006) conducted interviews with adolescents diagnosed with asthma ( $N = 28$ ) in the school setting, identifying their feelings about asthma in relation to intrapersonal, interpersonal, and societal factors. The findings of this study suggested that asthma does affect adolescents socially, in relation to their personal control and severity of their asthma. Those with better asthma symptom control (or not severely affected) were thought of more positively by their peers. A section of the interview allowed for the adolescent participants to describe, from their own experiences and the perception of others' experiences, what it meant to have either good or poor asthma symptom control. Words used to describe individuals with poor symptom control included: not happy, freaky, not smart, cannot participate, teased by friends, and loner. Words that were used to describe adolescents with good symptom control included: happy, normal, regular kid, popular, and has cool friends. These labels clearly demonstrate the connection between adolescents severely affected by asthma and the associated social isolation.

## Physical Dimension of Asthma QOL

The physical dimension of QOL in adolescents with asthma is also very important. Because asthma affects the lungs of those diagnosed with the condition, physical limitations are likely. Asthma is perceived by adolescents, both with and without asthma, to cause significant physical disability ( $p < .001$ ) and restrict activities ( $p < .0005$ ) (Wirrell et al., 2006). This disability can impact the adolescents negatively because they may struggle with participation in activities that they enjoy, isolating them from their peers. Adolescent athletes with asthma ( $N = 32$ ) who became *dyspnic* during exercise reported a lower QOL ( $p < .02$ ) in relation to general well being and lower physical functioning ( $p = .02$ ) (Hallstrand et al., 2003). These results suggest that adolescents



engaging in activities that required a higher amount of physical activity had a lower QOL when they became short of breath.

## Impact on Quality of Life

One key question that arises when asthma QOL is discussed is the level of control adolescents have over their disease. Control over the severity of symptoms can be intertwined with many factors related to asthma quality of life. For example, those with mild cases of asthma or those who have good control of their asthma symptoms are not affected by the breathlessness and other manifestations of asthma. Those with severe asthma or a poorer control of symptoms are more affected physically by asthma and, thus, the condition will have a greater impact on their everyday lives.

As previously mentioned, when adolescents are exhibiting asthma symptoms they often become socially isolated. It is during times of wheezing and breathlessness that these individuals are being characterized as a “loner” or “freaky” (Ayala et al., 2006, p. 211). In addition, when physical limitations are discussed, adolescents with asthma who experienced dyspnea were found to have a decrease in physical functioning, impacting their QOL (Hallstrand et al., 2003). It seems that the main problem surfacing is the underlying theme of control. If adolescents have better control of their asthma, would they suffer a decrease in their quality of life? What can health care professionals do to increase patients’ asthma QOL?

## Implications for Nursing Practice and Research

Before nursing interventions can be developed, the reason for poor control of asthma symptoms must be identified. Many times, adolescents with poor control fall into one of two categories: non-adherence to a recommended asthma treatment plan or ineffective treatment. If the adolescent is struggling with poor control of asthmatic symptoms while maintaining adherence to the treatment plan and all medications, the health care provider should be notified and the treatment plan re-evaluated. In this paper, however, non-adherence to recommended asthma treatment plans will be the focus of the nursing implications.

Several reasons for poor adherence to asthma management by adolescents have been identified. One explanation is the misconception that as adolescents age, they outgrow their disease. During interviews conducted by Ayala et al. (2006), 59% of the adolescents with asthma ( $N = 28$ ) reported that management behaviors were not needed because they had outgrown their asthma or it was not severe enough to warrant attention. One adolescent said “You only think about it when it you are having problems” (Ayala et al., 2006, p. 212). All

adolescents in this study felt that “managing asthma was time consuming and annoying” (p. 210). A burdensome treatment regimen that interferes with the adolescent’s daily activities can also lead to decreased adherence.

Poor symptom control can result when adolescents have a misunderstanding of the role of their asthma medications. Boulet (1998) found that adolescents and adults with asthma have an increased fear of inhaled corticosteroids believing that these drugs “could cause weight gain, build huge muscles, cause infections, make bones susceptible to fractures, or affect growth” (p. 589). Of the participants included in this study ( $N = 600$ ), 59% ( $n = 354$ ) indicated they were very or somewhat concerned about using inhaled corticosteroids because of the perceived negative side effects.

Health care providers can impact adolescent QOL and increase awareness of the illness with reinforcement of appropriate management skills that often wane in patients who have faced chronic illness. Patients with a chronic condition who are undergoing normal physiological changes (i.e., puberty) become aware of the changing impact of their illness. It is the responsibility of the nursing community, especially nurses who commonly encounter adolescents with asthma, to review and reinforce asthma education at each health care visit. Critical asthma information includes asthma medication administration, asthma triggers, and what to do during an exacerbation of symptoms. The school nurse is in an ideal position to intervene. In a study of 1094 middle school students, 374 received a case management intervention by a school nurse during year one and 720 did not. Of those who received the intervention, 60.7% ( $n = 227$ ) were more likely to bring their medications to school and monitor their asthma symptoms the following year compared to the 34.3% ( $n = 247$ ) who did not receive the intervention (Taras et al., 2004). This finding suggests that interventions by school nurses may be a plausible solution to increasing awareness of self-management of asthma.

In addition, nurses working with primary care providers should also facilitate conversations about asthma issues and asthma self-management. The literature suggests that nurses need to avoid making value judgments and an authoritative approach that can cause a breakdown in trust with the adolescent (Benedictis and Bush, 2007). Open communication among the health care provider, parents, and adolescent will increase future asthma self-management adherence by the adolescent (Benedictis and Bush, 2007).

Making interventions appealing to youth and presenting asthma management in a positive light emerged from adolescent interviews (Ayala et al., 2006). This is important feedback for nurses who work with adolescents with asthma. Many of the adolescents interviewed

mentioned the importance of personalization of interventions. Tailoring materials based on images representing diverse groups of people, as well as featuring celebrities coping with asthma were viewed as effective in encouraging adolescents to continue with daily asthma self-management. The importance of creating strategies to remind the adolescents to take their medication and cue other management behaviors was also identified. These methods included the use of traditional alarm clocks and cell phones. Finally, adolescents reported that rewards for successful management were crucial in achieving change. Examples of rewards included positive feedback from clinicians, helpful asthma devices, as well as candy and prizes (Ayala et al., 2006).

### Future Goals

Unfortunately, not much progress has been made in the advancement of knowledge of the affects of asthma quality of life in adolescents. One of the recommendations for future nursing research is testing specific asthma self-management strategies for adolescents that increase symptom control resulting in an improved asthma QOL. An asthma action plan detailing solutions to address issues causing the adolescent's poor control of asthma symptoms should be created.

The effectiveness of peer support groups for adolescents with asthma should be explored. Creating opportunities for open communication between peers with the same chronic illness can help address feelings of isolation while generating additional social networks.

Finally, those individuals who are close to these adolescents, such as parents and teachers, should be informed of the potential complications that the individual with asthma can face during their teenage years. Increased awareness and knowledge of effective symptom control by supportive adults will assist the adolescent with asthma self-management.

Asthma is a serious chronic illness affecting age groups differently. Adolescence is a time of transition from childhood to adulthood and chronic illness will begin to impact teens differently. Adolescents can be affected both socially and physically if their asthma is not managed appropriately. Nurses and other health care professionals have the opportunity to impact patients' lives through open communication and teaching to improve symptom control that may improve QOL, allowing these individuals to lead healthier and happier lives.

### Acknowledgements

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I am a third-year Undergraduate at the University of Kentucky, with a major in Art History and Pre-Medical career focus. I am an Honors student and winner of the Oswald Research and Creativity Award in the category of Critical Research in the Humanities, with my paper entitled “The Perfect Machine: The Reason behind the Anatomical Studies of Leonardo da Vinci.” Together with the thought-provoking lectures given by my first Art History professor, Dr. Ben Withers, my lifelong

love of art, history, and literature led me to choose an Art History major. I devote my time away from studies to volunteering at Kentucky Children’s Hospital with the organization Kreative Catz. I hope to attend Medical School after graduating from UK in 2009, and then to realize my dream of becoming a physician. In my paper, “The Perfect Machine: The Reason behind the Anatomical Studies of Leonardo da Vinci,” I combine my two greatest interests: Renaissance art and human anatomy. I presented “The Perfect Machine” at the UK Undergraduate Art History Research Symposium in December, 2007, and again at the Kentucky Honors Roundtable in March, 2008. I was guided in my efforts by Dr. Anna Brzyski, professor of Art History at UK, who taught me the key to meaningful research: “Ask more questions than can possibly be answered, then attempt to answer them all.”

#### Faculty Mentor: Dr. Anna Brzyski, Department of Art

Few artists have attracted as much popular and scholarly attention as Leonardo da Vinci. In an age when specialization has become the norm, the breadth of Leonardo’s interests and contributions have justly earned him a reputation as the paradigmatic Renaissance man. Nonetheless, he is mainly remembered today as a brilliant artist — the painter of *Mona Lisa*, *The Last Supper*, and other remarkable works. Amanda Cothern’s insightful essay reminds us, however, that our tendency to see Leonardo primarily as an artist has significant implications for how we interpret key parts of his oeuvre. This reminder is particularly true of the numerous drawings of the human body found in Leonardo’s notebooks, which the scholars have tended to see in relation to his artistic practice. Noting Leonardo’s consistent engagement with what would be called today “scientific research,” the precision of his recorded observations, and the artist’s apparent interest not just in the appearance, but also in the physiology of the human body, Amanda presents a convincing argument that Leonardo’s extraordinary anatomical drawings should be viewed primarily as scientific and engineering studies rather than preparatory drawings for his paintings.



## The Perfect Machine: The Reason behind the Anatomical Studies of Leonardo da Vinci

### Abstract

The legacy of Leonardo da Vinci is most often characterized by the works of his brush — however, there is more to Leonardo than what meets the art lover’s eye. His notebooks overflow with scientific studies, the most amazing of which are his detailed drawings of human anatomy. Scholars have long assumed that Leonardo dissected corpses in order to better represent the human form in his painting. In this paper, I counter that assumption, making the following points:

- I. Leonardo’s anatomical findings did not significantly influence his painting.
- II. Leonardo was an accomplished scientist and engineer.
- III. Leonardo applied his knowledge of physics to human anatomy — in the same way that he applied it to his mechanical inventions.
- IV. Leonardo was a scientist/engineer studying nature’s perfect machine, not a painter studying the human form.
- V. Leonardo da Vinci cannot be defined as having been primarily a painter, therefore, his studies of anatomy cannot be defined as mere extensions of his art.

I will highlight the multi-faceted mind of Leonardo da Vinci, and demonstrate that his detailed dissections and application of the laws of physics to human physiology would have been unnecessary had he considered himself a career artist.



## Introduction

*“Oh Speculator of this machine of ours, you shall not be distressed that you give knowledge of it through another’s death; but rejoice that our Creator has his intellect fixed on such excellence of instrument.”*

– Leonardo da Vinci

The legacy of Leonardo da Vinci is most often characterized by the works of his brush — such aesthetic treasures as *The Last Supper*, the *Mona Lisa*, and *The Madonna of the Rocks*, to name a few. Though it is the international renown and mystery surrounding his *paintings* that has immortalized Leonardo, it is no secret that he was more than just a painter. The so-called “Renaissance Man” also wore the hats of architect, musician, naturalist, philosopher, physicist, mathematician, and engineer in his lifetime (Bhattacharya and Cathrine). At the time of his death in 1519, he had filled more than 5,000 pages with his studies of physics, geometry, anatomy, and numerous other subjects (MacCurdy). Leonardo had a passion for learning in many different disciplines, the intensity of which was unusual even in the knowledge-hungry atmosphere of Renaissance Italy.

Some of Leonardo’s most significant contributions to modern academia were his studies of human anatomy. He filled notebooks with carefully drawn two-dimensional representations of the organs, tissues, and skeletal formations uncovered during his dissections. He made glass casts of the internal structure of the heart’s pulmonary artery, and attempted to uncover the mechanics of its function (O’Neill and Cone). He drew amazingly accurate cross sections of the human skull — so accurate, in fact, that the drawings are still used in some lectures to medical students today (Fig. 1).

Because of the frequency of human subjects in Renaissance painting, scholars have long assumed that Leonardo’s motivation for performing his studies of anatomy was directly related to his painting. (For example, the writings of Edward MacCurdy, E.H. Gombrich, and several authors outside the Art Historical community either stated or strongly suggested that Leonardo conducted his anatomical studies to improve his artistic rendering of the human figure.) Edward MacCurdy, in his acclaimed translation of Leonardo’s notebooks, states, “[modern research] has made manifest how [Leonardo] studied the structure of the human frame...in order the better to paint and make statues...” (MacCurdy 26). He is not alone in this assumption. Though his work was published in the early 1900s, MacCurdy’s notion that Leonardo approached his anatomical studies with a mind to improve his painting is prevalent to this day among the general public as well as most art historians.



Figure 1. Study of the Human Skull c. 1489

At the time of Leonardo, it was becoming common for painters to dissect human corpses in order to improve their depictions of the human body. It is documented that Donatello, Michelangelo, and even Verrocchio, Leonardo’s own painting master, performed human dissections (Xie and O’Leary 899-900). However, the extent to which Leonardo’s studies were taken exceeds any before them, even those conducted by physicians of the day (Fig. 2).

Their complexities would not be matched until the publication of Andreas Vesalius’ anatomical survey *De Humani Corporis Fabrica*, twenty-four years after Leonardo’s





**Figure 2** Study of an Infant in the Womb c. 1513

death (O'Neill and Cone). If Leonardo's anatomical studies were, like those of typical Renaissance artists, meant to improve his painting, why did they explore the body in such depth? Other painters of the time were not so concerned with the physiological aspects of human anatomy, nor did they make such careful drawings of their dissections. If Leonardo's anatomical pursuits were not mere additions to his visual knowledge of the human body, for what purpose(s) did he conduct them?

Perhaps Leonardo is primarily labeled "painter" because he began his career solely as an artist. Leonardo's father, a Florentine notary, recognized his son's abilities very early. Around age 15, Leonardo entered the studio of the well-known artist Andrea Verrocchio as an apprentice (Kemp, 2004). After some time under Verrocchio,

Leonardo began seeking his own commissions. To his patrons' dismay, however, he was very easily distracted from his work. He would work feverishly for a day or two, then completely abandon his brush for four days or more (Paoletti). Leonardo spent his "breaks" in academic pursuits, studying subjects such as physics and mathematics. As time went on, these "breaks" became longer and longer, until it was obvious to his patrons that Leonardo had no intention of finishing their works for them. In fact, it is documented that the Confraternity of the Immaculate Conception had to take legal action against Leonardo to force him to finish *The Madonna of the Rocks* in 1508 (Paoletti). Due to his lack of commitment to commissions, and obsessive perfectionism when he was working, we can attribute only about a dozen paintings to his hand with any certainty (Paoletti). As Leonardo left a trail of more and more grumbling patrons in his wake, it became apparent that painting was not his true love.

The young man continued to learn, and his areas of academic focus at the time are evident in his letter to nobleman Ludovico Sforza (c. 1480) offering his many services. Leonardo states, "I have a sort of extremely light and strong bridges, adapted to be most easily carried... And if the fight should be at sea, I have kinds of many machines most efficient for offence and defence... I will make covered chariots and catapults, safe and unattackable... I can give perfect satisfaction and to the equal of any other in architecture..." (Paoletti). To stifle any doubts of his abilities in his patron's mind, Leonardo adds, "And if any one of the above-named things seem to anyone to be impossible or not feasible, I am most ready to make the experiment in your park, or whatever place may please your Excellency..." (Paoletti). In all this discussion of his military engineering capabilities, Leonardo almost forgets to mention that he can paint. Toward the end of the letter, he inserts, "...and I can also do in painting whatever may be done, as well as any other..." (Paoletti). Sforza was impressed, and Leonardo entered his court with the title "Engineer and Painter" (Kemp, 2004).

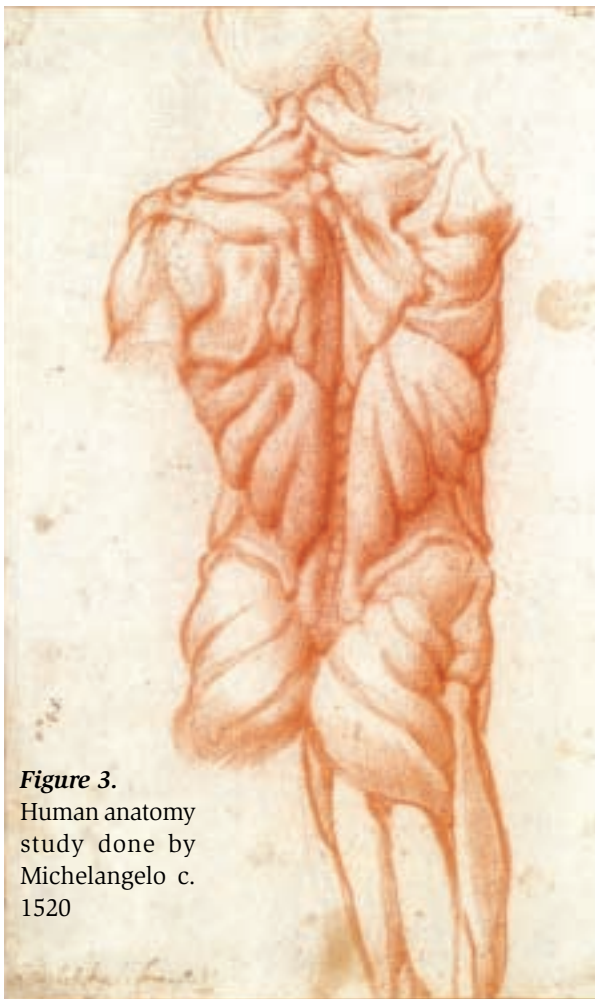
### **I. Leonardo's anatomical findings did not significantly influence his painting.**

About the time that he began working in the Sforza court, Leonardo began to study human anatomy (Kemp, 2004). He was no doubt assisted in his pursuits by his fellow court members, the prestigious Marliani family of physicians, who educated him on basic anatomical principles (Kemp). Leonardo was not alone in this cross-disciplinary work — anatomical studies were becoming popular among Renaissance painters as a way of improving their abilities to paint the human figure. Philosopher Leone Alberti had a profound influence on this trend,

writing in his treatise *On Painting*, “a painter should know anatomy” (Kemp, 2004).

Renaissance artist Michelangelo began his own explorations of human anatomy at approximately the same time (c. 1490) (Hall). Though very few of his anatomical drawings (Fig. 3) survive, the influence of Michelangelo’s dissections on his painted figures is obvious.

When looking at details from his work on the Sistine Chapel ceiling (completed 1512), the painstaking depiction of the figures’ underlying musculature is noteworthy. Giorgio Vasari wrote in his biography *Life of Michelangelo* (c. 1568), “[Michelangelo] was constantly flaying bodies, in order to study the secrets of anatomy, thus beginning to give perfection to the great knowledge of design [of the human figure] that he afterwards acquired.” (Hall). The artist studied the muscles and skeleton in great detail, but gave little regard to the internal organs. Michelangelo’s motivation for doing anatomy lay solely in his depiction of the human figure; studies of the body’s physiological mechanisms were not necessary.



**Figure 3.**  
Human anatomy  
study done by  
Michelangelo c.  
1520

The Royal Collection © 2008 Her Majesty Queen Elizabeth II

Erich Lessing / Art Resource, NY



**Figure 4.**  
*Eve (left) and the Libyan Sibyl (right) Details, Ceiling of the Sistine Chapel c. 1512*

Michelangelo’s anatomical knowledge brought normally invisible muscles to the surface on his figures, so much so that even his female figures look like body-builders (Fig. 4).

He was not the first to do so — exaggeration of musculature in rendering the human figure dates back to the ancient Greeks. Leonardo was well aware of this artistic convention, and he disapproved. He wrote,

You should not make all the muscles of your figures conspicuous; even if they are shown in the correct place they should not be made too evident, unless the limbs to which they belong are engaged in the exertion of great force or labour; and the limbs that are under no strain should have no display of musculature. If you do otherwise you will have produced a sack of nuts rather than a human figure. (Clayton, 1996).

Leonardo believed that any body structure not visible in a surface nude study, including the majority of the muscles, had no place in a painting. This belief makes it highly unlikely that his own anatomical studies, begun around 1490 and so focused on physiology, would have significantly affected his painting. Compare the anatomy of the Christ child in the original *The Madonna of the Rocks* (completed around 1485) (Fig. 5a) to that of the same figure in *The Madonna and Child with St. Anne and St. John the Baptist* (completed around 1513) (Fig. 5b).



The child's body structure barely changes. (Recall that Leonardo dissected the bodies of young children as well, as is evident in Fig. 2.) This point is further demonstrated by his work entitled *St. John the Baptist* (c. 1509) (Fig. 6), the subject of which has almost no visible musculature.

These pieces of evidence, together with the fact that Leonardo rarely painted nudes, make clear that his findings in the dissection of corpses did not have significant influence on his pictures. (The only true nude that can be attributed to Leonardo is the subject of a painting entitled "Leda and The Swan;" engraved copies done by other artists are all that remain of this lost work.) If Leonardo's intentions for his anatomical studies had nothing to do with painting, what exactly was their purpose?

Though Leonardo's studies of the body did not ultimately affect his painting, it is possible that he started them with intentions related to his art. Several early studies of external human proportions done by Leonardo survive and date to approximately 1487. His earliest dated anatomical drawings are his studies of the human skull (Fig. 1) drawn in 1489 and mentioned earlier. Thus, it is reasonable to assume that Leonardo's artistic explorations of *external proportion* progressed to scientific explorations of *internal anatomy*. Shortly after completing his studies of the skull, Leonardo mysteriously abandoned his anatomical investigations for a period lasting almost twenty years (Kemp, 2004).

## II. Leonardo was an accomplished scientist and engineer.

During this twenty-year period after 1489, Leonardo pursued knowledge in conceptual and mechanical physics, and his time spent conducting experiments in the field gave rise to some significant conclusions. According to Kemp, "Leonardo reasoned that the falling body gains increments of speed according to the physical pyramidal law in reverse...the speed at each stage was proportional



Figure 5a. Detail (left), *The Madonna of the Rocks*, c. 1485

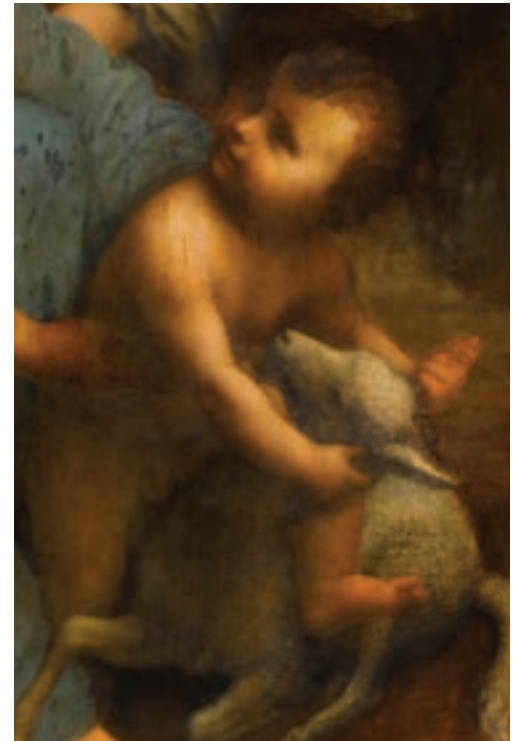


Figure 5b. Detail (right), *The Madonna and Child with St. Anne and St. John the Baptist*, c. 1513

to the distance traveled." (Kemp, 2004). Leonardo had developed the concept of *velocity* (the speed of an object is directly proportional to the distance traveled by the object over the elapsed time,  $v = x/t$ ), more than a century before Isaac Newton would include it in his *Laws of Physics* (Serway et al.)

He also developed other physical concepts for which Newton would later receive credit. Leonardo wrote on the movement of objects, "All movement tends to maintenance, or rather all bodies continue to move as long as the impression of the force of their movers remains in them." (Schlain). Newton later defined this idea in his First Law of Motion, as follows: "Every body continues in its state of rest, or of uniform motion in a straight line, unless it is compelled to change that state by forces impressed upon it." (Serway et al.) In fact, this concept was known as "The Principle of Leonardo" until Newton published his *Principia* in 1687 (Schlain). Leonardo wrote in another study, "The same force is made by an object encountering the air as the air against the object." (Schlain). This statement bears an uncanny resemblance to Newton's Third Law of Motion, which states: "For every action, there is an equal and opposite reaction." (Serway et al.) When celebrated for his achievements, Newton was quoted as saying, "If I have seen further than other men, it is because I stood on the shoulders of giants." (Schlain). He never specified

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Figure 6.  
St. John the Baptist c. 1509

who these “giants” were, but there is strong evidence suggesting that Leonardo da Vinci was one of them.

Leonardo was perpetually fascinated with the possibility of human flight, and spent much of his time away from anatomy in attempts to engineer a man-powered flying machine. He made studies of birds in flight, hoping to discover the physical principles underlying the birds’ amazing ability. He had some concept of gravity from his studies of physics, and kept it in mind as he watched the birds shift their centers of mass while flying (Kemp, 2004). He took his curiosities a step further with his dissections of the birds’ wings, making careful visual records of these as well. Leonardo paid close attention to the mechanical aspects of the wing’s function, noting on one such study, “The tendon ab moves all the tips of the feathers towards the elbow of the wings; and it does this in flexing the wings, but in extending it [the wing] by means of the pull of the muscle nm, these feathers direct their lengths towards the point of the wings.” (Fig. 7) (Clayton, 1996).

Leonardo imagined several different flying machines, but it was a simple glider of his design that proved successful when built and tested in 2003 by English hang glider Judy Leden (Kemp, 2004). His man-powered flying devices are not capable of flight due to the limitations of human strength, but the success of his glider proves that Leonardo was on the right track.



Figure 7. Study of a Bird's Wing c. 1508

### III. Leonardo applied his knowledge of physics to human anatomy — in the same way that he applied it to his mechanical inventions.

In order to achieve flight for humans, Leonardo turned to studying birds — nature’s perfect flying machines. If the wings of birds were the perfect mechanisms for achieving flight, what mechanical principles could be taken from another perfect machine, the *human body*? Perhaps it was this thought process that led to his renewed interest in human anatomy around 1510. Leonardo picked up his anatomical studies with a new fervor, this time going beyond mere visual representation into unexplored territory — human physiology.

As he did in his studies of birds, Leonardo began to look at the body’s functions in terms of physics. He even used physics vocabulary, referring to the brain as a “motor,” the neck and joints as “fulcra,” and the jaw as a “lever” (Clayton, 1996). While at the dissecting table, Leonardo’s thoughts often ran to physical concepts. This is evident from the seemingly unrelated side drawings of mechanical objects found on his anatomical studies. Upon close examination of a particular study of anatomical proportions, a small drawing of a pulley is visible on the lower right side of the page (Fig. 8).

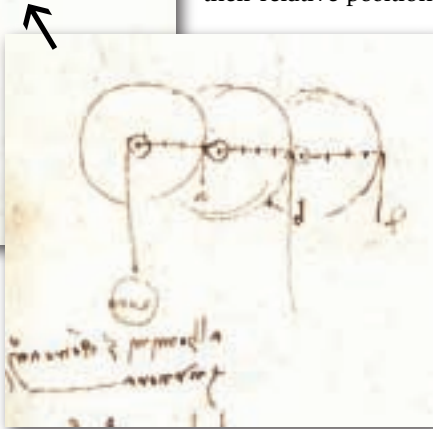
Under the drawing, a note reads, “Five men against one thousand pounds in one hour; one man in five hours; a fifth of the force of one man in twenty-five hours. And in this way it always goes, he who lightens





Figure 8a. (above), Study of Anatomical Proportion with Pulley

Figure 8b. (right), Detail, Study of Anatomical Proportion with Pulley



the work prolongs the time.” (Clayton, 1996). The use of pulley systems allows a large amount of work to be done quickly, using small amounts of force contributed by each member of the system. The same is accomplished by dividing a large work load among several able-bodied human workers. Here, it seems that Leonardo was comparing the mechanical efficiency of a pulley system with that of a group of human bodies.

Similarly, on a drawing of the muscles of the neck, a sketch of what look like ship’s oars can be observed on the right side of the page (Fig. 9).

Leonardo’s note at the top of the page reveals his thoughts, “You will first make the spine of the neck with its tendons like the mast of a ship with its rigging... Then make the head with its tendons which give it its movement on the fulcrum [the neck].” (Clayton, 1996). He reasoned that the considerable weight of the head was distributed among its supporting neck muscles, just as the weight of a ship’s mast was distributed among the ropes of its rigging. The elasticity of the muscles allowed for movement of the head on a stable axis (Kemp, 2004).

When studying the teeth, Leonardo attributed their shapes and functions to their relative positions along the “lever” of the jaw (Fig. 10) (Kemp, 2004).

The rounded molars, meant for crushing, were placed toward the back of the mouth. In this area, they were closer to the “fulcrum” — the hinges of the jaw. Here, they would channel the maximum force from the closing of the jaw, which enabled them to crush hard food materials. The pointed incisors, located at the end of the jaw, were made for cutting. This function did not require as much force, and so the incisors were placed farther from the fulcrum of the jaw.



Figure 10. Detail, Study of the Human Skull c. 1489

Figure 9a. (left), Study of the Muscles of the Neck, c. 1514  
Figure 9b. (above), Detail, Study of the Muscles of the Neck



#### IV. Leonardo was a scientist studying nature’s perfect machine, not a painter studying the human form.

Leonardo’s increasing knowledge of the body eventually enabled him to determine his corpses’ respective causes of death. Around 1507, Leonardo met a dying man at the Hospital of Santa Maria Nuova in Florence, whose body he would later dissect (Kemp, 2004). He wrote of the experience, “This old man, a few hours before his death, told me that he had lived 100 years and that he was conscious of no bodily failure other than feebleness. And thus sitting on a bed in the Hospital of S. Maria Nuova, without any movement or sign of distress, he passed from this life. And I made an anatomy to see the cause of a death so sweet.” (Kemp, 2004). Upon dissection, Leonardo discovered that the blood vessels nourishing the man’s heart had shrunk and withered, drastically reducing blood flow to the cardiac tissues (Fig. 11).

He concluded that the ‘Centenarian’ had succumbed to vascular failure (Kemp, 2004). Meeting one of his experimental subjects in life had a profound effect on Leonardo, as he often referred to his dissection of this man in his writings from that point on.

Between dissections, Leonardo kept up his studies of the physical sciences. He began to examine the turbulence of water, making note of the various forms it assumed in its natural flow. He found its formation of whirlpools most fascinating, watching as the water was drawn into a central vortex by some invisible force (later identified as “centripetal acceleration”) (Kemp, 2004). He wrote, “The spiral or rotary movement of every liquid is so much the swifter as it is nearer the center of its revolution.” (Kemp, 2004). Leonardo kept this image in mind as he returned to the dissecting table, and had a flash of insight while exploring the heart.

He had been examining the pulmonary artery, and wondered how it delivered blood upward from the heart (against gravity) to the tissues of the lungs (Fig. 12).

He reasoned that the heart must expel the blood upward in a forceful manner, and in order for the lungs to receive it, a mechanism must exist to keep it from flowing back down into the heart (Kemp, 2004). He searched and found a structure consisting of three hollow, dome-shaped pieces of tissue in place at the artery’s exit point (Fig. 13) (Kemp, 2004).

He guessed that this structure must act as a valve, somehow allowing blood to flow in only one direction — away from the heart. After some thought, he came up with an idea for the valve’s operation. The heart sent a forceful push of blood upward, the turbulence of which forced the upside-down dome-shaped structures to collapse toward the wall of the artery (Kemp, 2004). When the upward force of blood from the heart lessened, the blood would fill the three valve structures, causing them to expand and seal the entryway back into the heart. Using his knowledge of water turbulence, Leonardo explained that the fast flowing blood formed vortices. These spiraling vortices of blood were responsible for opening the valve when entering the artery, and also for snapping it shut when attempting to flow back into the heart (Fig. 14) (Kemp, 2004).

Martin Clayton wrote on the subject, “Leonardo’s analyses of visceral function were primarily in terms of hydrodynamics, for he had no understanding of biochemistry: his many observations on the turbulence of flowing water and understanding of the formation of vortices lay behind his acute analysis of the functioning of the heart’s valves.” (Clayton, 1996). Leonardo’s application of centripetal acceleration to the operation of the pulmonary artery was accurate. In fact, recent studies have proven that his thoughts on the artery’s function

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Figure 11.  
Study of the  
Centenarian  
c. 1507



Figure 12. Illustration  
of the Human Heart  
(Taken from Gray’s Anatomy)



Figure 13. Study of the Pulmonary  
Valve c. 1510

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were exactly right — almost 500 years after his dissections were conducted (Kemp, 2004). (Kemp, with the help of a team of scientists, successfully demonstrated Leonardo’s thoughts on blood flow in the pulmonary artery. Photographs of the experimental apparatus can be found on p. 80 of Kemp’s (2006b) book.)





**Figure 14.**  
Study of Blood  
Flow in the  
Pulmonary  
Artery c. 1510

## V. Leonardo da Vinci cannot be defined as having been primarily a painter, and so his anatomical studies cannot be defined as mere extensions of his art.

Supporters of MacCurdy's assumption about Leonardo's intentions for his anatomical knowledge would argue that several of his writings point to his agreement with Leone Alberti — that painters should know of human internal structure. This is true; Leonardo wrote on the subject, "The painter who has acquired knowledge of the nature of the sinews, muscles, and tendons will know exactly the movement of any limb...and he will not do like many who in different

actions always make the same things appear in the arm, the back, the breast, and the legs; for such things as these ought not to rank in the category of minor faults." (MacCurdy). Theirs would be a valid argument — *if* Leonardo were only a painter. The depth of his work concerning the body, and the fact that most of his time was spent attempting to discover the *mechanisms* by which it functioned, make clear that he was not taking a "painter's approach" to the subject. Those in agreement with MacCurdy would also maintain that Leonardo's painting *St. Jerome* (c. 1480) (Fig. 15), which depicts an emaciated man, would have required application of his anatomical findings.

This assertion is inaccurate as well. Leonardo could not possibly have applied anatomical knowledge to his work *St. Jerome*, because it was completed approximately ten years *before* he began his studies of human anatomy.

Leonardo hoped that his scientific findings would be shared with future generations, and left many indications that he wanted his writings published. He asks of the heirs of his knowledge, "I pray you, O successors, not to be constrained and get them [the writings] printed in..." (O'Neill and Cone). His practice of mirror writing, in backward letters from right to left, is most often attributed to some witty desire of his to confuse his readers, and therefore "encode" his ideas. A more logical explanation lies in simple printing methods of the day: words and drawings were somehow traced over with wet ink and transferred directly to another page (Bambach). Leonardo's mirror letters, when directly transferred to another sheet, would read legibly from left to right. Perhaps Leonardo did not publish his writings himself out of fear; after all, the great astronomer and physicist Galileo did not get in trouble until *after* he started publishing

his ideas. (Galileo Galilei (1564-1642) was persecuted by the Catholic Church for maintaining his belief that the Earth and other planets revolved around the Sun.) Leonardo willed his notebooks to trusted friends, hoping they would find a way to print them after his death.

His desire to be published indicates that Leonardo viewed himself as a scientist and thinker. His thoughts on himself and his work make it clear that he could not have conducted his studies of anatomy, nor of any other subject, merely to improve his painting. Granted, he was an artistic genius, but an apathetic one. Though he continued to run a studio, Leonardo thrived in court employment, which allowed him almost total intellectual freedom. It was said of Francis I, Leonardo's employer from 1516 until his death in 1519, "he took such pleasure in hearing [Leonardo] talk that he would only on a few days of the year deprive himself of [Leonardo's] company." (MacCurdy).

For years, scholars have attempted to define Leonardo as a painter who "occasionally" dabbled in scientific study. This persistent classification of him is far from accurate. A painter would not have spent so much time studying falling bodies, water turbulence, or principles of mechanics. A painter would not have cared about portable bridges, catapults, or flying machines. And a painter would not have spent more than ten years in painstaking study of the structure *and* function of the human body. As the evidence shows, it is more likely that Leonardo's anatomical findings were applied in his engineering pursuits than in his artistic ones. In fact, Leonardo believed that the only difference between the human body and a well-built machine was the presence of a soul in the former (O'Neill and Cone). Therefore, it cannot be assumed that his anatomical studies were mere extensions of his art, like preparatory drawings for a painting. They were academic pursuits in themselves — knowledge for the sake of knowledge. James Hall, a Michelangelo scholar, makes an important distinction between the respective anatomical approaches of Michelangelo and Leonardo, "Leonardo's anatomical studies were an end in themselves, with no obvious relationship to his paintings..." (Hall).

The fact is that Leonardo was a true intellectual, with an insatiable desire to learn. He was just as much physicist as he was astronomer, as much musician as he was architect, and as much anatomist as he was painter. To him, the body was a complex structure consisting of many integrated parts, and his drawings served as schematic diagrams of its operation. The fact that Leonardo devoted so much of his time to studies of the human body makes it indisputable that he saw more in it than just a beautiful form to be rendered on a canvas. To Leonardo da Vinci, the human body was fascinating, divine; it was the Perfect Machine.

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Figure 15. St. Jerome c. 1480

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I am a freshman at UK, majoring in FLIE (Foreign Language International Economics) – Japanese, and am a member of the Honors Program. As a brother in the Phi Kappa Tau Fraternity, I am actively involved in the community, volunteering for various groups around Lexington and raising funds for our national philanthropy, Hole in the Wall Camps.

My research into renewable energy investments was an attempt to gain a greater understanding of how global warming will affect the economy. Working with Dr. Atwood throughout the semester in his DSP course, “Energy and Our Global Environment,” has been a tremendous experience. His knowledge about the subject is astounding, and his ability to motivate his students in the active pursuit of knowledge is a rare talent. I cannot thank him enough for his continued support throughout this project.



**Faculty Mentor:**  
**David Atwood.**  
**Professor, Department of Chemistry**

Clay Bohle was a student in the Discovery Seminar I taught in Fall 2007 entitled “Energy and Our Global Environment.” Toward the end of the course the students were required to use their newly gained knowledge of environmental science to produce a written report and presentation on a topic related to renewable energy. Clay is interested in economics and conceived the idea of evaluating renewable energy stocks in order to suggest the creation of a new mutual fund or the choice of individual stocks for purchase. I worked with Clay on the outline of the report and helped with several drafts of the potential *Kaleidoscope* submission.

The result of this work was, in my view, a great piece of scholarly research on the future of renewable energy and the companies associated with the new developments. He used the metaphor of roulette as a vehicle for making the choices. I am quite well read in the environmental literature and I have not seen such a detailed, interesting treatment published anywhere. Clay has created something interesting, timely and useful in this *Kaleidoscope* submission. I expect that it will be of great interest and utility to the readers of *Kaleidoscope*. Furthermore, I am going to use his article in my future teaching of DSP courses and environmental science.



## Placing the Chips in An Investor’s Game of Roulette

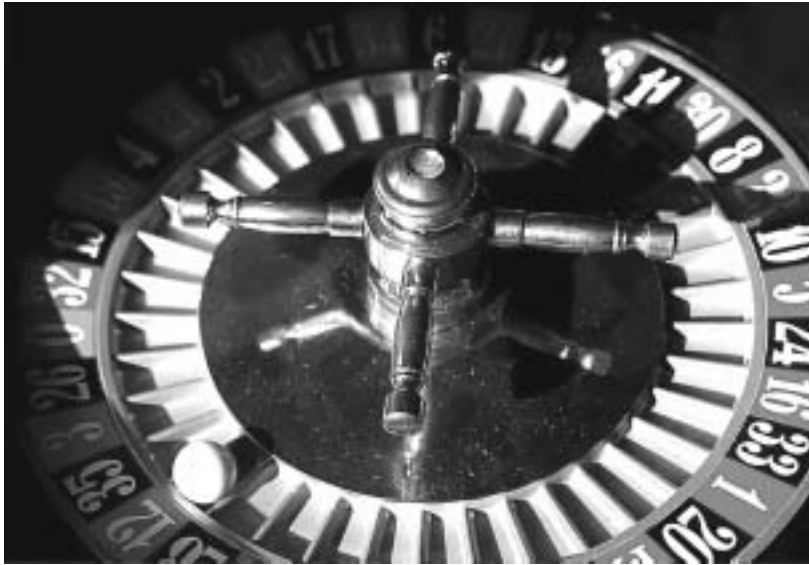
### Global Warming and Its Effect on the Stock Market

#### Abstract

The Kyoto Protocol, an international agreement aimed at cutting greenhouse gas emissions, has radically changed the global market for green technology. The demand for clean energy has increased, causing an influx of new companies producing renewable energy products and creating cleaner processes for fossil fuel consumption. The question is: how can we, as investors, take advantage of this growing market? Through research into the different sectors of the green energy market, this paper breaks down each type of renewable energy, providing an evaluation of the various investment options. Comparing these investments with the different betting options in roulette, the paper moves from low risk, low return investments to more potentially lucrative options. Ultimately, the readers are offered the advice of analysts and speculators on individual companies in which to invest, including the stock quote and quarterly earnings of each company. This will provide the opportunity to not only support the growth of sustainable, green energy, but to profit from the choices made.

#### Introduction

Roulette is a game of chance in which the player bets on the slot of a rotating wheel in which he thinks the ball will stop. With 38 choices on the American wheel, it is difficult to pick the correct number. There are several ways to win, however, each with a different chance of success and with varying payouts. One can make a safe bet, placing chips on either red, black, even, or odd. The odds of winning are 1.111 to 1, with a payout that is 1 to 1. Or if one is feeling lucky, he or she can put all the chips on a single number, 37 to 1 odds, but with a 35 to 1 payout. These are the two ends of the spectrum with many options in between, ranging from 2, 6, 11, or 17 to 1 payouts, and there are many betting combinations to increase the chance of success.



The stock market can be a similar game, especially when investing in immature markets. With new companies going public every month in these growing markets, it is nearly impossible to guess which ones will be successful. The Kyoto Protocol, an international effort to reduce global warming, has created a popular market for green technology. From renewable energy to cleaner fossil fuel processes, there are plenty of options for investment. Trying to choose which company on which to place your money is as risky as betting on a single number in roulette, but what if it were possible to narrow the choices?

By evaluating the different investment options in the green technology market, this study attempts to do just that. Starting from the standpoint of choosing either red or black, the strengths and weaknesses of both renewable energy and cleaner processes are discussed, narrowing the market to a single sector — renewable energy. Each renewable energy option is then analyzed: nuclear power, hydropower, geothermal energy, wind power, and solar energy. Again, the advantages and disadvantages of each are discussed, narrowing the choices to a single renewable energy option. Using the advice of several analysts and speculators, individual companies within this renewable energy field are examined, essentially giving the reader an educated bet on which single number to place his or her chips, with the possibility of earning a 35 to 1 payout.

## Should the Game be Played?

With the recent awarding of the Nobel Peace Prize to Al Gore and the Intergovernmental Panel on Climate Control (IPCC) for their work on human-induced global warming, there is no doubt of the forefront position that global warming has taken as a global issue. With the exception of the United States, the developed world has committed itself to cutting carbon emissions by ratifying the Kyoto Protocol of

1997. Reducing carbon emissions, whether through alternative energy or cleaner processes, will fundamentally change the global stock market. It is unknown which sectors of the market will come out on top, but by analyzing the investment options in green energy, it may be possible to narrow the choices and reduce the risks in placing a bet. Playing the stock market will be a game of roulette, and as an investor, the question is: Where should the chips be placed in order to cash in on the changing market?

The Kyoto Protocol of 1997 set a goal of reducing carbon emissions to 5% below the 1990 levels, to reach an atmospheric CO<sub>2</sub> concentration of approximately 320 parts per million, by

2012. This is only the first step in reducing carbon emissions to double pre-industrial levels, which would require a reduction by all nations to 60% of the 1990 levels. (Bailey et al., 2002, p. 178) When the Kyoto Protocol expires in 2012, it is possible that a new agreement will attempt to make more progress toward this end goal. Cutting carbon emissions by this amount will require a shift to using green, renewable energy technologies, such as solar, wind, or hydropower, or making the carbon-based energy sources, oil, natural gas, and coal, cleaner.

At present, 133 nations have signed the Kyoto Protocol. (Gore, 2006, p. 282) With Australia signing earlier this year, the only developed country that has not ratified the document is the United States. With a presidential election taking place this year, however, it is likely that the new administration will support the Kyoto Protocol, initiating substantial carbon emission cuts in the U.S. In 2000, the United States accounted for 25% of the Earth's energy use, despite having only 5% of the world's population. (Bailey et al., 2002, p. 10) If the Protocol were ratified by the U.S., the effect on the market would be exponential.

Australia has the highest per capita greenhouse emissions of any industrialized country, with 90% of its electricity produced by burning coal. It also has, however, the world's greatest geothermal resources, 28% of the world's uranium, and a more than adequate supply of solar and wind resources. (Flannery, 2005, p. 226) Now that Australia has ratified the Kyoto Protocol, it should have a relatively easy job of cutting carbon emissions by taking advantage of its sustainable energy resources.

The potential entrance of the U.S. into an already attractive pool of green technology consumers will cause a shift of the demand curve to the right, raising the value of each share invested in green technology. There is a visible stack of chips behind the wheel. If one bets correctly, there is a guaranteed profit to be made in green technology investments. It would be a safe bet to blanket the table, putting money in every possible technology through mutual funds; at least one of the chips is sure to turn a profit. However, this safe, relatively expensive bet would dramatically reduce the profits that could be realized.

## Red or Black?

In order to obtain a more profitable return, one must look at the individual options. As previously mentioned, cutting carbon emissions to Kyoto Protocol levels will require a shift to using green technologies that either use renewable energies or make fossil fuels cleaner.

Shell and Krantz (2007) discussed the possible investments in green technologies. In the section of their article on alternative energy, the authors provided the opinion of Robert Wilder, CEO of WilderShares, stating that alternative energy plays are not the best route to profits because the technologies are too immature. Instead, Wilder prefers the technologies that provide cleaner carbon-based energy. Fuel Tech, for example, creates devices that reduce carbon emissions from factory smoke stacks. According to Wilder, one should place one's chips on black.

The most recent predictions, however, indicate that the time remaining in the age of petroleum will be counted in decades. It is estimated that U.S. oil reserves will be exhausted in 29 years (excluding the immense Bakken field, which cannot be effectively recovered with current technology), assuming the level of imported oil remains constant. (Bailey et al., 2002, p. 17) With competition from rapidly growing China and India, that level may drop in the coming years, exhausting U.S. reserves even faster.

Simmons (2005) sees an energy crisis in the immediate future. He studied energy for over 30 years on-site in the Middle East, analyzing the amount of easily obtained oil and natural gas remaining. He has concluded that "proven reserves" are worthless data. He believes that the world's oil peak is much closer than the Saudis are telling us.

There is, of course, the previously mentioned Bakken field lying underground in the Northern U.S. and Canada. Although the estimates of the amount of oil constantly change, the most recent indication is that there are between 271 and 503 billion barrels, a number that dwarfs the remaining Saudi fields. (Langston, 2008)

The problem, however, is that not all of this oil can be recovered with present technology; only an estimated 3 to 50 percent, which brings up another investment option. (Langston, 2008) An investment in companies such as Gardner Denver, with new recovery technologies, for this and other reserves might seem profitable, given that current drilling of the Bakken formation has seen low direct drilling costs, a factor that will reduce the cost of oil per barrel and thus raise demand. There are, however, two drawbacks. While these new reserves of oil may seem heartening based on our current carbon-based economy and concerns about dwindling supplies, focusing on its recovery will only delay the switch to renewable energy and thus worsen the carbon emission problem. In addition, like all other oil reserves, they will eventually run out, and given currently increasing consumption rates, perhaps sooner than one might think.

Once the petroleum reserves are used up, they are gone for good. This is a problem not only for energy production but also for the multitude of commodities that rely on petroleum as a feedstock, such as plastics and chemicals. Oil originates from buried plankton and plant life deposited over many millions of years in the oceans, which doesn't decompose in the oxygen-free deep waters. (Flannery, 2005, p. 75) It takes millions of additional years for these biological deposits to be converted into oil through pressurization, high temperatures, and bacterial degradation. One hundred tons of ancient plant life are required to create one gallon of gasoline, and in 1995, the world was using an average of 24 billion barrels of oil per year. (Flannery, 2005, p. 76) This rate would render the 503 billion barrel Bakken field empty in a matter of 20 years. If the predictions are correct, this means that some of the black numbers will be removed from the wheel; with no oil, technologies that clean it or recover it will be worthless. It does not make sense to bet on an option that will not be there when the ball settles onto its final slot.

Of course, there are other fossil fuels besides oil. Natural gas and coal are predicted to last for at least a few more centuries. There are reserves of stranded natural gas that could produce 250 billion barrels of synthetic diesel fuel, but there is presently no economical way of transporting it. (Cook, 2004) Synthetic fuel, unlike crude oil, doesn't emit sulfur when burned, making it more valuable to those trying to cut greenhouse gas emissions. If the price of crude oil is \$37 per barrel, the reduced environmental problems mean that synthetics could be sold for as much as \$57. (Cook, 2004)

For any economic market, the demand curve is quite inelastic in the short-run. (Mankiw, 2007, p. 91) Consumers do not respond to price fluctuations because there are few or no alternatives. Take, for example, the



market for gasoline. People may complain as gas prices continue to rise, but they will keep filling up their tanks because they rely on gasoline for their livelihoods. In most cities, people must commute to work because they cannot afford the real-estate prices inside the city. They cannot walk to work and, in much of the U.S., public transportation is less than adequate. In the long-run, however, as newer technologies are produced and alternatives are created, the demand curve becomes more elastic. (Mankiw, 2007, p. 91) As gas prices continue to rise, as they are projected to due to falling reserves, consumers will switch to more efficient hybrid cars now becoming available in order to avoid the high costs of gasoline.

If all consumers switch to hybrid cars, gasoline consumption would dramatically decrease and the demand curve for gasoline will shift to the left, driving down prices. As a result, synthetic fuels will either suffer losses because of their high prices if they enter the market before petroleum runs dry, or synthetics will enter a market with little demand, after consumers have already switched to newer technologies.

The same analogy can be used for coal and large factories. As prices for petroleum shoot up in response to dwindling reserves, factories will switch to newer technologies, namely renewable energies, which will become cheaper. During the energy crisis of 1973, gas prices almost doubled from 38.5 cents a gallon to 55.1 cents in one year, and New York Stock Exchange shares in gasoline lost \$97 billion in value in six weeks. (1973 Oil Crisis, 2007) The United States government poured funding into nuclear research to break the dependency on foreign oil. However, no new nuclear power plants were built after the Three-Mile Island incident in 1979.

Though natural gas and coal may last for centuries more, economic forces will render them obsolete as consumers switch to green energies in order to dodge rising petroleum prices. Therefore, if one bets on black, technologies that clean fossil fuels or recover existing reserves, he or she will be putting chips on numbers that will be removed from the wheel, effectively throwing that money away. Based on this evaluation, the bet should be placed on red, that is, on renewable energies.

## Narrowing the Board

There are several renewable resources available for investments: nuclear, geothermal, wind, solar, and hydropower are the most common. Renewable energy currently accounts for 14% of global energy consumption. (Bailey et al., 2002, p. 74) A mutual fund covering them all would be a guaranteed profit. Larger returns are possible, though, because some renewable energies are more potentially lucrative than others.

Nuclear power already provides 18% of the world's electricity, with no carbon dioxide emissions. However, waste disposal presents a problem. If the use of nuclear energy continues to rise, waste management will become a more serious issue, and one that will increase the costs of this energy source. Already, the Chernobyl and Three Mile Island accidents have been deterrents in the planning for nuclear power. (Duetsch and Moniz, 2006) Other problems may arise from earthquakes because many of the major disposal sites are located on fault lines.

Nuclear waste can be recycled in what is known as a closed-fuel cycle, in which the plutonium is chemically extracted and turned into fuel for use at another plant. Recycling fuel, however, lowers the plant's efficiency, because it uses a portion of the energy produced to recycle the waste. This process could potentially raise the price of nuclear energy above some of the other renewable energy options. (Duetsch and Moniz, 2006)

Furthermore, if all gas- and coal-powered plants were displaced by nuclear plants, a process that could be completed by 2050, global carbon emissions would be reduced by only approximately 1.5 billion tons per year. Considering that humans put 13 billion tons of carbon dioxide into the atmosphere each year, this reduction would not be enough to meet the end goals of Kyoto Protocol type agreements. (Duetsch and Moniz, 2006)

Hydropower is another possible investment option. It currently produces 20% of the world's electricity created by renewable energy. (Bailey et al., 2002, p. 92) Hydropower has its drawbacks, however. Water backing up behind dams floods the shoreline, swamping human residences, archeological sites, and ecosystems, and it permanently alters the character of the river. Dams also hold back silt, which can have harmful effects downstream. The most well-known example is Egypt's Aswan dam, which stopped the annual flooding of the Nile, diminishing nutrient inputs for the crops of the Nile delta. (Bailey et al., 2002, p. 92) Additionally, the more widespread use of hydropower is limited by geographical considerations.

Geothermal energy is another option, but at present, it only provides 0.3% of the world's electricity. Geothermal steam is only available in the parts of the Earth's crust where the concentrated upwelling of heat from the Earth's mantle occurs. (Bailey et al., 2002, p. 96) Now that Australia has ratified the Kyoto Protocol, it could tap into its rich geothermal province, raising the percentage of global usage significantly. The rest of the world, however, lacks such rich provinces, making geothermal technology a less popular option for governments to promote. Instead, it is more likely that Australia will use solar or wind power to produce its electricity, because it will have already been more

heavily developed by the time Australia begins cutting its carbon emissions.

That leaves wind and solar power as the two options for producing enough electricity to satisfy the world's growing demand, and the final two choices for investment. Both are solid options. Wind electricity is now the lowest cost alternative to electricity from fossil fuels and nuclear plants. (Bailey et al., 2002, p. 93) Between 1990 and 1999, the rate of annual growth of wind electricity averaged 24 percent and is projected to continue increasing. (Bailey et al., 2002, p. 93) The problem with wind power, however, is that it lacks diversity. Wind power can displace coal-powered plants, but that is the extent of its use: creating electricity.

Solar power can potentially be used for a variety of energy sources, from producing electricity to powering a car, and there is an unlimited supply. Only 70% of the Sun's energy is captured by the Earth. Currently, humans only use 0.02% and plants use 0.34%. The rest of the energy is absorbed by the atmosphere (24%), the land (14%), and the oceans (32%). The other 30% is reflected back into space by the Earth's albedo. (Bailey et al., 2002, p. 5) Harnessing even a fraction of this incoming energy could easily make all coal and nuclear power plants obsolete.

The annual energy deposited by sunlight on the continental United States is nearly 600 times the total annual U.S. energy consumption in 1999. Enough sunlight falls yearly on each square meter to equal the energy content of 190 kilograms of high-grade bituminous coal. (Bailey et al., 2002, p. 74) Using flat-plate solar collectors converting sunlight to electricity at 10% efficiency, it would only take an area of 10,000 square miles in the Nevada desert to supply the total energy needs of the United States. (Bailey et al., 2002, p. 79)

Currently, solar panels are operating at an average conversion efficiency of 16 percent, but this number is expected to rise. In February of 2007, SunPower redesigned their solar panels to reduce the amount of sunlight being reflected away from the silicon, increasing efficiency to an industry-high 22 percent. (Davidson, 2007) For comparative purposes, 95% of the global plant biomass converts sunlight into carbohydrates at an efficiency rate of about 14 percent. (Bailey et al., 2002, p. 86) In addition, a new, cooler process for solar-grade silicon has been developed, which reduces energy consumption by 80%, further increasing the rate of efficiency. (Bailey et al., 2002, p. 81)

Research is also being conducted in the field of nanotechnology. In 2005, a form of solar paint was developed. Plastic solar cells, which capture the Sun's infrared energy as well as visible light, can be sprayed onto other materials and used as a portable source of

electricity. (Lovgren, 2005) In theory, a hydrogen-powered car with the new solar paint could convert enough energy to continually recharge its battery. Or, the paint could be applied to clothing in order to absorb enough energy to continually recharge a cell phone carried in one's pocket. The new solar cells could raise conversion efficiency to 30 percent. (Lovgren, 2005)

Many governments around the world also offer subsidies to citizens using solar energy. In the United States, residents of New York can receive a \$4.00 per watt incentive, covering half the cost of solar energy, and a 25% tax credit, capped at \$5,000. (USA, 2007) In addition, solar electric systems installed before January 1, 2011, are exempt from property tax. Any unconsumed energy that a solar power system creates is considered a cash credit on one's power bill. New Jersey and California residents receive similar incentives. (USA, 2007)

All things considered, solar energy seems to be the most attractive option for investment. This narrows the roulette board significantly and increases the possible returns on a successful bet. After eliminating all other forms of renewable energy, one can confidently place the chips on one of the columns, 2 to 1 payout.

## Feelin' Lucky

Tripling one's money would be a job well done for most investors, but suppose one wants the largest return possible. For the 35 to 1 payout, all chips must be put on one number, on one company. Picking out a single company from an industry can be a difficult process, but there are certain aspects of a company that can be used to narrow the choices.

As the evidence shows, solar energy has the most potential for becoming the premier form of global energy production. This is no secret, and as such, the market for solar energy is overcrowded. By November, the year of 2007 had seen eight new companies go public, four of them in the Chinese market. In an already overpopulated industry, this has put downward pressure on stock values. (Sylla and Axel, 2007)

This trend can be deceiving at first, resembling a falling market. Almost all of the companies are seeing their stock values depreciate. The economic forces of supply and demand are at work here. (Sylla and Axel, 2007) Investors have too many solar companies to choose from, thinly spreading the capital over the market. Companies see earnings fall short of projections as investors put their money into new companies that go public.

The fierce competition, however, will end up having a positive effect on the market. Companies will quickly develop new technologies to differentiate themselves from one another. (Sylla and Axel, 2007) The market will see the new start-up companies shift into specialized

suppliers, offering more efficient and diverse products. As a result, the solar energy industry will continue to grow and stock values will rise.

Analysts predict that by the end of 2008, investors will begin to see which companies will make it through the saturation of the solar market, and which companies will crumble beneath the competition. Most financial advisors suggest waiting for one or two quarterly earnings reports before investing in a particular company. This allows one to see the upper management skills and productivity of a company before making a decision. (Sylla and Axel, 2007)

With new markets, and solar energy is a relatively new market, it is important to look for diversity in a company. (Sylla and Axel, 2007) Different sectors of the solar industry will rise and fall as new technology is produced. A company needs to have flexibility in this regard in order to survive. Many analysts refer to this as the ability of a company to "take a hit." The company should have a wide variety of products within the solar market in order to cope with the shift in demand that will occur as new technologies are introduced. If one sector of the market fails, the company will be able to survive through the rest of its production options.

Stock value is another important characteristic to look at when choosing in which company to invest. The obvious goal is to buy low and sell high. Especially with new companies, the stock price can be enticingly low. It pays to be patient on the start-up companies, however, because the solar market is overcrowded. Many times, new companies cannot compete with the large competition and exit the market as quickly as they enter. Investing in new companies to take advantage of the low stock prices is a dangerous bet, one that most analysts would not recommend.

Here is a look at some of the individual companies in the solar energy market. The prices quoted are for Nov. 14, 2007 (Renewable, 2007):

- 1) SunPower Corp. was mentioned earlier in the article for their redesign of the solar panel. SunPower Corp. is one of the most widely suggested investment options in the market. As of Nov. 14, 2007, the last trade went for \$115.90, up \$7.48 for the day. Six months beforehand, the stock was worth less than \$60.00, and in January of 2007, it had a value of about \$35.00 per share. The one year target estimate is \$130.00. The P/E ratio, however, is extremely high, at 585.35. This could be due to high projected earnings for the company, or could be a speculative bubble based on the hype surrounding the company. Historically, bubbles have been followed by crashes, so it may be wise to take a wait and see approach with this company.
- 2) Solon ended the day with a value of \$80.60, up \$2.88 for the day. In January of 2007, the stock was worth around \$20.00 per share. In October, the company had taken losses, however, so their P/E ratio is undefined or N/A.
- 3) Solar Integrated Technologies ended at \$88.50, down \$2.50 for the day. The stock began the year with a value of \$22.00. Like Solon, the company had suffered losses in November, making their P/E ratio undefined.
- 4) Suntech Power Holdings, another highly suggested investment option, ended with a value of \$61.69, up \$1.99 for the day. January saw a stock value of around \$28.00. The one year target estimate is \$54.89, which they have exceeded. The P/E ratio is 77.70, relatively low compared to SunPower Corp., but still a high number.
- 5) Yingli Green Energy Holding Company Unlimited is one of the leading Chinese solar companies. It's still a relatively new company, having gone public in June of 2006. It ended the day with a value of \$30.73, up \$1.60. In June of 2007, the stock was worth less than \$10.00 per share. In October, it suffered losses, displaying an undefined P/E ratio.

It is important to remember the effects of the overcrowded market when looking at the losses many of the companies have suffered.

Shrewd speculators Kevin Sylla and Eric Axel offer their suggestions for solar stock investments on InvestorIdeas.com in an audio file entitled, "Solar IPO's and the Chinese Solar Market." The two speculators believe that the solar energy market is the correct investment option. When asked which stocks they would suggest to potential investors looking to break into the solar market, Eric Axel mentions SunPower Corp. and Suntech Power Holdings. He says that many analysts are pushing these two companies as the dominant players in the solar sector. He is not currently suggesting these two companies to his own clients due to the high P/E ratios. Kevin Sylla, though he does not usually recommend single stock investments, suggests Yingli Green Energy, believing that it has the diversity to be successful in the solar market. He mentions that the undefined P/E is just a result of the overcrowded market and should not keep people from investing in the company.

### All Bets on the Table

Through the process of elimination, and based on the advice of speculators and analysts, the board has been narrowed to the sector of the market that has the most potential for profit: solar energy. Due to the Kyoto Protocol, much of the developed world is cutting carbon



emissions and looking for a source of green energy. With its variety of energy uses, technological advances, and government subsidies, solar power appears to have the most potential for becoming the premier source of global energy.

According to the basic principle of “buy low, sell high,” the time to invest in this new market is now. An investment in solar energy should see a constant increase in value, with staggering returns possible in twenty to thirty years. Investing in a mutual fund of solar energy companies could be a safe but lucrative bet. Like betting on the columns in roulette, 2.167 to 1 odds, the chances of making a solid profit are good. If one is a risk-taker, however, wanting to invest in a single company, the best option would be Yingli Green Energy Holding Company Unlimited. They have the diversity to “take a hit” in a new market that will change with the technological advances. At present, the value of the stock is low, at \$30.73, so the returns could be enormous. It fits well with the roulette metaphor; betting on a single number with a 35 to 1 payout.

The wheel has begun spinning; it's time to place one's bets.

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I am a Senior English and Linguistics major. I participated in the Gaines Fellowship and the Honors Program. I received The John Spalding Gatton Provost's Scholarship in the Arts and Sciences and was inducted into Phi Beta Kappa. Next year I will teach English as a Second Language in a small town in Austria via the Fulbright Program.

I worked on these chapters under the mentorship of Jane Vance and Kim Edwards and I am eternally indebted to them for their wisdom, patience, and willingness to give feedback about crappy writing long enough for said writing to become slightly less crappy.



**Faculty Mentor:  
Professor Thomas Marksbury, Department of English**

Some satisfactions are permanent. It's been very gratifying to consult on a sustained piece of fiction with a young writer at once as open to criticism and as certain of his own emerging voice as Andrew Crown-Weber. He learned a lot from the leaps and snags and second starts of the process, but then again so did I. The proof is in the resolution, and "Only a Game" is an honest, penetrating, original novel in progress about the painful business of growing up in the twenty-first century. As this year's model of the oldest of stories, it hearkens back to Huck Finn and Holden Caulfield even as it anticipates texts and techniques yet to come.

We make such contradictory demands of our platonic fiction students — who invariably turn out to be real people in search of consistent advice. Over the course of this academic year, I have watched "Only a Game" evolve from an admittedly clever, somewhat self-absorbed and would-be opus spun out from a brilliant central metaphor into a mature, absorbing and now fully self-contained coming of age tale which movingly explores the aftershocks and repercussions of that initial image. It's one thing to whistle past the graveyard about such chestnuts as compression and point of view and consideration for the audience, and something else altogether to see Andrew put his old wine into such a useful new bottle.



## The opening chapters of: *Only A Game*

### Abstract

These are what may turn out to be the first chapters of a novel tentatively called "Only A Game," which could possibly be finished some time in the future, maybe. At present this book-to-be deals with the life of a young man who is addicted to one of the few new drugs to be discovered this century: massively multiplayer online role-playing games. If you are unfamiliar with this digital scourge, have some time on your hands, and haven't eaten recently, I recommend Googling the term for an eye-opening experience. I won't spoil all the many surprises and twists and intrigues that will appear later in the narrative (mostly because I don't know them myself at the moment), but I will say that these chapters represent this young man's interpretation of how he arrived at such an addiction. And, because this young man is diligent enough to begin his account in utero, we must at least commend him for his thoroughness.

### 1

Let's say it was April when Squire Kyle and I awaited our White Whale so our Quest could begin. Let's say we were dressed to kill: I in shining plate mail with the mythical sword Gondolin slung behind me and Kyle holding his Wand of Healing, his squat body bearing chain mail covered by a purple cleric's robe down at the Vine Street Bus Stop near the Post Office. Let's say we were outfitted for one purpose: to trade one death for another. Or more if need be. And that need would probably be because Furor, our enemy, the newly-minted Emperor of all Erewhonia, the wielder of 'Zentropia - Katana of the Void,' the Brutus who betrayed and murdered the former emperor Aaron, my better half... let's say that Furor would be our greatest foe yet faced, surrounded as he was by a horde of followers in his Summer Palace in Las Vegas where Kyle and I would mete out justice in one final showdown.

You could also say that I was a disturbed former-computer gamer whose character was killed and deleted in an online game called PenultiQuest and who had quit his job and burned his bridges in Lexington, Kentucky so that he could dress up in sheet-metal to journey across country to PQCon, the

yearly PenultiQuest Convention in Las Vegas, so that he could kill his in-game murderer in real-life.

Let's just say I was in a strange place at the time.

"But don't they say the best revenge is living well?"

This was Kyle, my would-be conscience slumped against the art-deco wall, a façade of smoky glass wafers welded together at the far eastern corner of the bus station. The station was simultaneously a glass cavern at the side of a sea teeming with schools of commuting car-fish. Our whale-bus was due any moment, so for now I humored my rotund and pensive companion. Kyle is the only person I've met who could still seem vulnerable under forty pounds of chain mail. "You could start over. Something new. I'd help you."

But I was beyond help at that point. I would not sit down – nor stand down, for that matter – for I'd learned to keep my guard up at all times, so I simply paced in front him in the limelight of his earnest, audience eyes.

"Dearest Kyle, I don't doubt that you would give up your life for me if you thought it would help. I don't doubt your intentions, which are as noble as ever. But I do doubt your perspective."

My pacing paused with a clank of oven-pan armor as I removed my helm, a silver spray-painted bike helmet supplemented by scrap metal. My months as omnipotent Emperor of a relatively sizable universe had taught me to seize and heighten whatever dramatic opportunities came my way. Sword in one hand, the other holding helm to hip, I gazed grandly and wistfully toward the Lexington skyline. Padrupiter himself, Game Master of The Two Worlds, offered mood lighting of his own, sending two suns to stain the skyline red since Erewhonia had a pair.

"When you have been to the top of the mountain, when you have conquered and mastered everything worth conquering and mastering, only then would you see we have but one option. See you yonder 5/3<sup>rd</sup> bank building?" I said, gesturing majestically with sword as laser pointer toward the shiny blue headquarters. "That building, the spot where I first learned of my destiny and that destiny nearly came to an end, I have looked down upon this city from that height and it cannot compare to how I towered in PQ. Thousands quivered with every mouse click and trembled at my slightest keystroke. No, only when you have been so high could you understand our sacred mission of vengeance. When you are King of the Hill and lose your spot, you don't go searching for new hills. You gather your strength and reclaim the throne. Or die trying. These are the Rules of the Game. We did not choose them, and yet we must obey if we are to win in the end."

The final 'win' went echoing down the length of the cavern to where two elderly men sat on a bench by

the ticket booth and craned their heads to look at us, at me, before turning back and returning to their mumbled conversation. It was alright if they looked on me with disdain. They didn't understand. They could not. But apparently Kyle did not as well.

"But you can't win anymore," he cried, waving his wand in the air. "You're banned for life. You don't exist in PQ anymore and you can never be restored. The game exists online and you can never log back on. You can't win at chess if all your pieces are off the board."

"I thought that, too, my friend. I thought that all was lost until I realized I had to think outside the board, outside the computer screen. Moving chess pieces or characters, that's just moving around symbols, but those symbols exist outside their realm. I've told you how I died, haven't I?"

"You've told me a thousand times!"

"And I'll probably tell you a thousand more. Rule of the Game #54: The noble man keeps his demise on his mind at all times. Since you know the exotic means of my undoing, then surely you can see the symbolism, the transcendent transformation this death worked upon the world? Aaron died so that the two worlds might be joined. The sacred could join with the profane. The world of energy mixed into the world of matter, the spiritual with the mundane, supernatural with natural!"

Aaron was the name of my most powerful character and, for a brief time, the most powerful character in the entire world. His full name was: Sir Aaron Spacemuseum.

Even then, I think I could smell the bullshit piling up, but I kept on going. Behind me the commuters in their cars were driving lazily down Vine, attending to whatever petty missions they were on in their own attempt to rise up the scoreboard.

"When the sun went down in my final sunset on Erewhonia, there was the darkness... the soul-crushing darkness. Though you know all about that..."

"Yes," Kyle said, soberly. "I knew it long before you."

"Well when I was in that darkness, when I was neither in pixelspace nor meatspace but in limbo — meatspace being derogatory game slang for what outsider's called 'real life' — I too felt that utter doubt. That there was no game. That all was meaningless. The one world where things were hard and fast was gone and now all I had was *this*" — I gestured around me — "this slapdash unprogrammed mess people call the 'real world.' But then dawn broke and I saw all at once — it poured in like morning light. Aaron, Rythm, all my former selves had died so that I could live now in a fused world. They died to show me that the worlds had always been united, that they had only seemed apart because I had not learned to see clearly. The two worlds were like the red and the



blue sides of 3D glasses. That morning atop the 5/3<sup>rd</sup> building, all of Lexington and all of Kentucky stretched out before me like one intricate, amazing game board. I learned to combine the two sides and now I see more clearly, more beautifully, more richly. It's all 3D, Kyle. This is the greatest graphics engine anyone could ever design. This is it. This is the big leagues. This is where the *real* game is. Look at the detail on this sidewalk. Look at the patterns in the clouds. Look at that court jester walking our way."

From around the corner came a homeless guy in a dirty jogging suit whose neon colors were upstaged only by his gravity-defying shock of unkempt hair. As he gamboled toward us I realized it was Henry Earl aka Downtown James Brown, a bum become famous for never being sober and always being in jail for said lack of sobriety. His relatively straight gait testified that he was freshly released from the county jail. We made eye contact and I knew his game. You had to pity the guy: stuck in his own tiny little world, seeing people only as means of getting his precious booze. Truly pathetic. But, also, in a strange way it was pure and noble the way he single-mindedly pursued his obsession.

Now he stood before us. Or, more accurately, an entity stood before us. With meatspace eyes he was a homeless man dressed in a jump suit. With pixelspace eyes he was a court jester in full fool regalia. The jump suit was the meatspace version of the pixelspace motley garb and the motley garb was the pixelspace version of the meatspace jumpsuit. I combined the two like 3D glasses to form my hybrid hyperreal reality.

I was totally fucking nuts.

And the jester saw it.

"Halloween's done been and gone, I believe. What you all dressed up for?"

I phrased my answer for both aspects of this entity. "We are on our way to Las Vegas for a video game convention. We are tracking down the killer of one of our friends and rescuing my Empress."

"That so?" he said, his wide smile showing a ravaged gum line. There was a pause, as if he was searching for some way to segue from my stated mission to his own, but, finding nothing, he plunged right ahead. "Say, you wouldn't have any change on you, would you, man? I could use to eat." The gin breath suggested a liquid lunch.

"My dear man, I could give you some petty silver, but that would not last you very long. You know what they say about giving a man a fish, and all that? Well, today I'm feeling generous. While we're waiting on the bus, I'll teach you a few Rules of the Game so you can earn your *own* silver."

He gave me a befuddled look, but, because I hadn't said 'no,' wobbled where he was. Sheathing my sword,

I reached behind my breastplate for my Bible. Now, it must be said, that this was my personal Bible, custom made over the years. It bore no resemblance to the Judeo-Christian tome, save that it too had two testaments which had been rudely crammed together. I'd made it by weaving together the spines of two books: the manual for PenultiQuest (My Old Testament) and the self-help guru Derik Powers' break out best seller "Everyone's A Winner: And So Can You!" (My New Testament).

Henry Earl would rather've had me pull out money instead of this shabby book. I flipped the book to the self-help section, since it was the more 'good-newsy' of the two.

"Ah, here's a good one. Rule #28: "You have to *see* it, before you can *be* it." Now, see, you're a bum because you *see yourself* as a bum—"

"Who you callin' a bum? You best watch that."

"I mean no offense, dear sir. I too was once just like you. When I started out I was a mere Level 1 like everybody else: naked, alone, and armed with nothing but a rusty broadsword. But look at me now! It wasn't easy. The only way I got to where I am now was by first *seeing myself* as a winner, as a secret king. That's the only way to change for the better."

"Man, I don't want to change nothin.' I just want some change for *food*."

"See, you're still caught up in the 'survival game.' You need to 'shift your paradigm' toward playing a game more conducive to self-realization."

"I got a game you could play. How bout trying to find a way so that I don't have to dig through garbage to live? I'm tired of playing it."

"Only *you* can change the game you're playing! Of course, it helps to have a book like this to guide you," I said, holding my Custom-Bible aloft.

"I got that covered already," he said, pulling out a small tattered Bible from his jumpsuit's pocket. It was a New Believer's Children's Illustrated Bible. "I can't read a word of this here book, but I believe every word of it. When I'm wonderin' 'bout how my day's gonna go, I'll open it and see what picture I get," he said, leafing through it like a flipbook. I was instantly intrigued.

"Well for Padrupiter's sake, consult your tome! Prophecy upon how fortune regards our grand mission!"

"Say huh?"

"Tell me my fortune and I'll give you some money."

"Oh, hah." He said, laughing. The poofball ends of his cap swayed as he shook his head back and forth. "Man, you a piece of work."

A piece of work! Yes, what wisdom from a fool! I was a piece of work: It'd taken me four years of hard work to get to this level of strength and experience.

I made mental note of all he said now, knowing the pregnancy of his prattle.

“Here goes,” he said, looking up toward the night sky while his hands split the book open. His left hand darted upward and then down.

“No picture on this page, want me to go forward or backward?”

I wished like hell I could save my game here, in case I chose the wrong way.

“Forward!” I cried, since progress was all important.

He pawed a few pages forward. “Well I’ll be,” he said, opening the book wide toward me.

Beneath his cracked fingers was an angry sea holding an angry beast, a whale with snorting nostrils, which, thanks to an x-ray cut-away, you could see held a helpless Jonah in its gullet. In keeping with the style of the book, Jonah looked like a strange, anime child, though the beast was as fierce as ever.

And, miracle of miracles, when he lowered the book our own whale thrummed up to the cavern’s mouth and opened its mouth sideways for its exiting passengers.

“A prophetic book!” I was dumbfounded and made a sign of the cross with my sword in spontaneous reaction to the miracle.

“Well you got your fortune told, now where that money at?”

As I reached toward my gold purse, it struck me that this encounter was meant to happen, that it was a part of this quest, and that this homeless man, not only a wise fool and a prophet, was also a helper sent to bring me aid to reach my goal. And that aid was the magical artifact: The Illustrated Children’s Bible of Prophecy. I had to possess it. “Your gold is here, my good man, a few coins from this ample purse. But, say, this whole purse could be yours, enough to feed a man like a king, if you would part with that rotten old book of yours.”

He looked at me quizzically for a moment. “You wanna to buy my Bible? Ain’t for sale, jack. The devil hisself could offer me a mansion and I wouldn’t trade him this. This here’s my soul. I’d die before I lost it.”

Rule #14: A strong enough desire destroys all obstacles in its way.

“I’ll give you all this gold plus these two books, my own Bible. They’re a lot newer and make more sense for this world we’re living in right now, anyway.”

“Whew, buddy. I don’t know what world you livin’ in, but why would I want two books I can’t read and I don’t believe in instead of this here book I do? Now where’s that money?”

I scowled and shoved the handful of silver into his mitt. I tried one last gambit.

“You know,” I said, making my voice low, quiet, and quivery. “I only want it because...because...I just

feel this emptiness inside of me. Like there’s something missing. And I don’t know, just empty... but also open, you know? Like something could change inside me but I just need that spark to set it off. I’ve been a sinner, but, I just get this feeling, like the angel’s themselves are whispering to me, that this book could bring me over to the side of the lord and deliver me from the devil.” I looked up, to see if he’d bought it.

“Shoo. I knew you was crazy when I saw you rambling on in the corner, but now you done shown you crazy as a fox. You ain’t ready to get nothing in your heart, right now. You slippery as a snake. Don’t worry about finding Jesus, man. He’ll find you soon enough.” And with that he turned and wobbled away.

I cursed at the ground and stamped my mighty boots.

“R, come on,” cried Kyle, standing at the whale’s mouth, ready to board.

I flipped my cape angrily as I went toward the bus. Denied already at journey’s beginning. Fortune seemed to be turning against us. I boarded the leviathan, climbing its stair tongue which lolled from the side of its mouth, panting like an idling engine. The conductor seated in the beast’s brain stared at me with a smirk of amusement

But then I received a message from Heaven, an epiphany of sorts that gave a certain knowledge of what to do and how to act. I received this power, coincidentally, shortly after my character was deleted. Now I knew the next part of my quest.

I turned to the Captain of the Whale and said: “My dear man, hold this beast here for me. I’ve something I must do.”

The Captain replied with a salty seaman’s gruffness: “Bus leaves in one minute. Don’t matter who’s on it.”

A glorious, metallic \*PLING\* tone shivered the air, which announced the undertaking of a MiniQuest. And in the right hand corner of my vision a timer appeared, counting down the 59 – 58 – 57 seconds remaining.

“Fortune favors the bold!” I cried and dismounted the humming brute.

My armor clinked and clanged as I rounded the corner and found him stumbling uphill toward High Street. The noise robbed me of my chance to rob him by surprise, for as I jangled toward him he spun around, his confusion shifting to groggy recognition to furious readiness. As I closed in he crouched into a tight fighting stance. At that moment he became an NPC, or non-player character, that is to say a monster to be vanquished. Keeping my momentum I tackled him straight on, butting my shoulder into his chest as we both slammed to the ground. I started to work my way up his thrashing body to pin his arms with my legs but found there was more feist than anticipated in the old bum who, when

I reached into his coat to grab the book, took hold of my arm and pulled his way up it's length to bite at my exposed neck. He succeeded. I reared back and, he, fastened to me by both hand and mouth came with me. This backward shift of weight caused us to both tumble down the sloping sidewalk, at first end over end and then horizontally spinning, an like an elongated multi-sided human die which rolled and bounced in a j-shaped path until we crashed into the cement wall bounding the alleyway. As luck would have it the roll came out in my favor, with me on top, and seizing the advantage I unleashed a series of one-handed blunt attacks with my fists upon the exposed weak point of Henry's face. I continued the pummeling until Henry's hitpoints were exhausted, his arms no longer flared about trying to shield his face or strike at my own. His eyes closed and he passed out.

In the air appeared golden text:

You have slain a\_bum07! You have gained 500 experience points! You have become better at hand-to-hand fighting (8)!

And then, even better, I heard that beautiful, golden chime. \*DING!\* which meant that I'd gained a level. I jumped up in celebration, and then, remembering my time limit, quickly knelt down to loot the body. As I did I got the message:

"You have obtained the Illustrated Children's Bible of Prophecy!"

Being a fair-minded and noble guy, I opened my ration sack and left him a loaf of bread and said, before sprinting back to the bus: "Man does not live by Bibles alone."

And I was back on the bus before the timer ran out and the whale closed its sideways grin and began its leviathan swim and the world gave a resplendent \*PLONG\*, the beautiful response to the \*PLING\*'s call that said "mission accomplished," quest fulfilled. Though the passengers on the bus, the young woman and her small son, the elderly redneck couple, the punk goth girl, the Mexican guy, though on one level they all avoided eye contact with me after glancing at my get up, on another level they were averting their eyes out of respect for a conquering hero, and thus the march to the back of thrumming bus was a triumphal procession, the black polyurethane floor was also a red carpet, and thus also the whale's tongue. I sat down by my squire and raised the book aloft.

"Ask and ye shall receive," I said.

Kyle looked me up and down. "Looks like you did more than ask."

"Ok. How about 'Take and ye shall get'?"

The whale veered starboard up the connector road toward High Street. The form of Downtown James

Brown still lay on the ground, pinned by gravity to the sidewalk, until the Whale took another turn and it swam out of view.

I layed Gondolin down on the seat beside me, grateful I'd not needed to use it so early in the quest. While Gondolin was simply a children's plastic sword, the two rows of razor blades welded onto an iron rod running the length of the plastic blade's interior were real. Appearances can not only be deceiving. They can be deadly.

## 2

Now you may be wondering how I became a tin-can knight embarking on a cross-country quest of vengeance. I too wondered this after I suffered my most recent, and hopefully last, ego annihilation, which we will get to in our good time. Though I've never been a big fan of cause and effect, it goes a little something like this: I was in such a state because I became addicted to PenultiQuest. I became addicted to PenultiQuest because I started playing it. I started playing because, among other reasons, back in high school David Gash, a senior, hoisted me, a freshman, up against the Centreville High School Wall of Fame and... embarrassed me.

But for its terribleness it would have been a thing of beauty to have watched Gash's hands fasten on the breast of my jacket, grip firmly, then heave my quivering body up into the cold air of the gym to smack against the Wall of Fame with all the choreography of a brutal ballet.

This was back when I was not insane and didn't have double vision, so Gash did not appear as a vengeful and furious giant or demon. He appeared as he did in meatspace: a soccer team captain's body much stronger than mine wearing trendy clothing much cooler than mine bearing a face much handsomer than mine that was twisted in grimace that would have made his red afro, if I'd been insane back then, look like a flame haloing his head.

There was simply staring in the brief moments before the end-of-school-day bell echoed through the empty gymnasium.

"Nobody talks to my sister like that. Especially not some piss-ant little freshman like you." He emphasized each syllable with a fresh slam against the wall.

How does one answer such a statement? I did not have my lines and was forced to ad lib. I replied only with the increased trembling of my body and grotesque distortion of my face whose mouth sputtered and searched for words, finding none.

"You fucking embarrassed my little sister you little shit. You know what, though? You hurt her, I hurt you." Another slam on the 'you,' this time my limp head flopped back and met the sharp edge



of a commemorative plaque — perhaps the Women’s Triple Jump record. The sharp pain at the back of my head traveled down past the twin pillars of his arms, cutting through the dull pain all over to reach down to my retreating genitals. In the midst of my tightening muscles, I felt an impending loosening, and clamped and squirmed to halt it.

This humiliation against the wall followed hot on the heels of another humiliation. Before I had fled my classroom, before Gash had found me breaking for the exit and cornered me in the gym, not two minutes previously all had been normal. I was in shop class, the final class of the day, wallowing in the normal. No! Not normal. I, my backpack, my aura: it all was aglow with glory from my first real party, *a Lake House Party*, the weekend before. As I remembered it I was the life of the party, and though I’d blacked out sometime during the party’s lifespan, I was certain my behavior in the unremembered time was simply an extension of joys remembered.

Kyle, my best friend, my companion forever, my soulmate in a non-gay way, was in that class as well. He had not been to the party, nor any other party, and I, like everyone else in the class, was trying to forget his presence. I was working my way up the cool ladder and fraternizing with Kyle, the pudgy nerdy weirdo dweeb, would ruin my promising future. After all, going to a lake house party as a freshman put me ahead of the game.

The end-of-the-day announcements brought me back to “GO.”

“Good afternoon Centerville High. How’s my favorite school doing? Just a few quick announcements. As y’all know, we have an away football game this Friday and we really hope everybody will come out and support the team. If we don’t support ‘em, who will? Directions will be available in the lobby on Thursday. Also, I have a special announcement today. It’s a special message from R Fancy to Samantha Gash coming to you straight from last Friday.”

Static hissed from the intercom until a fuzzy recording clicked on: “...it’s like we were meant to be here, you know? I mean I have always like, I mean, like, loved, LOVED you, loved you so much ever since we were just kids before I even had pubic hair, but don’t worry I do now and I bet you do too well of course you do because girls become women before guys become men but Samantha SAMANTHA I want you to make me a man because, because you’re the reason people play the cool game and you only live once right? You’re the reason the sun”...

By then the vice principal had run into the room and stopped the pirate radio.

It is worth noting that, at that point in my personal development, I’d come to believe that high school was a game where the goal was to be popular or die trying. One accomplished said task by accumulating cool points,

commodities bought and sold, earned and exchanged within the social marketplace of Centerville High. And in that moment I *did* die trying and lost all my cool points. I was socially bankrupt, socially dead.

The faces in the class, which had already pivoted to gawk at me, now burst into hoots and hollers and howls of laughter. I left my books where they lay and ran.

And I was out of the room, trying to outrun the laughter peeling from the classroom. I broke down the empty hallways toward the front entrance. If Mom’s car was parked outside to take me home, the plan would be to jump in and tell her to drive us home NOW. But that hypothetical, as hypotheticals are wont to do, remained so, for as I came into the lobby so too did David Gash emerge from the seniors’ hallway between Mom’s minivan and me, he a seething monstrosity and me skidding as I turned one-eighty degrees toward the back entrance. Then came the footrace: a string of heavy slaps echoing from the lobby past the lunchroom up the handicap ramp and by the vending machines, until I, certain that he would gain on me, veered toward the gym to lose him by doubling back through the second pair of gym doors. I flung open one set of doors to go in and ran down and flung open another set to go out when he was still coming in, thus he changed course and now I was trapped in the empty gym. I broke for the girls’ bathroom, of all places, but Gash tackled me not far from the entrance, more or less right beneath the “Centerville Wall of Fame,” an intricate metal matrix of athletic superlatives, such as “Highest High Jump” and “Longest Long Jump” with slots beneath for the current champion’s name. I’d always wanted to be up on that board.

And now: here I was! Pinned up by the champion who would make the “Most Goals Scored” slot later that year.

“What do you have to say for yourself, you little shit?”

Having now received a direct question from my assailant, I felt it apropos to answer posthaste. The impulse was correct, though my response, judging by his response, was not.

“Go beat up the guy who *played* the tape! You think I wanted anyone to hear that?”

This must have struck him as not according enough respect to the person pinning me to the wall, for he slid me down across the name plates behind me and head-butted me in the stomach. I “oofed” of course and felt a plume of pain, but even more worrisomely, I felt the tingle, the nearly irresistible urge to piss.

By now a few of the first kids heading to their cars had heard the commotion and become bystanders standing by the door. Sophomores or juniors, by the looks of it. None rising to my defense.

“Help!” I said. Nothing happened.

“This is between you and me kid. Now you’re going to stay up there until I think of some way you can make this up to her.” This beast did not seem to tire but now a change came over his face. His scowl blinked for a second into a smirk, a knowing, almost conspiratorial smirk, before changing back to an even harsher scowl.

Now I am aware that memory of the past often serves the present, and thus my remembrance may be colored by current circumstances, but I’m sure that right then that son of a bitch gave away his hand. This brother held me up not to uphold the honor of his sister, but to raise his own standing in school. And it was all within the rules of the game; you had to give him that. For better or worse, it was permissible to destroy the reputation of another to defend the reputation of your own. Gash, in seizing me, had seized the day. *Carpe freshman!* Especially when said carpe-ing magnifies your status as untouchable badass.

But to be a badass, you need to make someone your bitch. Guess which loser was the lucky winner of that honor?

“Do you think my sister is some kind of whore?”

“No!”

“Do you think she would ever sleep with you?”

“No!”

“Tell you what; I’ll let you down if you’ll yell this out: “My name is R Fancy and I have a small dick and... uh, and if I could ever find it, I wouldn’t know what to do with it.” And you better fucking yell it!”

Though I’d gotten used to the painful punctuation, learning to brace myself at each period or exclamation point, his next head butt broke through the meager meat of my abs and crushed my vital organs. Most vital of all, for the moment, was my bladder which responded to the pressure with orders of evacuation and I sputtered to admit my eternal sexual, social, total impotence before the dam burst.

But I had not felt that way last Friday, the night that fateful tape was made. That night my ‘best friends,’ Tommy and Patrick, and I had pledged eternal friendship as we drank our first beers together to the thought of our first real party, a *Lake House Party*, and how, as freshman, we might enter the record books for becoming so cool so fast. We spoke all this into Tommy’s tape recorder, Tommy being my *best* best friend, since we wanted to save our collective triumph for posterity.

Earlier that night we’d convinced Patrick’s mom of our angelic naïveté by letting her wish us good night with us curled up virginally in our respective comic-book-themed sleeping bags. Inside, we were all convinced we’d get laid that night.

Minutes later we had lost our alcoholic virginity and known the lithe body of liquor in the carnal sense. Then we were out the back door to the street where a creeping S.U.V. opened by Gash, Green, and Rightmeier brought us abruptly into a senior party caravan, scrambling between lip-bound beer bottles and cigarettes held to the side to exhale fog machine fog that enveloped us in our three-deep bitch seat with the blasting Rage Against the Machine shuddering the wisps of fog in time to the bass and the staccato howls of “PAaaaA-RRTTY” yelled out windows to the blue Kentucky tree-lined night roads.

I had finally been cast in the beer commercial of my dreams. I was finally amongst the cool.

And I worked like hell to play the part. How? Observing and aping the main actors: studying how beers caps were snapped, how cigarette packs were packed, how seven white heads bobbed to the rap of five black rappers to show appreciation: not too slow and certainly not too fast. Just right. Let the head sway the way the clutch of kegs in the back clinked and clanked.

I calculated spontaneity, faked naturalness, was earnestly nonchalant. I worked hard to take it easy.

At the lake house, Gash swung one keg above his head with a grunt and marched like a conquering Cro-Magnon hunter into the lake house, a small wood building whose few windows glowed like campfire coals in the indigo night. Appropriately, the beer in the keg was ‘Beast.’ We followed behind, the three freshman at the back. Before we stepped in, our shared glance communicated our unspoken communion of coolness. We were three musketeers: one for all and all for one.

“I’m going to give you to the count of three to say it or your chance is over, Fancy.”

I desperately juggled bodily activities: trying to open up the throat while clamping down at the earth chakra.

“Three...”

Fresh beer frothed forth from the keg cups. I was a red Dixie cup myself, was collecting the experience into myself, a vessel being filled with new knowledge. The foam on top was called ‘head’ and you didn’t want too much of it. You tilted the cup to keep the head down and could use face grease to melt the remaining head away. I gave myself 20 cool points for having a perfect cup of beer.

Alone with new people, I searched for Patrick and Tommy, wandering through a room full of girls dancing to gangster rap to the patio where people were playing cards and drinking. I found Patrick and Tommy crammed onto a ratty sofa in the corner. There was no room there. I considered crouching on the lip

of a potted plant but decided that was too desperate. I wandered around. The cool meter spiraled backwards. Look like you're going somewhere. Talk to people. I went to refill my still half-full cup because I needed a premise, a mission, something with a clear goal.

"How many you had?" said one cool guy to another.

"Me and Nate killed a half-case before we came out, so this here's number seven," said another cool guy, lifting his cup.

"I think I'm on 10, but you lose track at double-digits," laughed back the other.

I made note and drained my glass. It was cool to drink as much as possible.

From across the room came a burst of laughter. Gash had a laugh like an ambulance at night: You couldn't help hearing it and you had to decide whether to look or to pretend you didn't hear it. A crowd was circling a sofa upon which a chubby blonde guy was slumped.

"He's in creature-mode already!"

"The creech is loose," they cried.

The blonde paid no heed. He rambled to nobody in particular, eyes half-closed, his hands curled into tight, raptor-like claws. Each babbled nonsequitur brought out more laughter from the onlookers.

And then, like a becalmed hindu cow, the creature slumped across the couch's arm.

"And he's out!" they yelled and no sooner had he slumped then they pulled up his shirt and filled his belly button with maple syrup, tied his shoe laces together, and drew large permanent marker penises onto his cheek, each point with subtle squirt marks toward his mouth. A ritual shaming. Some must be sacrificed for the amusement of others, I thought.

I made another note: It wasn't cool to drink too much. I shuddered imaging myself such a ridiculed spectacle.

"Two..." grunted Gash, his smiling face daring me to disobey while I struggled to keep my bladder obedient.

I plopped myself down beside Tommy and Patrick in the newly opened seat. Our group was alone again and we strained for something to talk about so we would be seen having a good time.

All around people were talking and laughing. Each shared stories, anecdotes of past parties. The more you talked and the more people listened, the cooler you were. The more stories you had the more you could talk and the more parties you were invited to. The more parties you were invited to, the more stories you had. The more stories you had the more you talked the cooler you were

the more you were invited and so on. This was the cycle of coolness, as certain as the water cycle. I wanted to break into this cycle.

And in my own way, I did. Not as storyteller but story told.

Two pretty girls came up and stood in front of our couch. One wore a purple blouse and had faintly purple lipstick to match. The other had brown hair and bright large eyes.

"Well Ashley, don't you think these are just the three cutest little boys you've ever seen in your life?" said the one with purple make-up, her pursed lips filling her twisty straw with a red mixed-drink.

"Yes I do Becky, and I do wish they would introduce themselves," said big-eyed Ashley.

The three of us sat like statues and the girls giggled. Finally I stuck out my hand for a handshake and said, "Sorry. I'm R Fancy, nice to meet you. The beer has made us a bit lethargic."

The girls giggled again.

"Le-what?" said Becky, laughing.

I returned my outstretched hand and deducted 30 cool points.

"Hey Sam," yelled Ashley. "Hey, do you know these guys?"

From the far side of the room walked Samantha Gash. I hadn't been within ten feet of her since middle school but seeing her come over made me understand why people played the cool game. It was for girls like her. Her tight, lithe body bouncing our way assigned a mission for me that night, which at the time I was drunk and naïve enough to believe attainable: to possess her.

"Oh my God, yes I know these guys! I've gone to school with them since we were all in Montessori!"

She gave us all hugs in turn. I received the last hug and feeling the pressure of Samantha Gash's tiny arms encircling me, for a moment was heavenly and I fought the unsought tremors of impending erection.

"One..." growled Gash, the grim tenor upholding his fierce reputation. His arms digging under my solar plexus were a hell I sought to end by confessing whichever sins he assigned me, though within I felt a bubbling, a carbonation of bad spirits fizzing and buzzing like being tickled by knives from the inside. I still couldn't say anything and I fought the impending urination.

I couldn't say anything to Samantha as she sat, squeezed between Tommy and me on the couch. I wanted to be smooth so much that I became a ball of nerves. As she and Tommy talked I discovered that if you were drinking beer you had an excuse not to talk. I kept the cup at my face, draining it slowly and steadily. When the cup was empty I filled it again.



I had a great time filling the pump now. My arms and body were loose and wobbling now. Things were getting blurry. Now I no longer monitored my speech. Words came out and faces around me laughed. Every laugh was another 10 cool points, I thought, or maybe even muttered at that point.

It was now a card game and a table. You had cards in your hands and had to have people explain what to do with them. It was a game. A black card meant you drank as many drinks as the number and four in a row meant a waterfall where everybody drank and you couldn't stop until the person to your left stopped and the music was getting thicker and everything was funnier and you laughed when the beer dribbled down your chin and Tommy and Patrick were over with the senior guys having a big laugh waving at you and you wave back, eyes closed feeling how thick the music is and realizing you're talking like some beast granted the gift of speech.

And to an outside observer you appear a complete fool. But within you feel suave. Your every utterance one more hilarious joke in one long impromptu routine. You feel like you've accumulated so many cool points that you could do anything, accomplish any wild goal. And so, when you see Samantha head off alone toward one of the side bedrooms, you follow. You decide it's time for a private word or two to bring the matter to a head and a satisfactory conclusion.

It takes a rare ass to realize he's making an ass out of himself. I could not.

I could not have known that following Samantha into that bedroom with the intention of procreation would be a death sentence for me, nor that Tommy's tape recorder lay on the dresser greedily vacuuming up my monologue as I surrendered to the welling pressure and confessed to Samantha my eternal love in that now infamous drunken earnest outpour.

"Zero!" snarled Gash.

"My name is R Fancy and I have a small dick and" I began, yelling out, voice cracking and high pitched, when another high pitched voice added to the caterwaul.

"David! Stop! Put him down!" This was Samantha. In that moment her ample breasts concealed an ampler heart as she ran toward and through the crowd to my rescue. And yet, perhaps because my painful and awkward teenage longing for her love, vagina, and breasts – not necessarily in that order – was still strong, this final addition to the problem did not quiet but heighten the riot in my loins and, to mix too many metaphors to

count, her rescue was the straw that burst the camel's dam. My body, racked and afraid traitorously disobeyed the orders of my mind and released the pressure of my groin.

Warm and moist the urine dripped from my shrunken member and began to pool in my tighty whities, crossing that cotton membrane to stain across the face of my pants. One needed no instruction manual to read the message of my shorts: manliness, honor, and my entire social universe were on trial, and as one awaits the results of a home-pregnancy test, one could only read the moist blot bleeding across and down my shorts as an uncontestable negative, failure crudely scribed in bodily fluid.

I'm told that some lizards use this trick to escape predators. I may be quite highly evolved.

The laughter did not start immediately. Within the hush that arrived as the pant stain appeared there were the acoustics of disgust as Gash gagged, the flutter of my shirt as he unlatched and I fell, and then, loudest and clearest of all the wet repercussion of collision as my limp body landed toes, knees, and finally hands onto my own thin puddle.

The laughing started just after that. Not only were they not laughing *with* me, they weren't even laughing *at* me: their laughter went *through* me. Tore through me like piss through toilet paper. Slipping and sliding in the limelight I scrambled to my feet, taking one last masochist scan of my audience, a Pandora glance, before exiting the gym at a sprint. Then the school. Then the parking lot.

I traded piss stains for grass stains as I desperately humped the ground in a vain attempt to dry that cursed soak. I did not dare return to the school where Mom, presumably, now waited impatiently out front for a son who would not appear. Instead I walked the opposite direction across the overgrown field. I walked the three miles to home, avoiding all roads where I could, darting across them when need be until I escaped the thin band of urban and suburban and finally made it to the open, rolling grass hills where shy cattle grazed.

Out in the pasture at a small stream in the trough of the gently undulating hills, I could see no sign of town, no sign of humanity at all in every direction.

A wish welled up in me then that when I crossed the stream and peaked the hill in front of me, it would not be Centreville or Kentucky that surrounded me, but another time, another place.

But it was just more grass and trees and houses in the distance.

But I'd get my wish soon enough.



I am a Senior English and Linguistics major. I participated in the Gaines Fellowship and the Honors Program. I received the John Spalding Gatton Provost's Scholarship in the Arts and Sciences and was inducted into Phi Beta Kappa. Next year I will teach English as a Second Language in a small town in Austria via the Fulbright Program.



**Faculty Mentor:  
Dan Breazeale**

**Professor, Department of Philosophy**

Mr. Andrew Crown-Weber's essay, "Autopoiesis: Self-Creation in Nietzsche," was easily the best and most original essay I have received from any of my undergraduate students in several years.

He wrote the essay as a term paper for my class on "Nietzsche: First to Last," and the paper reveals a sophisticated and broad grasp not just of Nietzsche's entire corpus (an impressive enough feat in its own right), but also of the difficult issues and problems that surround the favorite Nietzschean injunction to "become who you are." Mr. Crown-Weber does a fine job of sorting out and criticizing the implications of both the "essentialist" and "existentialist" theories of self-hood, and he demonstrates convincingly that Nietzsche actually adheres most closely to the latter, while still employing some of the language of the former.

Mr. Crown-Weber also has the courage to take on one of the leading lights among contemporary Nietzsche scholars (Brian Leiter), and, in my view, he successfully demolishes Leiter's influential "fatalistic" and "naturalistic" account of Nietzsche's view of the self. Mr. Crown-Weber's interpretation of Nietzsche's denial of free will as a part of his campaign against Christianity is interesting and provocative, and his novel interpretation of the "automatic" and "aesthetic" dimensions of Nietzschean self-creation is very promising and original. Equally impressive is his suggestion that the value of an "egoistic" act depends on the value of the person who performs it. Surely this goes to the heart of Nietzsche's philosophy, and Mr. Crown-Weber offers a sympathetic and insightful discussion of this point with a nuanced response to several anticipated objections to the same.

Finally, this essay is a pleasure to read. It is artfully composed and beautifully written.



## Autopoiesis: Self-Creation in Nietzsche

### Abstract

A recurrent theme in the philosophy of Friedrich Nietzsche is his imperative that we must create ourselves. Though this theme of self-creation runs throughout the entirety of his published works, Nietzsche neither fully articulates in one place the processes and guidelines by which such self-creation could occur, nor does he fully resolve the paradoxes inherent in this concept. This paper attempts to distill from these fragments a coherent interpretation of both how we can and why we should, despite (or, paradoxically, because of) our many external and internal constraints, fashion ourselves the way an artist shapes a work of art.

### Introduction

Throughout his works, one of Friedrich Nietzsche's most common and consistent calls was for his readers to create themselves — at least those *capable* of creating themselves. We hear the first notes of this call sounded in Nietzsche's first published work, *The Birth of Tragedy*, when Nietzsche talks of our "status as art works" and how the "genius in the act of creation" becomes "at once subject, object, poet, actor and audience." This idea of shaping oneself as an "aesthetic phenomena" (BT, 5) is finally announced explicitly by the middle period when Nietzsche asserts: "We, however, *want to become those we are* — human beings who are new, unique, incomparable, who give themselves laws, who create themselves" (GS, 335). Here we see Nietzsche adding nuances to this idea, knotting together his maxim "become who you are" with the project of self-creation. As we shall see, self-creation is the *means* by which one becomes what one is. Even in Nietzsche's last productive year we find him giving Goethe the highest praise when he announces that Goethe "disciplined himself to wholeness, he *created* himself" (TI, IX, 49). This essay will first examine Nietzsche's conception of the self and then

turn to *how* Nietzsche believes we *can* create ourselves and *why* he believes we *should*. In order to understand what Nietzsche means by ‘self-creation’ we will need to examine that self’s interaction with the external world and grapple with many seeming contradictions in Nietzsche’s philosophy that threaten to muddle this encomium into meaninglessness.

## The Self

We face our first contradiction when looking at Nietzsche’s view of the self. At first blush he seems to give both an ‘essentialist’ and an ‘existentialist’ account of the self. An essentialist account is one in which each person has an *essential* core, a True Self, which lies at ‘the base’ of the personality and character, analogous to the Christian concept of ‘the soul.’ This essential core, because it is an extremely specific entity, is static, unchanging, and therefore it is often associated with the concept of ‘Being,’ that is, something eternal and otherworldly, the prime example of Being being God. The existentialist account of the self is contained in the phrase ‘existence precedes essence.’ Existentialists deny the existence of any *essential* self, typically because they deny the existence of any *essential* Being in the world, which is typically the source of the essential self. Without the boundaries of essence, the self dynamically changes over time.

Nietzsche seems to use the language of essentialism when he says that each person has “a productive uniqueness within him at the core of his being” (UM, 143) or urges people to “Be yourself! All that you are now doing, thinking, and desiring is not really yourself” (UM, 127). These both imply a ‘true’ self outside of current appearances. However, when we examine Nietzsche’s philosophy as a whole, we find that Nietzsche’s account of the self leans toward the existentialist conception and favors the dynamic model.

Thus, we see Nietzsche asserting that “the unalterable character,” a hallmark of the static conception of self, “is not in the strict sense true” (HH, 41). He believes it is only laziness and the shortness of life that lead us to delude ourselves into thinking of our character and ourselves as given, monolithic facts. As he says: “Man becomes that which he *wills* to become, his willing precedes his existence” (HH, 35). This statement not only shows the malleability of the self but allows that our will has a shaping power to direct our becoming. It is within this framework that Nietzsche can metaphorically cast us as both creators and created works of art — though, as we shall see, the actual agency and autonomy of this ‘creative will’ will come into question.

Nietzsche’s uses of essentialist tropes are the exceptions that prove the rule of his dynamic conception of self. He uses essentialist rhetoric as a skillful means of encouraging us, because it is reassuring to believe the fiction of having a ‘true’ self one only needs to find — for this frees us of the responsibility of creation by saying we need only uncover this self. However, at bottom, Nietzsche concurs with Zarathustra when he says: “Some souls one will never discover, unless one invents them first” (Z, 154). Thus the ‘to be’ in the mixed message maxim “become who you are,” can be understood as an ideal, unattainable shaping of our becoming in such a way that one “create[s] and carr[ies] together into One what is fragment and riddle and dreadful accident” (Z, 252) in order to approximate the perfection associated with the idea of ‘soul’ or ‘true self’.

Nietzsche’s view differs from the prototypical existentialist account of the self, embodied in Sartre’s philosophy. For Sartre, we choose what we become and are therefore responsible for every aspect of our becoming, of our self. Nietzsche does not take such a radical stand. Although I will argue that Nietzsche *does* believe we can choose *aspects* of what we become, there are undeniable determinants of our behavior that limit our ability to choose. These determinants include the totality of external events outside of our control, or ‘fate,’ or unchosen but fundamental internal aspects of ourselves, such as our genetics and drives. For Nietzsche, the autonomy necessary for self-creation will have to occur within the constraints of unchosen external and internal factors.

It is precisely regarding the issue of our autonomy that Brian Leiter raises a paradox that questions the possibility of self-creation. Nietzsche’s troubling and unclear position toward determinism and fatalism questions the autonomy considered necessary for a person to create him or herself. To use Leiter’s example: If I were brainwashed into becoming a criminal, though I would be causally responsible for the criminal activity, we would not intuitively say that I had ‘created’ myself as a criminal. Leiter claims that: “Nietzsche the fatalist views a person like a plant: just as... the essential natural facts about a tomato plant determine its development... so too the essential natural facts about a person determine its development” (Leiter, 223). These natural facts are ‘causally primary,’ that is: “they are *necessary* for [an] effect... though they may not be *sufficient* for it” (Leiter, 224). Thus one must necessarily have the natural fact of tallness to become an NBA center, although this is alone is not sufficient for becoming one. This brings us to the paradox: “If a person’s life trajectories are determined in advance by the natural facts about himself, then how



can a person really create himself, i.e., how can he make an *autonomous* causal contribution to the course of that life?” (Leiter, 226).

From this perspective we can't really create ourselves, for the requirement of 'autonomy' would require a *causa sui* origin outside of the chain of all previous causes and effects — something so impossible that Nietzsche himself goes so far as to call the idea a “rape and perversion of logic” (BGE, I, 23). However from this perspective nothing is ever created, for even the doodling of a smiley face would, from this perspective, be said to be a non-autonomous and therefore non-creative act. Therefore, *if* Nietzsche subscribed to this view and yet still speaks about creation at all, we must accept that autonomy is not essential to his understanding of creation. This, I will argue, does not scuttle the whole project of self-creation in Nietzsche. This is why I believe 'autopoiesis' captures Nietzsche's view of self-creation the best. Aside from being in the language of his beloved Greeks, the 'poiesis' not only denotes creation but connotes poetry, recalling the aesthetic aspect of such creation. The 'auto' not only means simply 'self,' but also connotes a certain 'automatic' involuntary aspect of this self-creation, again highlighting Nietzsche's lowlighting of agency and emphasis on fatedness.

Nietzsche's main impetus for problematizing free will comes not from his 'naturalism' (a role in which Leiter the naturalist is eager to cast him) but from its association with Christianity, and therefore slave morality — those eternally recurrent bogeymen in Nietzsche's writings. The idea of the absolute freedom of the individual to choose is derived from the Christian solution to the 'Problem of Evil,' namely: If God is both all-good and all-powerful, why does evil occur? If he is all good and 'wants' good for all, then he must not be powerful enough to bring this about. If he is all-powerful and *could* banish evil, then he must choose not to and is therefore not all-good. The Christian solution is to say that God is both all-good and all-powerful, but he gave humans the free will to choose to obey his laws. Evil exists because humans choose not to obey God. Nietzsche of course rejects this entire account. His problematizing of free will is an attempt to swing this pendulum of thought back to a Classical Greek view — the view of fate we find in Aeschylus in which the workings of the world are deeply mysterious and “in which Moira [fate], as eternal justice, is seen enthroned above men and gods alike” (BT, 9). Nietzsche holds that we currently overemphasize agency and do not recognize the extent to which unchosen events, both external *and* internal, play a decisive role in what we do, and thus, who we become.

Nietzsche has Zarathustra announce: “Body am I entirely, and nothing else; and soul is only a word for something about the body... The body is a great rea-

son, a plurality with one sense” while our reason and consciousness is a subservient “little reason” which is a “toy of [our] great reason” (Z, 147). But though “our organism is an oligarchy” (GM, II, 1) with 'mind' subservient to 'body,' the fatedness of our big reason and by extension the fate of the universe, the little reason still has a limited freedom of will. Metaphorically it has the power to nudge in one direction, but not the ability to shove and certainly not the absolute power to steer. To use a nautical metaphor, the idea of absolute freewill is the illusory idea that we are like the captains of a nuclear-powered ship able to go at full impulse in any direction we like. Nietzsche's view is that we are rather like captains of a sailboat, who cannot sail against the wind of fate but still have the responsibility of tacking a course within those winds.

As ever, the important consideration for Nietzsche is your response to 'the way the universe is,' whether you affirm the necessitude of the existent or gnash your teeth at it. In what I consider Nietzsche's definitive take on the paradox of free will and fate, he discusses 'Mohammedan fatalism,' which “embodies the fundamental error of setting man and fate over against one another as two separate things.” Against this error, Nietzsche proposes that man and his 'free will' are a part of fate itself and thus the seeming “struggle” and paradox of 'free will' versus 'fate' “is imaginary” (WS, 61). Both “free will” and the “unfree will” (BGE, I, 21) are, as we will briefly touch on later, simplifications and falsifications of the world, owing to the limited perspective from which we can experience, and therefore come to know something about, the universe. Consider the following:

You *have* to believe in fate... what then grows out of this belief in your case — cowardice, resignation or frankness and magnanimity — bears witness to the soil upon which the seedcorn has been scattered but not, however, to the seedcorn itself — for out of this anything and everything can grow (HH, 332).

This quote suggests that the important question is not whether or not we have autonomy, but how we psychologically respond to a world in which our answers to this dilemma are uncertain. The weak and slavish response is one of resignation while the strong and masterful response is one of boldness and a faith that we are ones who can become who we are, who are 'turning out well,' for “it is only a matter of *strong* and *weak* wills” (BGE, I, 21) and few possess the necessary strength of will for self-creation. “Everyone *possesses inborn talent*, but few possess the degree of inborn and acquired toughness, endurance and energy actually to become a talent, that is to say to *become* what he is: which means to discharge it in works and actions” (HH I, 263). Here we see Nietzsche denying the treasured

shibboleth that “all men are created equal” — it is only the “few” who possess the “inborn” and thus unchosen means of becoming who they are. But how do you know if you have this inborn talent? You find yourself in the same bind that Calvinist believers in predestination find themselves: you can’t know for certain. One has to have faith in being ‘chosen’ and one shows this faith by acting like a ‘chosen’ person would act. In the same way, a test for whether you *have* this inborn “toughness, endurance and energy” is whether, in response to this quote, you say “Yes” and go out and manifest these qualities or instead say “No” and do not engage in the activities of self-becoming, *demonstrating* a lack of said inborn faculties. There are either ‘strong’ or ‘weak’ responses to the question of inborn capacity. “He has no spirit who seeks spirit” (HH, 547). That is, if you don’t think you have that capacity, then you don’t.

Incidentally, I believe a great amount of Nietzsche’s appeal to readers stems from his conspiratorial ‘us versus them’ style of writing, which implies, though never states explicitly, that his reader must be one of the few — presumably by virtue of having the good taste to read Nietzsche! And because you have the good taste to be reading my words, we’ll assume that we’re both one of the few capable of creating ourselves...

## How We Can Create Ourselves

To become a self-creator we must first analyze the material we have to work with: we do this by analyzing ourselves with an intellectual conscience to find what values, drives, and virtues constitute us. We have to find what makes us a “unique miracle” (UM, 127). First of all, Nietzsche does not believe this kind of introspection can ever be complete, for “nothing... can be more incomplete than” a person’s “image of the totality of *drives* that constitute his being” (D, 116). However this is a good thing. People who delude themselves into believing they know exactly who they are create a self-fulfilling prophecy causing them to *actually become that*. Because Nietzsche believes that life is a process of seeking to grow, expand, and increase one’s power, taking “know thyself” to the extreme of actually believing we *do* know ourselves fully can freeze the potentiality of our becoming by pouring it into one static mold. Growth demands leeway. As Zarathustra puts it: “One must still have chaos in oneself to be able to give birth to a dancing star” (Z, Pr., 5).

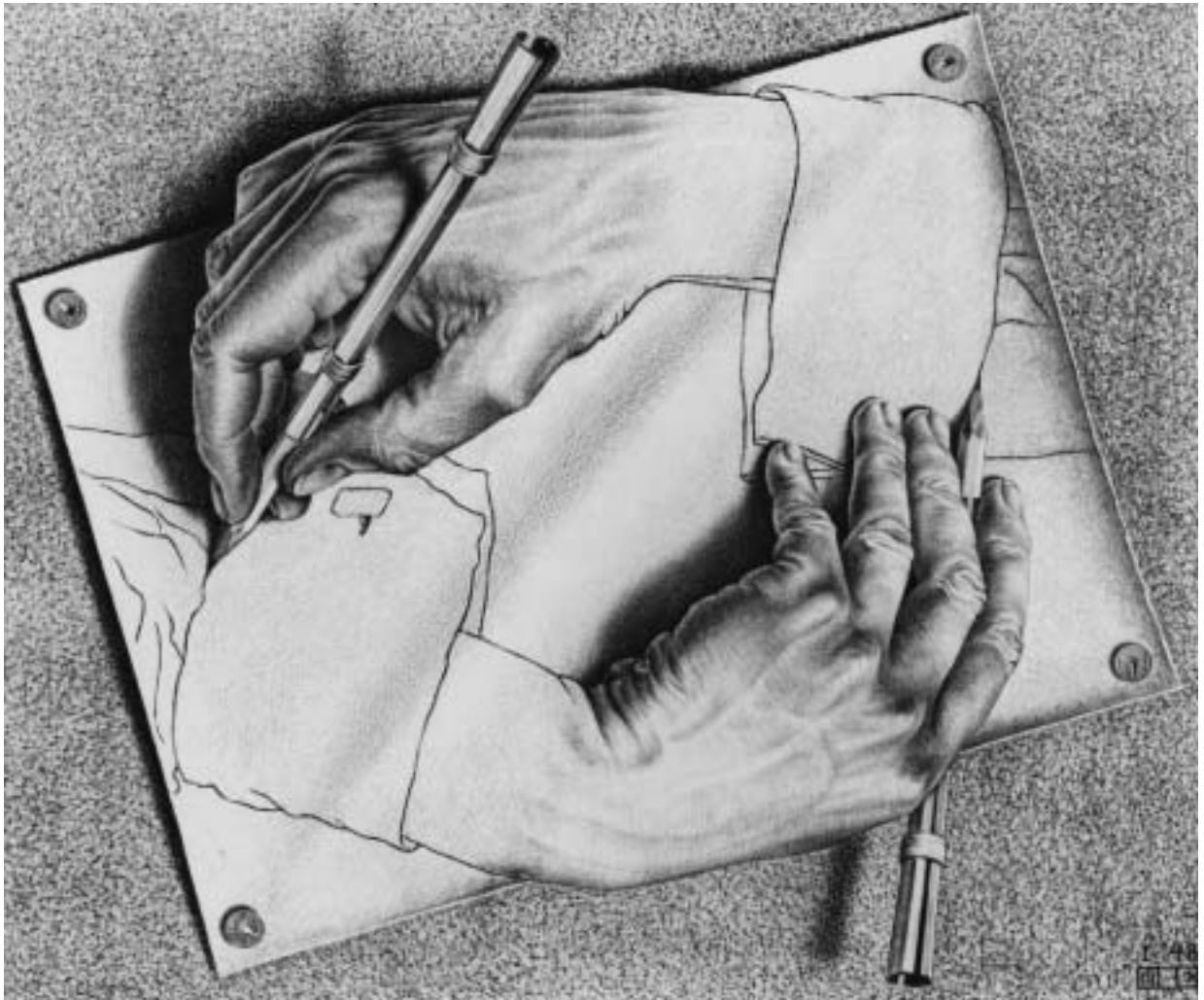
After this introspection, we must move on to do as “[a]ctive, successful natures” do, who “act, not according to the dictum “know thyself” but... “*will* a self and thou shalt *become* a self” (HH, II, 366). Because we are what we do, or as Nehamas puts it, “the sum total of qualities that can be attributed to us,” willing a self, and therefore self-creation, will mean changing and control-

ling what we do in order to “give style” to our character by “survey[ing] the strengths and weaknesses of [our] nature and then fit[ing] them into an artistic plan” and according to a “single taste” (GS, 290).

One method of achieving this is to examine what has guided our actions heretofore, that is to say, our morality. The creators must examine what “tablets of values” they have lived by and, if necessary, destroy those tablets that impede our self-creation. The creators will then posit their own ‘Yes’ and ‘No,’ their own ‘straight line’ and ‘goal’ (TI, I, 44), that is they will posit an ideal conception of who they want to become and create for themselves a morality that will allow them to achieve this conception. From thence forth, what is ‘good’ will be what moves them toward this goal, this will be their “*own* categorical imperative” (A, 11). At first this may sound extremely disturbing from a ‘moral’ standpoint, but as we will see later, this is not nearly as ghoulish as it sounds. This is merely a recognition that our morality and our self interpenetrate. Like Escher’s image of the two hands drawing each other, we both create our values and our values create us. This is what Zarathustra means when he says: “To value is to create” [schätzen ist schaffen] (Z, 177) and why Nietzsche calls self-creators those who “give themselves laws, who *create themselves*” (GS, 335).

“Every morality is... a bit of tyranny against “nature”” (BGE, 290). This tyranny channels our becoming toward our goal. Thus we should submit to our self-positing moralities the way a poet submits to writing a haiku, for it is within the restrictions of 17 syllables that innovations and beauty emerge. Nihilism, the utter freedom of constraints, would be like free verse, which Robert Frost disdainfully referred to as “playing tennis without the net.” Though these new values will place new restrictions upon us, they do not make us *less* free but rather *more* free. This result is because true freedom for Nietzsche is not ‘freedom *from* restrictions’ but the ‘freedom *to* become who we are’ (Z, 176) and this freedom will grow as we subtract out of our lives all resistances and frictions hampering us from becoming who we are. This freedom is a “harmony among all of a person’s preference schemes. It is a state in which desire follows thought, and action follows desires, without tension or struggle, and in which the distinction between choice and constraint may well be thought to disappear” (Nehamas, 187).

To attain this freedom, we must daily engage in what Nietzsche calls ‘self-overcoming.’ Self-overcoming is the process by which we progress toward a goal through determined and persistent application of energy and hard work. Say we want to become ‘brave.’ We must first determine what being ‘brave’ will mean for us — for “a virtue must be *our own invention*” (A, 11)



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*M.C. Escher's "Drawing Hands"*

— and then overcome our current ‘non-brave’ self to manifest our newly posited, idiosyncratic definition of bravery in actions.

Through the process of self-overcoming we will become a new self. However, this does not mean that our self-overcoming has achieved, or even can achieve, its goal, for Nietzsche does not believe this process does or should have any ultimate end or goal. Consider Nietzsche’s parable: “Not every end is a goal. The end of a melody is not its goal; but nonetheless, if the melody had not reached its end it would not have reached its goal either” (WS, 204). We are like this melody — keep this in mind when reading the quotation that ends this essay. Thus to return to our example of bravery, after we have become ‘brave’ according to our own definition, we will not sit on our laurels but instead posit a new, even more demanding definition of bravery to fight to attain. We will be like Faust who from desire rushes to satisfaction and from satisfaction leaps to new desires. It is through this self-overcoming that we will become

“poets of our life — first of all in the smallest, most everyday matters” (GS, 299).

In a great poem, every word and syllable is integral to the whole. As Saint Exupery put it: “You know a work of art is finished not when there is nothing left to add, but nothing left to take away.” Living life like a work of art would, ideally, involve having every aspect of your existence contribute to the poetic effect of the whole, partake in your guiding taste, your “unity of artistic style” (UM, 5). However we have one hulking hindrance that seemingly blocks this endeavor: the past. Though we can guide our becoming in the present through self-overcoming, we seem to be powerless to impose our guiding taste upon those parts of our life that predate this taste. As Zarathustra initially laments: “The will cannot will backwards ... that is the will’s loneliest melancholy” (Z, II, 20). However, he goes on to offer an avenue — a certain way of living — that would indeed allow the past to be brought into line with our current style.



One can use the psychological test of “the eternal recurrence” to ascertain whether one is living in such a manner. The test goes as such: What if a demon were to “steal after you into your loneliest of loneliness and say to you: ‘This life as you now live it and have lived, you will have to live once more and innumerable times more ...’” (GS, 341). Would you be satisfied enough with how you have lived your life so far to say: “Yes! Once more!” Or would you be terrified at the thought? Would you plead with the demon to give you a ‘do-over?’ The eternal recurrence test should inspire the self-creator to live in a way that he or she would be willing to live it eternal times more. This view makes every action and event reverberate with eternal significance because we have only *this* life to shape the wet cement of our existence before it sets for eternity.

Essential to eternal recurrence is that *no* aspect of our lives is unnecessary. If we were to change one aspect or event of it, we would not be who we are, we would be someone else. Nehamas puts it best: “a life that was different in any way would simply not be our life: it would be the life of a different person. To want to be a different in any way is for Nietzsche to want to be different in every way; it is to want, impossible as that is, to be somebody else” (Nehamas, 156). The self-creator wants only to be himself or herself. She or he will “learn more and more to see as beautiful what is necessary in things” and acquire *Amor fati*, the love of fate, which will in turn allow him or her to “be one of those who make things beautiful” (GS, 276): that is, a creator.

## Why We Should Create Ourselves

This idea allows us to segue from ‘how’ one might create oneself as a work of art to grounds for ‘why’ one might do so. Though Nietzsche never systematically spelled out the various grounds on which he extolled self-creation — or systematically spelled out any other topic, for that matter — we can construct an interpretation from his body of work to divine his whys and wherefores. Returning to our line of inquiry, consider Zarathustra’s statement:

Have you ever said Yes to a single joy?  
O my friends, then you have said Yes too to all woe. All things are entangled, ensnared, enamored; if ever you wanted one thing twice, if ever you said, ‘You please me, happiness! Abide, moment!’ then you wanted *all* back. All anew, all eternally, all entangled, ensnared, enamored (Z, IV, 19).

Self-creation is a method for affirming not only some aspects of our life but all aspects of our life, and indeed, of affirming *all* of life. “Creation... is the great

redemption from suffering” for we can affirm our woes because “much bitter dying” is necessary so “that the creator may be” (Z, 199). Thus, self-creation opens the door to Nietzsche’s conception of redemption: “The deep instinct for how one must *live*, in order to feel oneself ‘in heaven,’ to feel ‘eternal,’ while in all other behavior one decidedly does *not* feel ‘in heaven’ — this alone is the psychological reality of ‘redemption.’ A new way of life, *not* a new faith” (A, 33).

When we attain a new way of life through the self-overcoming of our self-creation, we can feel ‘in heaven,’ which means the feeling that we have overcome ourselves, that we are ‘turning out well,’ that we have Nietzsche’s conception of happiness: “The feeling that power is *growing*, that resistance is overcome” (A, 2). When we feel that we are ‘becoming who we are,’ we redeem every aspect of our lives because all were necessary to bring us to this present. In this way we “will backwards” and shape the fragments of our past — our “it was” — into “thus I willed it” (Z, II, 20) by resetting them into this newly created narrative of our selfhood.

However the preponderances of ‘I’s and ‘self’s in this paper leads us to a criticism of Nietzsche’s concept of self-creation and his philosophy in general: isn’t it egoistic and narcissistic? What could be more conceited than walking around saying “*my* great project is to live *my* life as a great work of art?” Could society function if every member focused selfishly on his or her own life?

First of all, Nietzsche doesn’t believe *anybody* acts unselfishly. We see this stance reflected in the quote: “Magnanimity contains the same degree of egoism as does revenge, but egoism of a different quality” (GS, 49). Everybody ultimately does what she or he wants, thus every action is egoistic: an instrument used to fulfill a desire or drive. This is seen in Nietzsche’s critique of the ascetic ideal or a more quotidian example: If you are on a diet and you deny yourself food that you want to eat, it may appear that you are *not* doing what you want. However you are actually just choosing to satisfy the desire to lose weight rather than the desire to have sensual pleasure. Nietzsche interprets altruistic acts in the same way. Self-creators do not deceive themselves and compromise their intellectual conscience by costuming egoism in the garb of altruism.

Though all our actions are inherently egoistic, as the above quote shows, egoistic actions differ in terms of quality. After admitting that we always do what we think will achieve our wants, self-creation involves *wanting the right things*. These ‘right things’ will be specific to our own taste and ‘straight line and goal,’ but insofar as we will want to create ourselves as someone ‘noble and high’ and not ‘petty and low’ — admitting these values are defined according to individual taste — we will eschew the petty egoism of revenge that harms

both avenger and target in favor of the noble egoism of magnanimity. Honest egoism that avoids resentment is good for both the egoist and the world at large because Nietzsche believes resentment is harmful for both the resenter and the target of resentment.

The hallmark of narcissism is excessive self-reflection; this was literally what entranced Narcissus. Nietzsche attacked excessive self-reflection not only on the grounds delineated above, i.e., that it can freeze becoming into the stasis of being, but on the related grounds that narcissism, excessive self-love, halts our self-overcoming. If you 'love yourself just the way you are' you won't seek to improve on what you are. Thus Nietzsche believes the self-creator will actually be concerned with people beside herself or himself. As he says: "Morally speaking, neighbor love, living for others, and other things *can* be a protective measure for preserving the hardest self-concern. This is the exception where, against my wont and conviction, I side with the 'selfless' drives: here they work in the service of self-love and self-discipline" (EH, II, 9). Insofar as these altruistic motives and deeds prevent us from falling into the infinite regress of full-blown narcissism, they actually turn out to be our own best interest, as well as others. The 'hardest self concern' involves *not always being* concerned with yourself. Because self-creation involves the avoidance of excessive self-reflection, it is not narcissistic.

The self-creator will actually manifest the 'altruistic' morals of the herd: "[Y]ou will always encounter [poverty, humility, and chastity] to a certain degree" in the lives of "great, fruitful, inventive spirits" (GM, III, 8). However the self-creator does not achieve this directly, but as the unintentional result of his or her project of self-creation. Because self-creation involves cultivating certain desires, virtues, and projects, it necessarily entails forgoing all other 'non-essential' desires, virtues and projects. The self-creator forgoes these selfish desires because he or she recognizes life as a zero-sum game. She or he simply has better things to do than strive for such transient self-gratification.

If we look at Nietzsche himself as representing the self-creator or overman, we see that the overman, is not some malevolent, egotistical wrecking ball smashing everything in its wake as it follows its own trajectory. Nietzsche, the 'great immoralist,' was a decent and polite man. Though he would have hated the terms, he was 'nice' and 'kind,' someone whose last sane act was to embrace a horse that was being cruelly beaten on the streets of Turin. Though he 'selfishly' gave himself a personal categorical imperative, this morality was actually stricter than those around him. Thus such an egoistic project does not mean you will automatically exploit and harm those around you.

Indeed, Nietzsche suggests this selfish project will help both oneself and others in two important ways. First of all, the process of self-creation, of 'giving style to one's character' allows one to "*attain* satisfaction with [oneself]" (GS, 290). This satisfaction is desirable because, for Nietzsche, petty and negative behavior stems from dissatisfaction with oneself, from being ashamed of who one is. Ashamed persons seek ways of denying responsibility for having 'turned out bad' and thus they seek to denigrate the world around them, whether in general or particular people around them. When Nietzsche says: "Whom do you call bad? — Those who always want to put to shame" (GS, 73), he means these dissatisfied people who devalue those around them in order to bring others 'down to their level.' Conversely, the self-satisfied, self-creative individual does not 'bring others down' but instead not only spares others shame (GS, 74), but potentially 'raises others up' by providing them an example of a liberated individual, for Nietzsche considers "the seal of liberation" to be "no longer...ashamed in front of oneself" (GS, 75). As the maxim has it: You have to love yourself before you can love someone else. Self-creation is a means of becoming excellent and this in itself contributes to both society and individual, for Nietzsche holds that "civilized conditions" require "everyone [to be] superior in one thing" for this allows the individual to both "be helpful and...thus feel free to accept help without a sense of shame" (HH, 509).

Secondly, the self-creative individual's path to self-creation is by no means entirely an 'internal' affair. The creator will necessarily seek ways of externally manifesting his or her virtues and talents, whether as a painting, a building project, a book or, as in Nietzsche's case, a philosophy. Because this creation will manifest the creator's individual and idiosyncratic talents, will be something that *only she or he* could have produced, he or she will give the world something unique and never before seen, thus pushing forward the possibilities of what human beings are capable of producing.

Why will the creator externally manifest his or her virtues? If we are what we do, the only way to be great is to do something great. The creator will be such a fruitful and generative force, she or he will 'flow over' with creativity and from this overflow will contribute to those around him or her out of what Nietzsche calls the "gift-giving virtue." This gift-giving both benefits the giver and the receiver. Thus the fruits of self-creation blur the lines between altruism and egoism. The world is a better place because, say, Beethoven 'selfishly' chose to chase the limits of his talents as far they would take him.

This cultivated fruitfulness of the creator ultimately creates that creator and his or her creation. This brings us

to perhaps the most important reason for why one should create one's self. Nietzsche denies all otherworlds. Without God, Heaven, and the soul, it seems we are denied the possibility of outliving our death, denied immortality. However self-creation and its fruit, the creation of some great work, offers us a path to a *this-worldly* immortality. In death, when the creator "himself is now nothing but the grey ashes" "the fire" kindled by his great works can continue to blaze, thus when one considers that "every action performed by a human being becomes in some way the cause of other actions, decisions, thoughts, that everything that happens is inextricably knotted to everything that will happen, one comes to recognize the existence of an actual *immortality*, that of motion" (HH, 208). We live on to the extent that our actions continue to produce effects in the world after our death. Those self-creators who have cultivated greatness and produced great works can achieve this secular immortality. By discussing and freshly interpreting Nietzsche's creations here, I have in a small manner perpetuated and contributed to his "immortality of motion" set in motion over a century ago.

We can question the worth of self-creation from another perspective: Nietzsche's perspectivism. This philosophical position poses problems for proselytizing: because he denies that humans have access to universal truths, he concludes that our conceptions of reality are always subjective by virtue of the limited perspective from which we observe them. Science, freewill and other treasured concepts are, ultimately, "necessary fictions" that simplify, and thus falsify, reality into a manageable shape. Nietzsche recognizes "untruth as a condition of life" (BGE, 4). If this is so, does that not mean that Nietzsche's own philosophy is just another assemblage of untruth? If so, why would we pick this interpretation over another?

Nietzsche, to avoid being a self-deceptive hypocrite, must admit that his philosophy *is* only an interpretation. However this is not damning: according to this interpretation, interpretations are all we *can* have. To demand more is impossible. To believe you have 'The Truth' is to delude yourself out of a weakness of character that demands a degree of certainty humanity is not capable of attaining. The self-creating master merely *desires* certainty, while the slave *demand*s certainty (GS, 288). Furthermore, some falsehoods are more false than others. All interpretations are not created equal. To interpret Nietzsche's work as, say, a Christian apologetic is certainly a worse interpretation than the one this paper presents. Such an interpretation would be willfully misreading reality or reading into it things that are not there — which is what Nietzsche believes Christianity does when it 'reads into' the 'text' of reality the unreal realms of heaven and hell. Thus Nietzsche believes his

untruths are less false than Christian untruths because he has undertaken the creation of his worldview with an 'intellectual conscience' that seeks the truth as much as possible, though ultimate attainment will always elude it.

Our worldview is intimately connected with our morality and ourselves. All three interpenetrate and influence the becoming of the others: thus the falsehoods we live by influence who we become, who we are. Nietzsche's ultimate grounds for favoring his philosophy over others is that he believes it will produce a better you, a better humanity, usually expressed with the metaphor of 'health.' His philosophy will make you 'healthy' enough to achieve great things. But this just continues the shell game of justification. What makes something healthy? For Nietzsche, something is healthy to the extent that it is 'life-promoting.' Because "[l]ife itself is to my mind the instinct for growth, for durability, for an accumulation of forces, for *power*" (A, 6), life-promoting or healthy acts are those that make us grow in power and durability. But this definition of life, which is the basis of these valuations, is itself another interpretation, another untruth. Without recourse to a universal ground of morality, Nietzsche cannot ultimately justify why his values are better than others. To justify something means to judge it necessary or right according to criteria outside of the situation justified. Nietzsche's denial of a humanly knowable absolute truth lying outside of human understanding precludes the possibility of these outside criteria.

The impossibility of external justification for our project of self-creation brings us back to our theme of 'living life like a work of art.' Now we can see that this trope appealed to Nietzsche precisely because art creates its own justification. Great works of art justify themselves not by recourse to some outside source, say a literary theory, but from within, from the very appeal of their appearance. This is the meaning behind Nietzsche's statement: "Only as an aesthetic product can the world be justified to all eternity" (BT, 5). When Nietzsche later 'revises' this statement to only "as an aesthetic phenomenon" is existence "still *bearable* for us" (GS, 107) he is simply taking his original thought to its logical conclusion: if we live our life artfully, we ourselves are our own justification for ourselves; as such, this project of living ever more artfully gives a meaning to our life, a *why* to life. This project makes life bearable by giving meaning to our suffering, for man will endure any *how* so long as he has a *why*.

Ultimately life is "full of sound and fury/signifying nothing" (Shakespeare, *Macbeth*, Act V, Scene V). But why should we use the words "ultimately meaningless" with a slanderous intent? The notion of "ultimate meaning" is nonsensical. We should not



condemn the world for not being as we would like it to be. We should take the world as it is. Like it or not, this world and this life are the only ones we have. The philosophy and the philosopher that Nietzsche created orbit around one goal: not just to ‘like’ the way things are, but to love them, to affirm life in such a world. This is the mindset of the noble free spirit, the self-overcoming self-creator: earnestly self-overcoming to create a greater and greater self, all the while recognizing this self and its worldview, its tablets of virtue are all ‘holy lies’ and thus not taking it all so seriously, reveling in the lightness of being: in this way we are paradoxically serious enough to work toward our goal while being able to laugh at ourselves, able to “laugh and be elevated at the same time” (Z, 153).

It is a testament to the unity of Nietzsche’s thought that we find this same idea in his first work: “The Dionysian man...realize[s] that no action of [his] can work any change in the eternal condition of things... [and thus] in order to act [he] require[s] the veil of illusion” (BT, 7). These illusions, which we recognize as illusions, still allow us to love our fate and our world enough to create: “For it is only in love, only when shaded by the illusion produced by love...that man creates” (UM, 95).

With this love of this world and our fate within it, hopefully we will have the bravery and passion to live dangerously under the aspect of eternity in order to become who we are, a corona of energy managing to manifest its flux into its most luminous of possible forms before ultimately returning to the surging, eternal maelstrom of energy that is life. We become the child who understands the meaning of Nietzsche’s most beautiful and powerful aphorism:

Seriousness in play — In Genoa at the time of evening twilight I heard coming from a tower a long peal of bells: it seemed it would never stop, resounding as though it could never have enough of itself, of the noise of the streets out into the evening sky and the sea breeze, so chilling and at the same time so childlike, so melancholy. Then I recalled the words of Plato and suddenly they spoke to my heart: *Nothing human is worthy of being taken very seriously; nonetheless...* (HH, 628).

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## Abbreviations:

- A — The Antichrist  
 BGE — Beyond Good and Evil  
 BT — The Birth of Tragedy  
 D — Daybreak  
 EH — Ecce Homo  
 GM — On the Genealogy of Morals  
 GS — The Gay Science  
 HH — Human, All Too Human  
 TI — Twilight of the Idols  
 UM — Untimely Meditations  
 WS — The Wanderer and His Shadow  
 Z — Thus Spake Zarathustra

## Acknowledgements

I would like to thank Dan Breazeale for the way he taught his Nietzsche class. The course for which this paper was written was by far the most demanding I’ve taken at UK, requiring us to read all fifteen of Nietzsche’s published works and turn in a two page response paper at each class meeting. Dr. Breazeale’s passionate excitement in teaching Nietzsche was infectious, inspiring us to meet his massive demands and to put into this class as much of ourselves as we could so that we could, in return, receive as much as possible back from the class. I consider Dr. Breazeale to be an educator in the same high sense that Nietzsche praised Schopenhauer as his educator: not someone who fills his pupils with facts, but one who draws out from his students their own unique potentials.



**H**ow can developing countries build strong governments and dynamic economies to improve the lives of their people? As a Foreign Language and International Economics major, I became intrigued by this question throughout my undergraduate studies. The focus of my research project, Fair Trade coffee, was especially interesting to me as a tool for economic development. Fair Trade represents a non-governmental attempt to address the effects of a volatile

coffee market on farmers in developing countries. Through my research, I gained a lot of experience doing statistical analysis and came up with a few surprising results. I look forward to pursuing my interests further in graduate study, followed by a career in academic research.



**Faculty Mentor:**  
**Christopher Bollinger, Department of Economics**  
**Gatton College of Business & Economics**

Increased social awareness of worldwide poverty has led to a number of interesting programs designed to aid development without simply giving money. One such program is the Fair Trade Coffee movement, which pays higher than market prices to farmers who grow coffee meeting certain agriculture and labor standards. This program can be viewed as a simple price floor, but is unusual in that it is an agent operating in the market rather than a government entity guaranteeing the price. This type of market intervention has not been well studied. Erin Troland noted that classic price floor theory would suggest that ultimately the Fair Trade movement could have the impact of lowering average prices in the market rather than raising them, because farmers would be induced to produce higher output. However, she also noted this impact depended upon many factors. Other models can suggest either higher prices or simply no change in prices. Erin collected extensive production and price data at the country level for a period of up to sixteen years. She then estimated models for the price and quantity of coffee. One concern, given that participation in Fair Trade is optional, is that countries with historically low coffee prices (relative to the world price) would be most likely to participate. Erin used a number of approaches, including fixed effects estimation, to control for this issue. Her research finds that indeed the Fair Trade movement has the unanticipated effect of reducing coffee prices by at least 10% in countries with participating growers, and increasing production by as much as 20%. Her results demand further investigation and are a fruitful area for further research. The paper is well written and professionally done.

## What Is Brewing in Your Latté? – An Economic Analysis of the Fair Trade Coffee Movement

### Introduction

In late December of 2003, Ethiopian coffee farmer Hayder Hassan found himself in a grim situation:

“Three years ago you could get twice as much for a kilo of coffee as you do today... We have no factories or any other means to live here. We dream of a better price for coffee, but only the government or God can assist us.” (Oxfam America)

Beginning in the late nineties, coffee prices on the world market began to plummet to record lows. In 2002, the International Coffee Organization (ICO) published a report stating that world market prices were at a 100-year low in real terms and called the situation a “global coffee crisis.” The ICO attributed the crisis to vast overproduction fueled by the rapid rise of coffee production in Vietnam and Indonesia.

Coffee is one of the world’s most valuable traded commodities, providing the livelihood for an estimated 125 million people worldwide (Osorio, 2). In other words, a version of Mr. Hassan’s story could be repeated 125 million times over. Moreover, coffee accounts for a very large share of total exports in some of the world’s poorest countries. In Burundi, Rwanda, Uganda, and Mr. Hassan’s Ethiopia, coffee accounts for at least one fifth of total exports (International Trade Center). All four African nations have a calculated per capita Gross National Income (GNI) of \$300 or less (World Development Indicators 2006). Clearly, “a ‘coffee crisis’ is therefore a crisis of development” (Ronchi, 2).

The coffee market is currently in the process of recovering from the crisis. Prices have begun to climb over the past few years. However, the effects of the coffee crisis are still being felt around the world. As Mr. Hassan dreamed of a better price for his coffee, governments and aid organizations around the world proposed various programs to alleviate poverty caused by the crisis. One such

program began to gain popularity as the crisis continued, though it had existed in some form for several decades. As coffee farmers saw coffee prices reach record lows, the demand for certain types of coffee bearing the label “Fairtrade Certified” began to take off. Each bag of such coffee, though typically more expensive than most, carried the prospect of poverty alleviation in countries hit by the coffee crisis.

The theory behind the Fair Trade movement is that certain market failures, such as lack of market power and asymmetry of information, decrease the return to farmers and increase their vulnerability to volatility in the market (Ronchi, 1). Logistically, the program involves the cooperation of four parties: the producers, the fair trade organization, the distributors, and consumers. Producers promise to uphold certain environmental and labor standards set by the Fair Trade organization in exchange for the right to call their product “fair trade certified.”

The fair trade organization sets a minimum price (above that of the market) at which distributors may purchase the fair trade products. Distributors buy these certified products at the above-market fair trade price in exchange for the right to sell the products as fair trade certified. Consumers can then purchase these fair trade labeled products, (typically more expensive than non-certified products), with the knowledge that producers were paid above market price and were required to uphold certain environmental and labor standards.

In 1997, most of the major fair trade organizations centralized the inspection, certification, and price determination process by creating the independent Fairtrade Labeling Organization International (FLO). Only coffee bearing the “Fairtrade Certified” label has been independently certified by FLO. (The term Fair Trade refers to the movement as a whole. “Fairtrade” is a registered trademark of Fairtrade Labeling Organization International, which certifies the vast majority of Fair Trade coffee.) Since the centralization of the labeling and certification process, the demand for Fairtrade coffee has risen dramatically. Since its introduction to North America in 1998, the market has grown an average of 65% per year in the US alone (Ronchi, 3). According to the International Trade forum, sales are also very strong in Europe, growing at an average rate of 20% per year since 2000.

This dramatic growth illustrates an increasing concern among consumers in developed countries for the well-being of coffee producers such as Mr. Hassan in Ethiopia. These consumers purchase fair trade coffee with the intention of helping such farmers cope with the hardships of the coffee crisis. This paper aims to discover if these good intentions are translated into sustainable relief for Mr. Hassan and the rest of the world’s coffee growers.

Because Fairtrade pays producers above the market price, some might argue that such a policy distorts the market for coffee and decreases average coffee prices in a given country. Basic supply and demand theory predicts a positive relationship between price and supply. High prices increase supply by attracting new farmers to the coffee market and encouraging existing farmers to increase their yield. The above-market Fairtrade price then provides an incentive to farmers to grow more coffee. This response not only perpetuates their dependence on coffee, but results in the overproduction of coffee, causing market prices to fall. Because the vast majority of producers do not sell to the Fair Trade market, these non-Fair Trade producers would have to suffer this decrease in price. Moreover, for those who do sell to the Fair Trade market, Fairtrade sales represent only a fraction of their yield (Ronchi, 4). Their participation in the Fairtrade market may increase the price at which they sell one fraction of their coffee, but decrease the price at which they sell the remaining fraction.

However, it is also possible for Fair Trade to have a positive impact on market price. Fair Trade encourages quality improvement among its producers. Investment in higher quality could improve profit margins, as consumers in developed countries are clearly willing to pay top dollar for a “premium” cup of coffee. Non-Fair Trade producers may be encouraged to take advantage of this premium market by their distributors. These producers could make improvements in quality without having to incur the costs of adopting Fair Trade labor and environmental standards. Fair Trade could encourage quality improvements among non-Fair Trade growers in a given country, resulting in higher market prices for coffee.

This paper will examine the following question: How does Fair Trade presence in a given country affect market prices paid to non-Fair Trade growers?

To test for the relationship between price and Fairtrade, I gathered average prices paid to growers in coffee exporting countries over the period of 1990-2006. I controlled for supply shocks (droughts), demand shocks (GDP of principal export market), and sticky price response (lagged price). I also included a time trend variable to control for overall market fluctuations.

Regression results suggest a negative relationship between equilibrium price and Fair Trade presence in a given country. Price regression analysis predicts market prices in countries with Fair Trade presence to be an average of 9.50% — 17.04% lower than in countries without Fair Trade. I also ran an export regression with the same market shock variables. Export regressions predict a positive Fair Trade effect on exports, which corresponds with the theory that Fair Trade encourages overproduction.



## Background Information: The Coffee Market and Fair Trade

### 1. Coffee and Coffee Exporting Countries

As many as 70 countries are exporters of coffee. Most of these nations are located in Latin America and Africa, though several Asian nations also have considerable presence in the world coffee market. These countries produce and export the two main varieties of coffee: Arabica and Robusta. Arabicas, mostly grown in Latin America, typically fetch higher prices on international markets than their Robusta counterparts (Food and Agriculture Organization of the United Nations). Arabicas are considered to have a more subtle taste than Robustas. Robustas, as the name implies, have a much more robust flavor, which some consider to be “an inferior tasting beverage with a higher caffeine content” (Coffee Research Institute). Africa and Asia produced the majority of Robustas.

The world’s coffee exporters are some of the poorest nations in the world, intensifying the considerable humanitarian implications of a coffee crisis. Over half of these countries had a 2006 per capita GNI of less than \$3,595, falling into the Low Income and Lower Middle Income groups as defined by the World Bank. Only 6 coffee-exporting countries, 5 of them Latin American, made it into the Upper Middle Income category (\$3,596-\$11,115 per capita GNI). No major exporter of coffee is in the highest income range of greater than \$11,115 per capita. The closest country is Mexico with a per capita GNI of \$7,870, still well below the lower bound for high income.

Even more telling are the figures for coffee as a percentage of total exports. Of the four countries for which coffee accounts for more than 15% of total exports, all four fall into very bottom of the Low Income category for 2006, with per capita GNIs of \$300 or less (International Trade Center). Burundi, in which coffee accounts for over half of total exports, is ranked at the very bottom of the World Bank GNI rankings, with a per capita GNI of \$100. These developing nations are, therefore, extremely vulnerable to price volatility in the world coffee market. (See Figure 1)

Fair Trade is an attempt to address such price volatility. However the regression results suggest that in exchange for lower vulnerability for Fair Trade growers, the program may, in fact, be causing increased vulnerability for non-Fair Trade growers by lowering the equilibrium price market price.

### 2. Prices, Production, and the Coffee Crisis

The coffee market is currently in the process of recovering from a decade-long crisis that caused extreme hardship for millions of farmers worldwide. In 1997, coffee exports were valued at an estimated \$12 billion, second

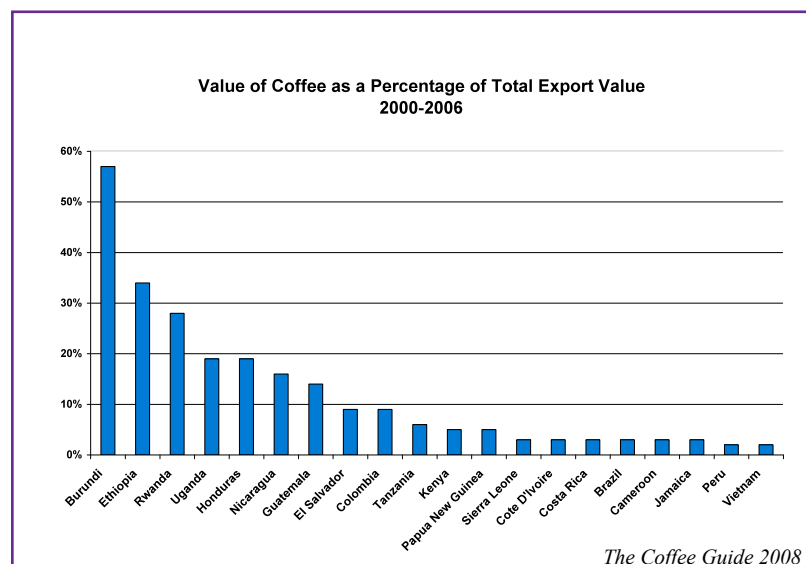
only to oil in terms of overall market value for commodities (International Trade Center). By 2001, export values plunged to a mere \$4.9 billion, less than half the pre-crisis value (International Trade Center).

The recent coffee crisis was a classic case of overproduction in which rapid expansion in supply outpaced demand. Figure 2 and Figure 3 illustrate the particular overproduction crisis of the coffee market. Before 1989, the world market was rigidly regulated through a system of quotas that had existed in some form since 1963 (ICO). The beginning of the 1990s represent a period of market adjustment when overall production and exports fell to a decade low of around 87 million bags by the beginning of 1995.

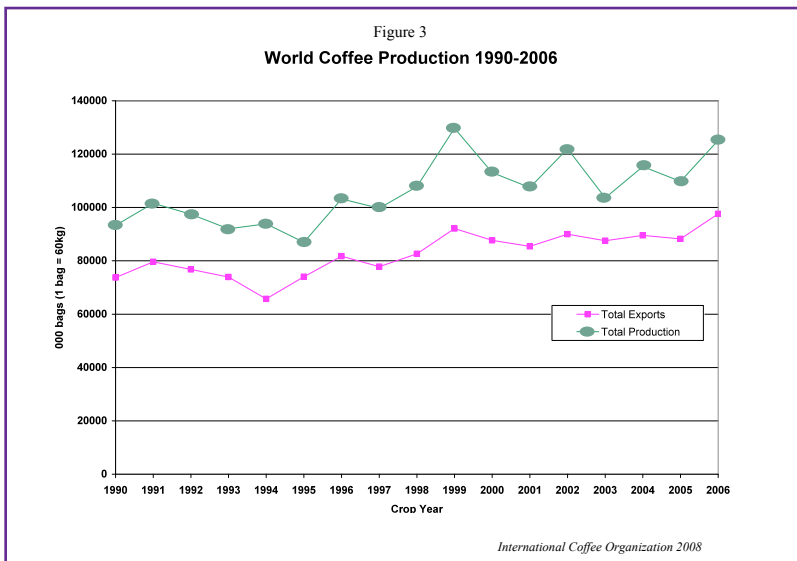
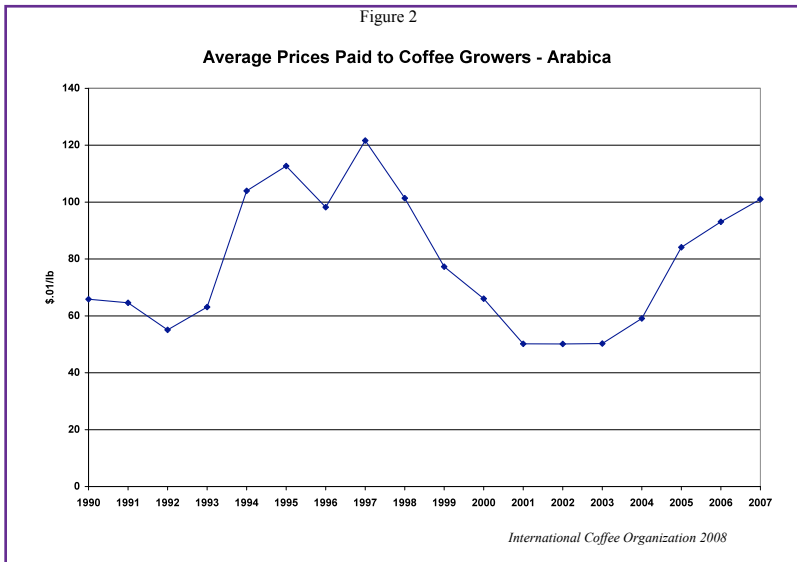
After declining a bit in the beginning of the decade, prices began a period of rapid growth. Such high prices and the collapse of the quota system lured new producers into the market, both in countries with historically high market shares of coffee production and in countries relatively new to the coffee market. Specifically, production in Brazil, the world’s top producer, and Vietnam increased dramatically in the mid to late 1990s. Vietnam’s market expanded so fast that by 1999 it had eclipsed Colombia as the world’s second largest producer of coffee (Food and Agriculture Organization of the United Nations).

In response, prices plunged to record lows. The very prices that had lured a multitude of thousands of producers to the market began to fall rapidly. The market had overcorrected as too many producers entered the market, causing an overproduction crisis. Averages of prices paid to coffee growers reveal an equally dramatic decrease nearly simultaneous to the large increase in coffee production and exports. Farmers in some of the world’s poorest nations faced increasingly greater hardships as the crisis wore on.

Figure 1



The Coffee Guide 2008



### 3. The Characteristics and Distribution of Fair Trade in the Coffee Market

The Fair Trade movement's rise to prominence was simultaneous to the dramatic collapse of world coffee prices. The movement first took off in Europe in the late 1990s and was introduced to US markets beginning in 1998. In 2003, Fairtrade coffee represented as much as 2.5-3% of the coffee market in Great Britain, Switzerland, and the Netherlands. Fairtrade's share in the US coffee market was about 1% for the same year. However, as the world's largest importer of coffee with an industry valued at \$22 billion, 1% is nonetheless a considerable amount (Transfair USA 2007). Fair Trade's market share continues to expand; the latest figures estimate a 3.31% market share in the US for 2006 (Transfair USA 2007).

Fair Trade guarantees farmers a certain minimum price for coffee. For Arabica coffee, the minimum price

is \$1.21 per pound. Beyond the minimum price, Fairtrade requires an additional \$0.10 per pound Fairtrade premium to be allocated for use by the coffee cooperative for various development projects. When the price of Arabica coffee on the New York Board of Trade (NYBT) exceeds \$1.21, the Fairtrade price is then equal to the NYBT price plus an additional \$0.10 (FLO 2007).

Fairtrade is heavily concentrated in Arabica-exporting countries. Of 33 Arabica-exporting countries, 25 have at least one Fair Trade cooperative. Of those 25, 22 have had Fair Trade cooperatives operating within their borders since 1999. Of 23 Robusta-exporting countries, only ten have Fair Trade presence. Eight out of those ten also export Arabica.

Arabica production is concentrated in Latin American, a region that has a long tradition of coffee cultivation. It is home to both the largest number of Fairtrade cooperatives (199 in 2006) and the largest number of countries that export Fairtrade coffee. Mexico has the greatest number of cooperatives selling Fairtrade coffee, 41 total in 2006. Fairtrade cooperatives exist in 14 Latin American countries, six of which are home to at least 15 Fairtrade cooperatives (Transfair USA 2007).

African countries were home to 32 Fairtrade cooperatives in 2006. Nearly all of these countries are in the World Bank's Low Income category in terms of 2006 GNI per capita. Moreover, coffee accounts for a large fraction of total exports for these African nations.

Asian countries have the smallest number of Fairtrade cooperatives. Indonesia and India have very few cooperatives as compared to Latin American countries such as Guatemala with similar production figures. Vietnam, the world's second largest exporter of coffee, has no Fairtrade presence at all.

### Variables and Data Sources

I pooled average price and quantity data from the International Coffee Organization historical statistics database for 33 Arabica-exporting countries from 1990-2006. Due to the heavy concentration of Fair Trade in Arabica-exporting countries, I chose to restrict my analysis to Arabica production only. Moreover, most Robusta-exporting countries that are home to Fair Trade cooperatives are also exporters of Arabica.

The two dependent variables are average price and average quantity. Average price is the average market price paid to growers in each country in a given year. Quantity is the amount exported by each country in a given year measured in standard 60 kg bags.

As previously noted, there are two main varieties of coffee: Arabica and Robusta. Most countries specialize in either one or the other. There are several countries that export a mix of both varieties (ICO). However, export data broken down by coffee variety were not available for periods prior to 2006. For these countries, I used ICO

export data from 2006 and 2007 to calculate the percentage exported of each variety. I then extrapolated these percentages to the preceding years to estimate quantities of each variety exported over the entire time period. Though Arabica and Robusta are priced differently, prices for both varieties tend to fluctuate together as a function of the coffee market as a whole. Relative prices tend to remain fairly similar. Consequently, there is little incentive to substitute one variety for the other when both varieties maintain the same price relative to each other. As a result, I concluded that export percentages should be relatively constant over time.

Table 1 and Table 2 present descriptive statistics for price and quantity. Clearly, there is considerable variation in both variables. The minimum price over the entire time period was a rock bottom 12.9 cents per bag in Madagascar at the height of the coffee crisis in 2001. The maximum price was \$3.55, twenty-seven times that figure, paid to Jamaican growers in 2006. However, Jamaican coffee is highly specialized (Coffee Research Institute). Coffee prices in this Caribbean nation are typically two to three times the average price paid for coffee produced in other countries. A more accurate figure is the 1997 figure for Kenya, \$1.85 per bag when coffee prices peaked just before the coffee crisis.

Exports exhibit an equally wide variation. Brazil is the dominant producer in the world, producing nearly twice as much as the second largest producer, Vietnam. The top 20 producers excluding Brazil exported an average of 3,012,312 bags per country in 1997 when prices reached their decade high. That figure barely budged when prices reached record lows in 2002, when producers exported an average of 2,969,595 bags. Clearly, supply response was quite delayed in the face of falling prices.

The independent variables include controls for supply shocks (droughts), demand shocks (the GDP of the principal export) and the variable of interest, Fair Trade.

I pooled drought data from the International Emergency Disasters Database. The severity of the drought is measured by the estimated number of people affected by drought annually in each country. Ideally, other sources of supply shock, such as changing prices of fertilizers and pesticides, would also be included. However, data was unavailable for these types of supply shocks.

To control for demand shocks, I collected GDP data (real US dollars (USD)) in the principal export market for each coffee exporting country from the Penn World Tables. I identified the principal export market based on geography. The United States imports the bulk of coffee produced in the Western Hemisphere. Therefore, I designated the United States as the principal export market for Latin American and Caribbean countries.

The exception is Cuba. Due to the American embargo, Cuba's principal export market is not determined by geography. Asian countries export most of their coffee to Japan. African countries' main export market is Europe, whose top three coffee importers are Germany, Italy, and France. I combined the real GDPs for these three countries as a measure of the principal export market for African nations.

Fair Trade data were gathered from Fairtrade Labeling Organizations International and Transfair USA. Unfortunately, specific yearly export data were not available for all countries with Fair Trade. Consequently, the Fair Trade variable is a dummy variable whose value is 1 if Fair Trade was present in a given country in a given year and 0 if Fair Trade was not present.

Table 1

Price (\$0.10 USD)		
Mean	77.39	
Standard Error	2.34	
Median	64.23	
Standard Deviation	49.70	
Range	341.97	
Minimum	12.92	Madagascar 2001
Maximum	354.89	Jamaica 2006
Count	453	

Table 2

Exports (60kg bags)		
Mean	1,757,887	
Standard Error	163,963.5	
Median	522,490.5	
Standard Deviation	3,883,547	
Range	26,749,980	
Minimum	3,014	Philippines 2001
Maximum	26,752,994	Brazil 2002
Count	561	

## Methodology

I first pooled average prices and quantities for coffee exporting countries over the period of 1990-2006. I chose to begin collecting data in 1990 because prior to the nineties, members of the ICO participated in a quota system that limited exports. Therefore, 1990 marks the first year in which market forces began to take control of the coffee industry.

I ran two different types of regressions to evaluate the effect of Fair Trade on market prices paid to growers in a given country. The first type of regression is an



Ordinary Least Squares (OLS) regression:

$$P_c = B_0 + B_1P_{c,t-1} + B_2D_c + B_3FT_c + B_4GDPEX_c + B_5TRD_c + B_6TRD_c^2 + \epsilon_c$$

Price ( $P_c$ ) is the dependent variable. Clearly, many things could affect the market price for coffee in a given country other than Fair Trade: weather, prices of inputs (fertilizer/pesticides), and demand for coffee. I wished to isolate the effect of Fair Trade on market prices, holding all of these other factors constant. The OLS regression does just that. The drought and export market variables serve as “control” variables, allowing me to analyze the effect of Fair Trade by itself.

The variables on the right side of the equation are the independent variables discussed in the previous section ( $D$  = drought,  $FT$  = Fair Trade,  $GDPEX$  = GDP of main export market). The coefficients represent the effect of a 1 unit change in the independent variable on the dependent variable (price). If  $B_4 = .005$ , then a \$1 increase in the GDP in the main export market results in a \$.005 increase in the average price paid to growers. However, as evident from Table 1, there is huge variation across countries in prices paid to growers. A \$.005 increase in price in high-end Jamaican coffee is quite different from a \$.005 increase elsewhere. Consequently, I chose to evaluate percentage changes in price rather than absolute changes.  $P_c$  is, therefore, the log of the average price paid to coffee growers for a given country in a given year. The  $B$ 's then are the *percentage* changes in price resulting from a 1 unit change in each corresponding independent variable.

There are several other independent variables included in the regression, to further control for factors influencing price other than Fair Trade.  $P_{c,t-1}$  is the lagged price, or the price paid to growers in the previous year. Average prices in commodities markets tend to be fairly sticky due to market shocks. For example, a drought causes lower yields, driving up market prices. If a drought causes prices to be higher than average in one period, we might expect the effects of the drought to continue to affect prices during the next period. Even if the drought itself has ended, coffee tree stocks might be depleted and seed quality may have gone down. The effects of the drought are, therefore, endured well after the first good rain. Including the lagged price implicitly controls for the longer term effects of such market shocks.

The last two independent variables ( $TRD$  and  $TRD^2$ ) are time trend variables. I included these variables to control for overall market trends caused by factors that may not be included in the regression. It is also likely that instead of following a straight line, these market trends may follow a more curved pattern over time. The squared term allows me to analyze the possibility of such a curved, parabolic pattern.

OLS allows for the inclusion of “control” variables such as drought, last year’s price, and market trends. These factors vary both across countries and over time. However, there are many factors that vary across countries and do not change over time (or changes are insignificant given the length of the time period). These “fixed effect” factors could include any number of things: geography, form of government, or even the cultural importance of coffee.

Any of these “fixed effects” could cause average prices to be lower in some countries than in others. In these countries, farmers have more to gain by applying for Fair Trade certification and taking advantage of the guaranteed minimum price. Therefore, countries with lower than average prices resulting from such a “fixed effect” are more likely to have Fair Trade. In such a case, this “fixed effect” is interacting with the Fair Trade variable and distorting the estimated coefficients in the OLS regression.

For example, in a given country, coffee may be quite culturally important. It has been grown by generations of farmers passing down cultivation techniques over many years. When faced with falling prices, these farmers may be less likely to diversify away from coffee to a more profitable crop. This cultural inertia further aggravates falling prices, causing average prices to be lower than in a country in which coffee has no particular cultural importance. Lower average prices encourage farmers to apply for Fair Trade and receive the minimum price. This “cultural fixed effect” is then correlated with Fair Trade, but is not controlled for in the OLS regression. Resulting estimated Fair Trade coefficients are therefore inflated.

A fixed effects regression solves this particular problem. The basic fixed effects regression model is shown below. This type of regression looks similar to OLS, but keeps track of each specific country over time. In doing so, the regression isolates the effects of factors that change over time and controls for those that do not. As a result, any fixed effect that is causing lower than average prices will no longer distort the estimated coefficient for Fair Trade.

$$P_{c,t} = B_0 + B_1P_{c,t-1} + B_2D_{c,t} + B_3FT_{c,t} + B_4GDPEX_{c,t} + B_5TRD_{c,t} + B_6TRD_{c,t}^2 + \epsilon_{c,t}$$

I also ran several more regressions in which I restricted the data to specific time sub-periods. Such restrictions also allowed for a more precise fit of the time trend variable. The first restricted regression includes only data from 1997-2006. During this time, prices followed a fairly parabolic path. During 2000-2004, the price trend followed an even smoother parabolic path. However, such an approach involved a tradeoff between the fit of the time trend and the number of observations. Each additional restriction decreased the sample size, perhaps causing accuracy to diminish somewhat.

## Results

### 1. Price

The price regressions reveal several key relationships between average price and Fair Trade presence in a given country. Most strikingly, there appears to be a negative correlation between price and Fair Trade presence. Though restricting the time period does cause the estimated coefficients to decrease in significance, the coefficients are consistently negative in all regressions. Additionally, it appears that price changes, rather than structural differences, are the major force behind Fair Trade presence in a given country. The estimated coefficients for Fair Trade are quite similar between OLS and fixed effects for all time periods, with the exception of the period from 2000-2004.

Restriction of the time period as well as the inclusion of a time trend reveals that the simultaneity of a negative price trend and the rise of Fair Trade had some impact on the estimated percentage decrease in price. The second regression predicts a 17.04% lower average price in countries with Fair Trade presence as opposed to those without. The magnitude of the estimated percentage in price difference is cut in half when the time period is restricted to 1997-2006. Such a restriction allows for the isolation of the crisis of the mid 1990s followed by the current partial recovery. This pattern of price change is clearly illustrated by the positive coefficient on the squared time trend variable.

In addition, possible fixed effects such as form of government and cultural importance of coffee do not appear to be very strong. In the first three regressions, the estimated coefficients from OLS are fairly comparable to those predicted by the fixed effects regression. However, the fourth regression reveals an entirely different result.

I chose the time period from 2000-2004 as an additional attempt to smooth the effects of the coffee crisis on the estimated coefficient for Fair Trade.

First of all, the estimated percentage decrease in price resulting from Fair Trade jumps to 35.33%, nearly twice that of the second regression (1990-2006). This time subset represents a phase in which world coffee prices hit their decade low. It is not surprising that a regression that isolates the bottoming out of the market would show such a strong negative correlation between Fair Trade and average price.

Secondly, the fixed effects regression estimates a price decrease of nearly three times the decrease that is estimated by the corresponding OLS regression. For this particular time period, it appears that possible fixed effects are having quite a large impact on Fair Trade. Moreover, the fraction of variance due to fixed effects in this regression is quite high (.869) as compared to the first three regressions.

However, it is important to consider the fact that less dramatic price fluctuations may cause the OLS estimates to be less precise. Additionally, accuracy may be diminished due to a smaller number of observations.

The remainder of the independent variables appear to have fairly predictable effects on price, indicating a good overall fit of the regression. The lagged price is consistently positively correlated with the price at a very high degree of statistical significance. This result is quite logical. Market prices are typically correlated over time. If a negative shock causes prices to be lower than average in one period, we might expect the effects of the shock to continue to negatively affect prices during the next period. Similarly, the effects of a positive shock in the previous period may continue into the current period.

The estimated coefficients for the GDP of the main export market are all positive, though not statistically significant in all regressions. This result is also expected. Growth in the main export market of a given country will likely increase the demand for the export. Increased demand shifts the demand curve to the right and increases price.

	[1] 1990-2006		[2] 1990-2006		[3] 1997-2006		[4] 2000-2004	
	OLS	FE	OLS	FE	OLS	FE	OLS	FE
lagged log price	.7797 (.0367)**	.6290 (.0438)**	.7387 (.0452)**	.4393 (.0590)**	.7490 (.0608)**	.3842 (.0756)**	.8065 (.0740)**	-.0354 (.1523)**
drought (per 100,000,000 affected)	-.1030 (.0374)**	-.1180 (.0380)**	-.1070 (.0409)**	-.0948 (.0369)**	-.0181 (.0249)**	-.0399 (.0207)**	-1.700 (2.970)**	-.0205 (.0184)**
fair trade	-.1653 (.0414)**	-.2008 (.0580)**	-.1895 (.0486)**	-.1704 (.0562)**	-.1003 (.0545)**	-.0950 (.0705)**	-.1217 (.0750)**	-.3533 (.1325)**
GDP main export mkt (\$100,000,000 USD)	.00012 (.00008)	-.00089 (.00053)	-.00013** (.00008)	-.00100** (.00038)	-.00016** (.00008)	.00100** (.0007)	.00022** (.000010)	.00175 (.00171)
time trend			.0643 (.0250)**	.1076 (.0237)**	-.9848 (.1054)**	-.9742 (.1003)**	-.8585 (.3562)**	-2.362 (.4292)**
(time trend) <sup>2</sup>			-.0038 (.0015)**	-.0080 (.0015)**	-.0420 (.0044)**	-.0390 (.0042)**	-.0371 (.0137)**	.0893 (.0168)**

Each pair of columns represents a different regression. \*Indicates statistical significance at the 1% level. \*\*Indicates statistical significance at the 5% level.

The surprising result is the negative coefficient for drought. One expects a drought to cause the yield to go down for an agricultural commodity, shifting the supply curve to the left and increasing the equilibrium price. This unexpected result brought into question the regression as a whole. As a result, I ran all of the regressions without the drought variable. However, the coefficients and standard errors on the other independent variables were practically identical. The coefficient is consistently positive (and statistically significant in the first and second regressions) and appears to have no adverse effects on the other variables. Therefore, I kept the drought variable in the regressions.

One theory for the cause of this counterintuitive regression coefficient stems from the idea of product quality. Perhaps many of the droughts were not severe enough to cause the crop to fail, but instead caused the quality of the crop to decrease substantially. When it came time for harvest, distributors were unwilling to pay a high price for an inferior product.

## 2. Exports

As noted in the data section, the overall change for exports between 1990 and 2006 was a slow but sustained positive trend. It seems that, faced with falling prices, producers had difficulty responding to market signals. The export regressions in general do not fit the data as well as the price regressions. Many of the estimates vary significantly across regressions in magnitude, statistical significance, as well as sign. However, there is a clear positive coefficient on Fair Trade in almost all of the regressions, which corresponds to the negative Fair Trade coefficient in the price regressions.

This result is consistent with the idea that Fair Trade provides a disincentive for coffee farmers to respond to market fluctuations. Instead of substituting production by diversifying their crop, a guaranteed high price encourages producers to keep producing at present levels.

Side by side comparisons of OLS and fixed effects regressions provide little explanation for the relative importance of fixed effects in determining the export volume of a given country. In the first and third regressions, the estimated coefficient for Fair Trade decreases. In the second and fourth regressions, the difference is just the opposite.

For reasons of symmetry and comparison, I ran the same series of regressions for both price and exports. However, because producers did not respond to the coffee crisis by drastically reducing output, trends in average export volumes did not mirror those of average price. Consequently, there is less need to restrict the time period in an attempt to smooth volatility in the dependent variable.

The fourth regression predicts some surprising effects, most notably a 51 % decrease in exports due to Fair Trade. This value is not only the opposite sign but also more than twice the magnitude of all other estimates. However, the overall R<sup>2</sup> value reveals that the fourth regression explains only 19.11 % of the variation in exports. The other three regressions produced R<sup>2</sup> values ranging from .4230 to .9449. Additionally, as noted with the corresponding price regression for this time period, the dependent variable did not vary substantially during this time period. Consequently, the signs and especially the magnitudes of the estimated coefficients in the fourth regression should be interpreted with caution.

## Conclusions

There appears to be some evidence of market distortion in coffee exporting countries with Fair Trade presence. Price regressions predicted Fair Trade to have a negative impact on average price paid to growers. Export regressions, though weaker overall, predicted Fair Trade to have a positive impact on total exports. Together, these results are symptomatic of a market distortion that encourages overproduction.

	[1] 1990-2006		[2] 1990-2006		[3] 1997-2006		[4] 2000-2004	
	OLS	FE	OLS	FE	OLS	FE	OLS	FE
lagged log price	.8588 (.0321)**	.2052 (.0459)**	.8588 (.0321)**	.1814 (.0422)**	.9864 (.0172)**	.4356 (.1183)**	.9837 (.0234)**	.1938 (.2182)
drought (per 100,000,000 affected)	-.1300 (.0477)**	.0958 (.0369)**	.1300 (.0477)**	.1620 (.0537)**	.0018 (.0236)*	.0111 (.0280)	-.0082 (.0309)	-.1910 (.0229)
fair trade	.1834 (.0670)**	.1016 (.0650)	.1834 (.0670)**	.2113 (.0648)**	.0363 (.0570)	.0742 (.1199)	.0348 (.0076)	-.5171 (.0070)**
GDP main export mkt (\$100,000,000 USD)	.00012 (.00008)	-.00114** (.00030)	.00035* (.00016)	.00036 (.00045)	.00003 (.00009)	.00015 (.00090)	.00005** (.00014)	-.00087 (.00208)
time trend			-.0786 (.0062)	-.0477 (.0240)*	-.0272 (.1243)	-.1150 (.1118)	.5311 (.5424)	-.2322 (.4477)
(time trend) <sup>2</sup>			.0029 (.0033)	.0002 (.5754)	-.0015 (.0054)**	.0039 (.0047)	-.0192 (.0207)	.0092 (.0180)
Each pair of columns represents a different regression. *Indicates statistical significance at the 1% level. **Indicates statistical significance at the 5% level.								



However, the magnitudes of the estimated coefficients for Fair Trade appear unrealistically large (9.5% — 35.3% lower prices on average in countries with Fair Trade). It seems that if Fair Trade were causing such huge price decreases, there would be more opposition among non-Fair Trade growers or the governments of such countries. Part of the explanation may be the direction of causation: a negative shock causes prices to fall and farmers to apply for Fair Trade certification. The negative shock encourages the entrance of Fair Trade via falling prices. Nevertheless, one would hope that the data set used in this paper (33 countries over 17 years) would be large enough to eliminate such effects.

Another explanation is the limitation of the Fair Trade to a qualitative variable due to data constraints. Consequently, there was no measure of the amount of Fair Trade presence in each country. In 2006, Mexico had 41 Fair Trade cooperatives, while Cameroon had only two. These two countries were weighted equally in the regression, perhaps causing the estimated coefficients to be inflated. Some of this discrepancy is due to the large difference in export volume. However, there may be other relevant effects to identify. If data could be found on the number of cooperatives and the total volume of Fair Trade exports in each year, one could include some measure of the magnitude of Fair Trade in each country (controlling for the size of the coffee industry). Such a modification of the Fair Trade variable would likely lead to a more accurate estimation of the degree of influence on equilibrium price and quantity.

By no means does this paper provide a definitive conclusion as to the overall value and effectiveness of Fair Trade as a development tool. It merely suggests that when designing and implementing a program such as Fair Trade, it is important to take a more comprehensive approach to evaluating overall success. It is not enough to simply consider those who participate and benefit directly from Fair Trade.

Furthermore, the regressions in this paper are straightforward equilibrium price and quantity regressions. Additional considerations, such as social benefits and effects on areas outside the coffee market, are not included in this analysis.

More research is needed to fully measure the overall economic and welfare implications of Fair Trade. Some inclusion of social welfare is clearly necessary. Furthermore, there are other aspects of this recent economic phenomenon yet to be explored. If Fair Trade producers are paid above market price, why haven't more producers chosen to participate? What is preventing the mass conversion of traditional production to Fair Trade production? It would be interesting to do country-specific analyses as well as overall market analyses to better address these issues.

Clearly, there is a need to address the plight of farmers who depend on coffee for the livelihood of their families. The daily hardships endured by Mr. Hassan in Ethiopia represent an opportunity for development projects to alleviate his suffering along with that of coffee farmers around the world. Fair Trade's goal is a noble one: directly helping farmers who are vulnerable to the volatile coffee market. This paper reveals that the key to lasting poverty alleviation for coffee farmers is more complex than it appears. However, by no means is it beyond human capability. It is likewise significant that so many consumers in developed countries are willing to purchase coffee with the intention of helping a farmer halfway around the world. This raised awareness is an encouraging first step.

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I am a senior Theatre major at the University of Kentucky. My primary focus in my major is Costume Technology. I plan to continue my studies in Costume Technology at graduate school once finished with my undergraduate degree. Throughout my time in the Theatre department I have had the opportunity to be taught by Robert Haven, the Costume Technician in the Theatre Department, some very useful embellishing skills that are becoming a dying art for costumers.

These techniques include hand embroidery with silk and cotton floss and tambour beading. I am currently learning more advanced costume construction techniques from Nelson Fields, the Costume Designer in the Theatre Department.



#### Faculty Mentor:

#### Professor Robert Haven, Theatre Department

This embroidery and costume construction project grew exponentially over a matter of days, when Corey asked for some practice embroidery projects to do over the winter break. I knew she was capable of undertaking such an advanced project that was filled with the challenge of complex pattern matching, symmetrical draping, and period embellishment. Creating this dress by itself was closer to a graduate level activity, adding a layer of hand worked embroidery set it apart from the norm.

In addition to the actual construction of the project, Corey investigated the history of clothing at that time. The combination of both the research and the fabrication of the garment provided a unified experience and understanding of the time period and how clothing reflected the everyday culture. The simplest of details, such as cording the bottom hem, become important when one realizes that in the 1880s few streets were paved and this cord provided protection from the dirt and wear.

Corey's construction skills and attention to detail are unsurpassed, as is evidenced in the careful matching of the damask fabric across very difficult pattern shapes on the bodice. Her embroidery skills are equally polished and ones that will serve her both professionally as well as put her in a prime position to attract the attention of major graduate programs in costume technology. She has a keen eye for good design, highly developed sewing skills, and a passion for the work, a winning combination in the professional costume industry.



## 1880s Day Dress

The 1880s Day Dress and Embroidering project emerged when I wanted to practice specific embroidering techniques over last year's Christmas break. First I would like to talk about some of the history behind the dress. There are many useful sources that discuss the Victorian era clothing. Arnold (1984) is a great source that provides wonderful illustrations of the construction of women's garments from 1860 to 1940. Additionally, it is important to know that during this time period "ornamentation of dresses, coats, and wraps became very lavish with silks, braids, frogging and embroidery" (Cassin-Scott, 1971). Arnold (1984) also explains that day dresses can be referred to as "promenade dresses." Another source states that the day dresses were an important part of society in which they were primarily used for daytime social calls (Colman, 1972).

The process for creating the day dress first started with developing an embroidering design. I began by researching different embroidering books, including Nichols (1974) and Houck (1978). These great resources provided wonderful insight into what a good embroidering design should look like. After finding a suitable design for the dress, I modified the embroidering design in order that it could fit the particular areas on the bodice that I wished to embroider. Then I selected a cranberry wool crepe fabric on which to embroider the design. After tracing the bodice pattern shapes on the fabric I had to transfer the embroidering design onto the fabric as well. Once finished tracing I stretched the fabric with the design onto a frame. The embroidering design was accomplished using cotton floss; I used four different kinds of stitches: split, satin, stem, and french knot.



For the construction of the bodice I had to lay out the pattern onto fashion fabric, trying to make the most of the damask fabric. I flat lined the pattern pieces for the bodice. I then applied the embroidering to the areas on the bodice and hand finished them. Once finished, I began assembling the bodice and laid the pattern out for the skirt. Because of having a limited amount of fabric, I had to make the most efficient use of the brocade, so I used a straight to bias technique for the underskirt. For the hem of the skirt I used cording; doing this helps protect the underskirt and it also gives more body to the dress.

The over drape of the dress is done in a deep green wool crepe. I draped a piece of muslin over the underskirt and began pinning each drape I made. Then I took the muslin off but still pinned from where I had draped it and traced the pattern of the draping onto fashion paper. From there I placed the pattern onto the wool crepe and began marking with pins where the drapes should be. I placed the fabric back onto the manikin and re-draped where the original folds were.

Embroidering and other forms of hand stitches (tambour beading and Japanese silk embroidering) are an endangered art. I have been fortunate enough to learn a lot about these hand stitching skills from Professor Robert Haven. He is continuing to teach me more advance techniques in this type of art, which will help when there is need to embellish costumes and to make them more authentic to a particular time period. Being able to gain this skill will assist in keeping the art alive. Also these hand stitches will provide my portfolio with a variety of skills that will help in future career opportunities in film, television, historical reproduction, and theatre.

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**Corey Gregory and the finished Day Dress**

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*Embroidery detail*

*Front view*



*Right side view*



*Cuff detail*





*Bodice detail*



*Rear View*





*Rear detail*



**Figure 1. North Atlantic Conveyor Belt**

Based on: North Atlantic Conveyor Belt. Chart. BBC News Website. Environmental Correspondent Richard Black. 30 Nov. 2005. 08 Nov. 2007. <[http://www.thewe.cc/weplanet/news/people/abrupt\\_climate\\_change\\_event.htm](http://www.thewe.cc/weplanet/news/people/abrupt_climate_change_event.htm)>

Figure 1 illustrates the flow of the North Atlantic Conveyor Belt. The red arrow indicates warm water that is carried by the Gulf Stream from the equator. The yellow arrows designate the water in the process of cooling; some of the warmth of this water is being transferred to the air around Western Europe. The sinking regions are areas where water becomes too dense to stay in surface currents. The blue pathway represents cold water that is moving in the direction of the equator.





I am a freshman scholar at the University of Kentucky, where I double major in Arts Administration, with a concentration in music performance, and Psychology. I plan to continue to gain a comprehensive education while attending the University by pursuing extracurricular activities outside of my primary area of learning; the research and study put into this article “On the Brink: The Melting of Earth’s Polar Ice Caps” prove to be some such activities. Throughout the course of writing this submission, I have eagerly acquired knowledge surrounding the subjects of global warming causation and effects, in addition to obtaining valuable research and composition skills while under the guidance and instruction of University of Kentucky faculty member Dr. David Atwood. I am also an avid musician and study clarinet under the direction of Dr. Scott Wright.



**Faculty Mentor: Prof. David Atwood, Department of Chemistry**

Ms. Kelley was a student in my Discovery Seminar course: “Energy and Our Global Environment.” She was a valuable participant in the class throughout the semester and did exceptionally well on all of the exams and assignments. It was clear to me that Ms. Kelley developed a deep understanding of how the world’s energy consumption could affect our environment. This understanding was demonstrated in her in-class presentation on the melting of the world’s polar ice caps, in particular the dramatic ice reduction observed in the Arctic. Her presentation and attendant written assignment were of such high quality and originality that I encouraged her to develop the topic further for possible publication in *Kaleidoscope*. She and I felt that it was important to explain in detail what is taking place at the poles of the earth, most likely due to human-induced global warming. This submission to the Journal is the outcome of this effort.



## On the Brink: The Melting of Earth’s Polar Ice Caps

### Abstract

Research indicates that earth’s polar ice caps are melting at a faster rate than ever before, a product of continued global warming. Unfortunately, side effects of this melting may negatively impact the lives of humans who dwell on this planet. Consequences may include: a significant loss of albedo, a considerable rise in sea levels, damage to aquatic ecosystems, and/or an ice age resulting from the shutdown of major oceanic currents. Although the situation is not yet imminent and the causes not yet pinpointed, the present outlook is too grim to ignore.

### Essay

The media rarely leave their audience hanging — there’s occasionally something fresh, every so often something unusual, and always a story that is in high-demand. Viewers can usually count on the news networks to discuss up-to-the-minute events every minute of every day. Imagine flipping on the television to a news channel covering a breaking story about a governmental forum on our planet’s rising temperature and the effects it has on worldwide environment. Lobbyists and other public speakers hotly debate the causes, but all agree: it is unlikely that any person even partially educated in the field of climatology can deny global warming exists.

An astonishingly large number of scientists and researchers recognize the evidence for our planet’s increasing temperature, which has risen about 1.4 degrees Fahrenheit since 1880. In fact, today’s population currently boasts the record for the hottest two decades (1980 and 1990) in the last



400 years (National Geographic, 2007). Unfortunately, a warming earth induces a number of harmful side effects. Many of the more unfortunate repercussions occur far away from CNN and Fox News headquarters — indeed, far away from the borders of any continental state in the U.S. Polar ice is a significant, natural reflector of sunlight; this quality is especially important in the current day and age because it aids in global cooling. In addition, fresh water from ice caps harbors the potential to raise sea levels, damage aquatic ecosystems, and initiate an abrupt ice age. The melting of earth's polar ice caps has effects that are far broader (and more newsworthy) than one might initially presume.

Unlike breaking stories, the breaking of entire blocks of ice does not usually take place overnight — unless the time span is being measured against the entire history of recorded temperature, which, if one observes ice core data in some areas, is a really long time. Just a few months ago, researchers in Antarctica unearthed a core detailing what they hope to be at least 100,000 years of climate record (National Science Foundation, 2008). But exceptions exist to all general trends and, increasingly, the so-called 'anomaly' of swift melting is occurring over shorter and shorter time periods. Scientists often use the Larson B ice shelf as a popular illustration of abrupt melting. Located on the eastern side of Antarctica's most prominent peninsula, this 220-mile-thick shelf began a rapid collapse into the ocean starting on January 31, 2002. The suddenness and magnitude of this event stunned scientists and researchers around the world; in a mere 35 days, the shelf lost a total of 3,250 square kilometers — larger than the state of Rhode Island, which contains a mere 2,171 square kilometers of land mass (National Data Center, 2002). Although unexpected, developments prior to this incident — and the ways they presumably established themselves in order to prompt the actual outcome — do not present many surprises.

Ted Scambos, a researcher at the National Snow and Ice Data Center, suggests that the primary cause of the Larson B shelf collapse was due to melt water residing in pools on top of the ice, an effect of the warmer-than-usual climate. He, along with other experts, believe that some of the melt water trickled down moulins (cracks in the ice), expanding them until they grew large enough to cause the ice to splinter completely. In addition, more cracks were created from this process, thereby increasing the rate of fracture (National Data Center, 2002).

Although the collapse of a single Antarctic ice shelf does not necessarily prompt a major rise in sea-level, such a collapse does have a pronounced effect on something that very well could: glaciers. Because glaciers are, by definition, situated on land and therefore do not

already contribute to the volume of the ocean, their retreat into the sea does, in fact, raise water levels (as opposed to sea ice, which, because it floats on ocean water, does not). Glacier melt also contributes to a number of other fresh-water-meets-salt-water issues.

The *National Snow and Ice Data Center* does an exceptional job of describing the important roles ice shelves play in relation to glaciers:

Ice shelves act as a buttress, or braking system, for glaciers. Further, the shelves keep warmer marine air at a distance from the glaciers; therefore, they moderate the amount of melting that occurs on the glaciers' surfaces. Once their ice shelves are removed, the glaciers increase in speed due to melt water percolation and/or a reduction of braking forces, and they may begin to dump more ice into the ocean.

Obviously, barriers such as Larson B are extremely vital to the health and longevity of our polar ice caps.

Unfortunately, the breaking up of an ice shelf isn't a one-time occurrence. Similar events have happened elsewhere since the Larson B incident, and will almost certainly occur again, particularly when considering the warming our planet is experiencing. Not only are the temperatures in Eastern Antarctica rising more rapidly than ever before (Gore, 2006, p. 102), but the other side of this delicate continent could find itself approaching a melting point as well. This possibility is of major concern; if the ice shelf on the western side of Antarctica ever detaches itself and the surrounding sheets slide into the ocean, sea levels could rise six to ten inches in a mere century (Flannery, 2005, p. 149).

To avoid charges of exaggeration, it would be worthwhile to mention that, normally, the amount of Antarctic and Arctic ice is lowest near mid-summer, the time immediately after the summer-melt season. Shortly after this period, it enters a phase of "recovery," which takes place throughout the winter months, as most of the remaining melt refreezes and becomes part of the ice sheets once again. On September 21, 2005, scientists determined that nature followed the early part of this trend exceptionally well. Although there were still increases in ice during the previous winter, they were smaller than those of any former winters and 2005's summer onset of melting was, in an unfortunate circumstance, notably earlier. As a result, only 2.05 million square miles of ice were documented by satellites — the lowest amount on record (O'Connor, 2005).

Evidence of continual melt, reminiscent of the incident in 2005, comes in the form of satellite images from the National Aeronautics and Space Association (NASA), which illustrates the reduction of the polar ice cap with shocking clarity. "The area of permanent ice

cover is contracting at a rate of 9 percent per decade. If this trend continues, summers in the Arctic could become ice-free by the end of the century" (Natural Resources Defense Fund, 2005). In the summer of 2007, the Antarctic as a whole experienced an ice loss totaling the area of six Californias (Revkin, 2007), evidence that the clock counting down the last days of our polar ice caps in the present interglacial period may have already begun ticking.

One major concern regarding ice barriers and melting glaciers involves the northern island of Greenland. Here, a thin shelf separates the Arctic Ocean from a vast 2.85 million cubic kilometers of ice cap (Pearce, 2007), portions of which are already making their way toward the ocean at alarming rates. The sheer mass of these glaciers could increase sea levels by a shocking twenty-three feet (Flannery, 2005, p.144).

Although it is uncertain whether the Greenland Ice Cap will slide into the sea or, if it does, if it will do so as quickly as the Larson B Ice Shelf, the possibility looms in a not-so-distant future. The Jakobshavn Glacier, one of the many outlet glaciers for the Greenland Ice Cap, is advancing toward the ocean at an astonishing 135 feet per day (Struck, 2007). Large portions of the Petermann glacier in Northern Greenland have already broken off into the ocean. More recently, a large crack has appeared further inland, widening with each subsequent year; it threatens to break off another 56 to 60 square miles of ice (Byrd Research Center, 2008). Jonathon Gregory, a climatologist at the University of Reading, UK, claims that an irreversible melting process could begin in less than half a century; "The only good news," states the reporter interviewing him, "is that a *total* meltdown is likely to take 1,000 years" (Pearce, 2007). Clearly, mankind has reason to be concerned with the rate at which Greenland's ice is thawing.

As previously suggested, a serious consequence of melting glaciers is the amount of sea-level rise that might occur. Tim Flannery blames the escalating pace of increase, stating that the rate of sea level rise has doubled throughout the 1990s (Flannery, 2005, p. 145). As of 2005, he estimated that two out of every three persons lived along the shoreline (Flannery, 2005, p. 143). These situations in combination present serious concerns about the relocation, financial burdens, and survival of ocean-front dwellers. The stress of circumstances such as these might easily compare with those experienced by the 2005 Hurricane Katrina victims in New Orleans.

Unfortunately, sea level rise has the potential to reach well beyond individuals and small groups; even a slight rise could endanger entire populations around the world—those in the major cities of Shanghai and Lagos, for example, both of which lie a mere six feet above sea level (Defense Council, 2005). Such an incident would

once again raise concerns about refugees, economic stress, and the continued existence of cities, but on a much larger, more difficult scale.

The entrance of glaciers into the oceans wouldn't reserve its adverse effects for the human population only; marine life would be negatively affected as well. Ice, when liquefied, produces fresh water, and when an aquatic population with a propensity for high salinity is exposed to large amounts of fresh water, the effects are almost always extremely detrimental. Currently, these effects can be exemplified by the ocean's krill population, which seems to have declined in direct correlation with decreasing amounts of Arctic sea ice (Flannery, 2005, p. 97). The reduction of this particular population seems to be having a greater-than-normal effect on marine life as a whole, most likely due to its placement toward the bottom of the food chain, which makes it as vitally important and abundant as vegetation is in a land-based ecosystem.

Another undesirable effect of earth's melting polar ice caps is the potential halt of the North Atlantic Conveyor Belt, a product of the "thermohaline circulation" ("thermo" for heat and "haline" for salt) See Figure 1 (p. 70). This chain of moving water is a key factor in regulating temperatures in Europe. To grasp fully the significance melting glaciers have on this "conveyor belt," it is necessary to understand the basics of how the system works. First, heat near the equator warms ocean water, lowering its density and, in some cases, making it light enough for northward-running currents (namely, the Gulf Stream) to drive the water in the direction of the Arctic pole. As the current moves northwards, heat from the water is transferred to the air, warming temperatures above any landmasses it bypasses.

At this point, it is worth reiterating that glaciers are masses of frozen freshwater; the ice in the glaciers is a result of the build-up of snow over many years. The snow originated in the evaporation of ocean water; the salt is left in the oceans when the water evaporates. It is this salt-rich water that water flowing toward the poles in the North Atlantic Conveyor Belt mixes with. In turn, the flowing water suddenly becomes denser due to its colder temperature and higher salinity and, thus, starts to sink. It eventually moves back toward the equator, where the process begins again.

The problem posed by glaciers derives from their freshwater base. Either by directly sliding into the ocean and melting because of the warmer temperature, or by first forming lakes and then dumping all at once into the sea because of a broken ice dam, the added amount of freshwater tips the freshwater-saltwater balance dangerously. If enough freshwater dilutes the sea in that area, the salinity will become so low that the water does not sink and will almost immediately stop shifting back toward the equator. Such an abrupt shift may entirely eliminate heat flux to the northern landmasses, radically decreasing temperatures in the very populated countries of Europe (Quadfasel, 2005, pp. 565-566).

The shutdown of this current system is by no means a stretch of the imagination. In fact, this event occurred twice in the last 15,000 years—once 12,700 years ago, which triggered an ice-age in Europe that lasted 1,000 years; and again 8,200 years ago, which led to incredibly low temperatures in Greenland. Both times, the ice dams holding back glacial melt water in North America and Canada broke through. The enormous volumes of freshwater inundating the northern portion of the North Atlantic Conveyor Belt caused the failures (Flannery, 2005, p. 61).

Furthermore, the melting of these ice caps might actually contribute to future warming. Very large objects with high reflectivity possess the ability to bounce light from the sun back into space, which lowers temperatures on

our planet. Scientists use the term “albedo” to describe the level of sunlight an object reflects. Earth’s polar ice has the capacity to reflect significant amounts of sunlight — about ninety percent of the sun’s rays that enter through the atmosphere (Flannery, 2005, p. 144) — substantially decreasing global temperatures. When melted, this ice turns into its less reflective form, liquid water, thus lowering the albedo in melting regions. In addition, chances are that forests, which insulate land and store heat, will eventually replace the areas on which glaciers used to reside (Flannery, 2005, p. 99, 103), further lowering earth’s total albedo and increasing its heat-trapping capability. If the loss of this critical cooling agent continues, our planet may soon find itself stuck in a negative cycle of melting and heating.

The primary cause for earth’s global warming is under debate. Ideas range from the effects of sunspot activity to a natural phenomenon known as the Milankovitch Cycle, a cycle based on earth’s orbit around the sun, to a number of other possibilities and any combination thereof. Greenhouse gases are another commonly suspected cause — one that tends to be the subject of many climatic debates. The fact that humans cannot evade the consequences of the Milankovitch Cycle or sunspot activity is not cause for optimism. If, however, a chance exists that global warming does indeed stem either directly or in part from the large-scale release of greenhouse gases into our atmosphere, then it seems that humans have a moral obligation to reduce their emissions as a kind of homage to the continued health of our planet.

Perhaps the most direct avenue to improving this health would be to have groups of individuals doing their part to reduce carbon emissions, a key ingredient in greenhouse-gas warming. Biking, diminishing our energy usage, and pushing for our government to employ alternative energy sources are all ways in which we can make a difference. Countries such as the United States have left renewable resources such as wind, solar, and hydro power remarkably untapped and have progressively reduced funding for environmental research since the climate craze of the 1970s dissipated. Our government instead returned to the readily available and (temporarily) cheaper use of non-reusable, carbon-dioxide emitting coal.

However we change the direction of our planet’s temperatures, whether such an action is possible or not, humanity must hope for the best: for earth to cool enough so that the majority of ice cap melting stops. If the best doesn’t happen, we can adapt. Populations in countries where the sea level rises can be relocated, albeit with a large amount of economic hardship. Earth’s ecosystems are flexible enough to find a way to recover from a loss of marine life, even if it means dropping a few species along the way. If the North Atlantic Conveyor Belt shuts down, Europe and other portions of the globe will still maintain the ability to acclimatize to colder temperatures. But such adaptations could be crippling to a world that’s grown accustomed to moderate conditions. After all, when we’re on the brink of such a major climate shift with so many varied, sensational effects, how could the media possibly figure out which story is in highest demand?

## Acknowledgement

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I am undergraduate senior majoring in both English and history. The work that I present here was done for my senior thesis for my honors history class. By making extensive use of Senator Alben W. Barkley's archives located in the M.I. King Special Collections in the library, I was able to explore the role Senator Barkley had on the Democratic presidential ticket in 1948.

One of the greatest assets that I had while working on the project was my professor and mentor Dr. Kathi Kern of the history department. Dr. Kern constantly pushed me and the other students in the class to produce better work and probe deeper into our research. Her efforts were instrumental in making my thesis the work that it is today. I was incredibly fortunate to have her as a professor and will always be indebted to the direction and encouragement that she gave me while working on this project.

While attending UK, I was active in a number of student organizations including: Phi Alpha Theta, College Democrats, and UK Kentuckians for the Commonwealth.

**Faculty Mentor:**

**Dr. Katherine Lee Kern, Department of History**

I am writing to convey my endorsement of John Ghaelian's paper: "Alben W. Barkley: Harry S. Truman's Unexpected Political Asset." John wrote this paper, his senior thesis, in my history 471 class. Therefore, I am quite familiar with the research and the resulting paper. It was very exciting to work with John because he really wanted to engage in original research. So, although his course work had led him to study Ancient history, the excellent source material housed in UK's Special Collections and Archives beckoned John into the twentieth century. Because he is deeply engaged in the current Presidential election, John was drawn to the controversies surrounding an earlier Presidential election, Truman's victory in 1948. John was particularly curious about the historical amnesia that has crept up around this election. Alben Barkley, the vice-presidential nominee from Kentucky, has largely been forgotten in the national narratives. But, as John argues, this oversight needs to be corrected. Truman's presidency has experienced a renaissance, thanks in part to a popular biography by David McCullough. But, what about Barkley? As John demonstrates in his paper, Barkley helped to deliver the South to Truman and to keep the South an important player in the Democratic Party. When we consider the political landscape of the decades that followed, and particularly the success of the Republican Party in capturing Southern voters on cultural issues, Barkley's unique genius seems particularly significant.



## Alben W. Barkley: Harry S. Truman's Unexpected Political Asset

### Excerpt from a Gaines Thesis

#### I. Introduction

On April 30, 1956 the great orator and Senator Alben Barkley loudly proclaimed, "I'm glad to sit in the back row, for I would rather be a servant in the house of the Lord than sit in the seats of the mighty." He then took a step back to accept the thunderous applause of the audience. Suddenly, he collapsed to the ground. His wife Jane hurried to the stage; but it was too late, he had died of a heart attack. Since his death, Barkley has largely been forgotten by history. Despite this historical amnesia, Barkley had a long and distinguished career of public service that has been ignored. He served in a variety of elected offices and played major roles in the political debates of his times. The few scholars who have written about Barkley have focused mainly on his early career and his time as Senate Majority leader. Few Americans know of his rousing keynote address in 1948, his "prop-stop" campaign, or that he served as Truman's vice-president and was given the nickname the "VEEP." In particular, little attention has been given to Barkley's pivotal role in the 1948 election.

While Barkley has faded from view, the man he propelled into the presidency has gained in historical stature. Harry Truman's upset victory over Thomas Dewey has been closely examined by historians, e.g., Donaldson, *Truman Defeats Dewey*; Karabell, *The Last Campaign: How Harry Truman Won the 1948 Election*; and McCullough, *Truman*. All are major works that focus on

Truman and his reelection efforts, but none of these give Barkley any serious attention. The picture of Truman holding the *Chicago Daily Tribune* with the headline “Dewey defeats Truman” and the memory of his whistle stop campaign have become icons of American political history. While Truman’s role in the campaign has been examined, Barkley’s contributions to the race have been overlooked. Barkley’s popularity — both in the country and in the Democratic Party — political skills, and remarkable speaking ability bolstered Truman’s reelection efforts significantly by keeping most of the South in the Democratic column and by picking up traditionally Republican states in the Midwest.

## II. Early Career

Barkley was born on November 24, 1877, in a small log cabin in Graves county Kentucky. While attending Marvin College, a small Methodist University, Barkley joined Marvin’s Periclean Debating Society where he learned to hone his speaking and debate skills. His first elected position was county attorney in 1905, but it was not long before Barkley ran for federal office. (Libbey, 1979) In 1912, Barkley was elected to the House of Representatives where he earned a reputation as a progressive Democrat by working closely with President Woodrow Wilson on enacting a number of reforms. This work led to his political maturity. Barkley “assumed Wilson’s vision of America as a nation where individual enterprise and competition should not be jeopardized by monopoly capitalism.” (Libbey, 1979, p. 67) The young Kentucky Congressman worked with the Chief Executive to lower tariffs and to pass both the Federal Reserve Act and the Clayton Anti Trust Act. Working with Wilson prepared him for his partnership with Roosevelt, with whom he would work closely on several pieces of New Deal legislation.

The United States Senate gained a new member in 1926 after Barkley managed to win a close primary and general election. (Hatfield, 1997, p. 424) During the campaign, Barkley had been forced to unite the different factions of the Democratic Party in Kentucky. This would prove to be important in his Senate career. Historian James K. Libbey writes, “The knack he possessed to conciliate factions and ingratiate himself among potential opponents would serve him well as a distinguished representative from Kentucky to the United States Senate.” (Libbey, 1979, p. 48) Barkley’s time in the Senate would introduce him to the national stage and earn him a reputation as a strong proponent and defender of the New Deal and the Democratic Party.

The Senator’s rise in importance caused him to be selected to give the Democratic keynote address to his party’s convention in 1932. His success there would lead to him giving the keynote address again in 1936, 1940,

and 1948. Barkley reached an even larger audience when his party selected him to defend the New Deal against Henry Fletcher, the chairman of the Republican Party, in a radio address. He was so successful that his party selected him to, “confute the Republicans in 1934 congressional elections, when he launched a twenty-state blitzkrieg to defend the New Deal and its candidates.” (Libbey, 1979, p. 67) The radio address that Barkley gave led to higher name recognition with the general public; which in turn caused FDR to use him in his legislative efforts more.

President Roosevelt relied on Barkley to help pass many of his reforms including: the AAA (Agricultural Adjustment Act), NIRA (National Industrial Recovery Act), and FERA (Federal Emergency Relief Act). (Libbey, 1979, p. 66) On May 27, 1935, the Supreme Court declared several pieces of New Deal legislation unconstitutional, including the NIRA. Roosevelt was infuriated by the Court’s actions. He called a special session of Congress and unveiled the second New Deal which included the Banking Act, Social Security Act, and the Wagner Relations Act. Roosevelt would not forget or forgive the Court’s decision.

The Democrats headed to their convention in 1936, with FDR’s second New Deal in mind. Barkley gave the keynote address and used it to defend the New Deal, attack the Hoover administration, and praise the accomplishments of the president. Barkley also attacked the Supreme Court. He asked the audience “Is the court beyond criticism? May it be regarded as too sacred to be disagreed with?” By striking down the NIRA, the Supreme Court had infuriated Barkley, because he felt the legislation to be vital for improving America’s economic woes. Barkley did not comprehend, “that within his keynote address lay the seeds of future Democratic discord, nationwide controversy, and a tragic event that, nonetheless, would elevate Barkley to new heights of leadership and responsibility.” (Libbey, 199, p. 71) Roosevelt and Barkley collaborated to ensure that the Supreme Court would not strike down any more New Deal legislation.

On February 5, 1937 the president gave Congress legislation to reorganize the Federal Judiciary. He did so without giving his allies in Congress any warning. This action was quickly labeled as Roosevelt’s “court-packing” plan. The bill allowed the president to appoint a new federal judge for every member of the bench above the age of seventy. If Congress had enacted the measure, FDR would have had the power to appoint six new justices. Americans were outraged by the president’s attempts to reorganize the Supreme Court with political allies who would support his legislative agenda. The conservative wing of the Democratic Party was equally outraged and revolted against the plan. Senate Majority Leader Joseph Robinson and Barkley both supported the bill,



*Barkley speaking in Louisville*

*Photo Courtesy of UK Public Policy Archives*

and attempted to convince other Democrats of its merits. In the midst of the legislative battle Robinson died of a heart attack leaving Barkley acting Majority Leader. With Robinson's death any hope for FDR's court packing plan ended. (Hatfield, 1977, p. 424)

### **III. Barkley as Majority Leader**

Barkley's loyalty to Roosevelt during his court packing scheme led to the president backing him for Senate Majority Leader. FDR leaned on state Democratic leaders to pressure their Senators to back Barkley. Also, on July 15, 1937, he addressed a public letter to "My dear Alben" signifying his support. (Barkley Papers, Box 61, Folder 1) The conservative wing of the party largely

backed Pat Harrison of Mississippi who had argued vehemently against the "court-packing" plan. (Krock, 1937, p. 16) During the leadership contest, Barkley had his first intimate contact with Truman. Initially, Truman supported Barkley, but changed his support to Harrison for reasons that are largely unknown. Before switching, he told Barkley, "The pressure on me is so great that I am going to ask you to relieve me of my promise." (Barkley, 1954, p. 155) The vote was close, 38 to 37 with Barkley triumphant. (Gullan, 1998, pp. 117-8) After the vote was tallied, Harrison stepped forward and moved that the vote be made unanimous.

The newly elected Majority Leader quickly realized the difficulties of his position. Early into his term, several





**Alben Barkley. Year 1949**

Republican senators unexpectedly introduced an anti-lynching bill. (Davis, 1979) This angered the southern Democrats who quickly threatened to filibuster. Barkley was surprised by the Republican bill and attempted to adjourn the Senate, which would have cleared the agenda for the day. His efforts were blocked by a coalition of both Republicans and liberal Democrats. Republicans finally agreed to withdraw the bill when Barkley assured them that anti-lynching legislation would take top priority in the next session. This battle over civil rights legislation showed a major rift in the Democratic majority. “As long as the party’s agenda remained essentially economic, its diverse elements held together. When confronted with racial issues, however, the complex fabric began to unravel.” (Ritchie, 1991, p. 134) The tension between the two factions would frustrate Barkley frequently in his role as Majority Leader.

Barkley carried out his word and supported the bill in the next session, but despite his best efforts he was unable to overcome Southern filibusters. The Kentucky Senator supported civil rights legislation throughout his tenure as Majority Leader, earning him the admiration of liberals. He was always willing to listen to conservative views and work toward compromise, thus also earning the respect of Southerners. His popularity among Southerners despite his stance on civil rights would prove to be vital later in his career.

Barkley became a member of the “Big Four” which included Vice President Henry Wallace, House

Speaker Sam Rayburn, and House Majority Leader John McCormack. (Hatfield, 1997, p. 425) The four met regularly with FDR to discuss the administration’s legislative priorities and strategies. Barkley generally led the president’s efforts, but in 1944 he broke with him over a controversial tax bill. The president vetoed a two billion dollar tax increase calling it relief “not for the needy, but for the greedy.” Barkley was shocked by the president’s actions. The tax bill had been the result of hard work and compromise and the Majority Leader felt it was the best he could do. The president knew his feelings, but chose to ignore them.

The Majority Leader’s surprise quickly gave way to anger; he discussed the matter with his wife and both came to the conclusion that he would have to break with the president. Barkley stayed up late into the night pacing the floor of his room wondering how he would respond. (Barkley, 1954, p. 175) The next day he entered the Senate chamber determined to give a speech responding to the president’s veto. The Kentuckian spoke with anger that was rare for him. He saved special vehemence for the President’s statement that the tax bill was for the greedy, declaring in a speech in Washington on February 22, 1944, “That statement is a calculated and deliberate assault upon the legislative integrity of every member of the Congress of the United States.” He ended his speech by resigning as Majority Leader to the shock of his colleagues. His speech was highly regarded by his colleagues who showered it with applause. The next day he was unanimously reelected to his position, and Congress overrode the president’s veto.

The controversy over the tax bill seriously strained Barkley’s and Roosevelt’s relationship, but because of Barkley’s popularity the president moved to make public amends with him. He sent the Kentuckian another “Dear Alben” letter on February 23, 1944. The president declared, “Certainly, your differing with me does not affect my confidence in your leadership nor in any degree lessen my respect and affection for you personally.” (Barkley papers, Box 16, Folder 10) Barkley accepted the president’s gesture. He graciously replied the next day, “If we cannot trust one another in this tragic period of our nation and of the world, how can the people trust us?” (Barkley Papers, Box 16, Folder 10) Despite the exchange of letters between the two, their partnership would never be the same.

#### **IV. Barkley and Truman**

During the convention of 1944, FDR set out to find a new vice president. The majority of the delegates favored Barkley but, “Roosevelt would not tolerate one who had so recently rebelled against him.” (Hatfield, 1997, p. 425) Roosevelt ultimately decided to pick Truman over Barkley. Barkley later recalled that his

relationship with Roosevelt improved after he campaigned vigorously for the Roosevelt-Truman ticket. (Barkley, 1954, p.191) When FDR died in 1945 it was Truman who became president and not Barkley. Barkley continued to serve as Majority Leader under President Truman. The two men managed to work reasonably well together, but their relationship was not as smooth as Barkley's and Roosevelt's had been. This unevenness was largely due to Truman's difficulties coordinating his office with the legislative branch. The Senator often felt that Truman would launch a major legislative effort without consulting the members of his party beforehand. Still Barkley continued to work with Truman on several pieces of legislation including the

European Recovery Program. Dean Acheson, Truman's secretary of state, described Barkley as the president's "field commander." (Acheson, 1961, p. 140)

Truman had numerous challenges awaiting him after he took the oval office. With the end of World War II, America had entered a new era in which a Cold War with the Soviet Union was looming; and America's economy needed to be converted from wartime to peacetime. Americans turned to the new president to guide them through these challenges, but quickly found his leadership lacking. The new president, "suffered from inexperience, a poor image, and bad advice." (Donaldson, 1999, p. 7) Truman's difficulties can be seen with the conversion of America's economy. In order to hold

*Leaving Blair House for the inauguration with President Truman, their wives, and the Trumans' daughter Margaret. Year 1948. Photo by John Adams*



Photo Courtesy of UK Public Policy Archives



*Harry Truman*

*Simeon Willis*  
Curtis and Mays, Paducah, Ky

**President Truman, Senator Alben Barkley, Governor Simeon Willis of Kentucky. Year 1946**

down inflation, Truman retained wage and price controls that had been created during the war. Organized labor was infuriated by the wage freeze and labor strikes occurred all across the country. Union strikes created even more economic difficulty. Consumers who believed that economic prosperity had returned were frustrated by Truman who was, "telling them that the products they had been denied for so long would remain unobtainable for a just a while longer." (Donaldson, 1999, p. 14) Republicans were quick to use this dissatisfaction to their electoral advantage.

Americans vented their frustrations with the Truman administration in 1946 by giving Republicans control of both houses of Congress for the first time since 1930. Republicans used messages such as, "Had enough?" and, "To err is Truman" to recapture Congress. The New Deal coalition that Roosevelt had worked so hard to foster and maintain had seemingly fallen apart in the 1946 elec-

tions. Liberals, conservatives, farmers, unions, African Americans all had complaints, and Truman, unlike his predecessor, was unable to walk the tight balancing act required to satisfy one element of the coalition without offending another. (Donaldson, 1999, pp. 6-7) This break up had caused the Democrats historic losses, which caused the Democrats to turn their frustration on Truman.

Barkley became minority leader after the Democrats lost their majority. His first major decision as minority leader would have implications that would affect the 1948 presidential election. The matter involved Senator Theodore Bilbo of Mississippi, a segregationist who had been accused of fraud. Barkley worked out a compromise with the new Majority Leader Robert Taft that allowed him to be seated. Bilbo died shortly after this, but Barkley's actions confirmed in "the mind of many southerners that Barkley was a man whose word they



could trust.” (Gullan, 1998, p. 118) The Kentuckian was unique because he was popular with all segments of the Democratic Party.

Many of the actions of the Republican Congress infuriated Barkley. He was especially angered by the passage of the Taft-Hartley Act, which allowed government injunctions in labor disputes to weaken organized labor's strength. The Minority Leader encouraged Truman to veto the bill and was dismayed when Congress overrode the veto. After the passage of Taft-Hartley, Barkley could be seen wearing a tie that stated, “Repeal Taft-Hartley Act.” (Libbey, 1979, p. 93) The law was particularly frustrating because it seemed, “Americans had tired of reformist crusades, and the slide toward conservatism allowed Republicans to throw damaging punches at New Deal ideas.” (Libbey, 1979, p. 93) To a Senator from Kentucky who had dedicated his life to many different reforms, this trend was particularly disheartening.

Besides facing difficulties in the public arena, Barkley also had personal problems to deal with at the same time, the most serious of which was the deteriorating health of his wife Dorothy. The expensive costs of medical treatment and nursing care had forced the couple to sell their Washington home and move into an apartment. Barkley began accepting speaking engagements all across the country, “to provide the treatment and the special nursing care that she needed.” (Barkley, 1954, p. 71) On March 10, 1947, Dorothy passed away. (Louisville *Courier Journal*, March 13, 1947) Her death was a crushing blow to Barkley, but did not stop him from continuing to serve as Minority Leader.

## V. Barkley and the 1948 Election

With the Republicans firmly in control of Congress many people were predicting that the Republicans would capture the White House in 1948. Barkley was not optimistic going into the election. In a May 19<sup>th</sup> letter to his friend Claude Bowers, Barkley expressed his feelings about the circumstances: “I deplore the situation in which our party has been placed with regard to the coming contest.” (Barkley Papers, Box 65, Folder 11) He disagreed with Bowers' suggestion that he challenge Truman for the nomination writing that, “In many ways, he has not done a bad job of administering the government.” (ibid.) Barkley believed that most of the mistakes Truman had made had been of a political nature. He agreed with the president on most issues, but felt that his poor communications with Congress had created unnecessary difficulties.

He offered the example of civil rights. Barkley had always favored equal rights for all Americans; in Congress he had consistently voted against the poll tax and in favor of anti-lynching laws, but he believed that

compromise was necessary. Truman, he argued, had tried to do too much at one time. In the same letter to Bowers, he stated that the administration, “threw a whole basket full of matters in the lap of Congress at one swing and the result has been that it has injured him... in the South and it is doubtful whether it has helped much in the North.” (ibid.) Barkley believed that the situation had calmed somewhat, but that it was still tenuous.

Barkley's frustrations with Truman did not make him look upon the other political party favorably. The Senator believed that the Republicans had nothing to run on in 1948. He bluntly wrote to Bowers, “I realize that after 16 years the people make up their minds to change party control of their government, but the Republicans really have nothing constructive to offer.” (ibid.) Barkley further argued that the New Deal coalition of Roosevelt had accomplished a great deal in the sixteen years that it had controlled the government. Barkley thought that Senator Taft was the best of all the Republican candidates calling him, “honest and courageous.” (ibid.) He still thought that the Democrats could beat him and any other Republican candidate, despite the mood of the party.

Many Democrats were convinced that the 1948 election was going to be a disaster for the party, unless they found somebody to replace Truman. People began to approach Barkley to convince him to challenge Truman for the nomination. They feared that, not only would Truman cost them the election, but that his civil rights platform would split the party irreversibly. Barkley refused to accept any of these overtures. With the party's national convention approaching, the solicitations became more fervent. Earle Clements, the

*Democratic National Convention – Ed Halsey presents gavel to Senator Alben Barkley (Left to Right) Ken Romney, Ed Halsey, Pat Haltigin, Alben Barkley, Clarence Cannon, Joe Sennot. Year 1932*



Photo Courtesy of UK Public Policy Archives



**Oliver J. Carter, Chairman Democratic State Central Committee of California; Alben W. Barkley, Vice President; E. George Luckey, Vice Chairman, Democratic State Central Committee. Year 1949**

Governor of Kentucky at the time and the leader of the Kentucky Democratic Party, was one of the people who approached Barkley about running for president. Barkley refused to go along. Writing to a friend about the matter, Clements explained, “The entire Kentucky delegation did everything within its power to bring this about, but at the expressed wish of the Senator himself, it was necessary that we limit our sight to the Vice Presidential nomination.” (Clements Papers, Box 228, Folder 2) Despite all the attempts to make it otherwise, Barkley remained loyal to Truman.

J. Howard McGrath, the national chairman of the Democratic Party, selected Barkley to give the keynote address at the convention. Historian Neal E. Claussen argues that Barkley was selected again for several reasons, but the most important one stemmed from his popularity in the South. Claussen explains that Southern frustration over civil rights had increased the likelihood of Southern democrats leaving the party, causing the national committee to name “two Southerners to the top convention offices, Barkley as temporary chairman and Sam Rayburn as permanent chairman.” (Claussen, 1979, p. 82) Barkley went to the convention determined to make the most of the opportunity to give one last keynote address.

The Democratic convention began on July 10, 1948. The delegates who attended the convention were a forlorn group, convinced that the party had no chance of victory in November. The *New York Times* noted, “It

is a simple statement of fact, not an editorial judgment, to report that the majority of delegates assembled here have no enthusiasm whatever over naming him [Truman] as their standard-bearer for 1948 against Gov. Thomas E. Dewey.” (Lawrence, 1948a, p. E7) The mood of the Democratic delegates was in stark contrast with the Republican convention that had been held in Philadelphia two weeks before. According to the article, “The Republicans were certain of victory, no matter whom they nominated.” (ibid.) The mood of his party’s convention did not go unnoticed by Barkley who later remarked, “When I got over there on Saturday before the convention, you could cut gloom with a corn knife.” (Shalett, 1953) Barkley entered Philadelphia determined to rouse his party out of the stupor into which they had fallen.

On July, 12 Barkley delivered his address. The speech was a call to arms to all the Democrats who heard it. Barkley attacked the record of the 80<sup>th</sup> Congress and tied the Democrats to the New Deal and FDR. Claussen writes, “Barkley knew that Democrats had little to cheer about since 1946 and realized defeatism could be surmounted by arousing a sense of pride.” (Claussen, 1979, p. 85) By using the accomplishments of the New Deal, Barkley turned the focus to the previous and more popular president Roosevelt. In his address, the Kentuckian proudly declared, “In the first place, it was recovery. The new administration breathed into the nostrils of every enterprise, large or small, a breath of new life and new hope and determination.” The Senator made the argument that Democrats who had created the New Deal had helped people in their time of need; while the Republican Party had fought it “as if it were some blight or plague that had poisoned the lives and consumed the liberties of the people and kept them chained and helpless.”

The New Deal had helped all segments of society Barkley argued. Farmers benefited from programs that had brought electricity to a large swath of rural areas for the first time, price controls had given them a stable market, and soil conservation had led to better crops. The elderly found financial protection with Social Security. Laborers had profited under a federal government that supported a worker’s right to organize, demand better working conditions, and receive a minimum wage. The upper classes were not left out of Barkley’s speech. He mentioned several programs such as the Securities and Exchange Commission, the Export-Import Bank, the Reciprocal Trade Agreement, and the Reconstruction Finance Corporation. Barkley argued that these programs had created higher employment levels, increased production, and prosperity for all.

Barkley attacked the Republicans in his Keynote address for doing nothing to help people during the Great

Depression and for having no accomplishments since recapturing Congress. Barkley challenged the convention audience: "Let us ask, and let the American people ask, those who spray this forest of superb accomplishment with the froth of their vindictive lips, which tree will they cut down with their mighty ax or puny hatchet?" With this question Barkley implied that Republicans would dismantle the New Deal if they regained the White House. He used his famous sense of humor to dismiss Republican promises to eradicate bearcats by defining one, "as a Democrat who holds some office that a Republican wants." The Republicans' record, Barkley declared, "is one of things promised and not consummated." Barkley historian James K. Libbey argues that Barkley's attacks on Republicans for inaction established the Eightieth Congress' "do-nothing" reputation that both he and Truman would use during the campaign. (Libbey, 1979, p. 95) Barkley avoided the civil rights issues and ended the speech with a prayer.

The crowd's spirit had been buoyed by the Kentuckians' magnificent oratory. Cheering had erupted throughout the speech. A journalist who covered the event observed that Barkley had been encouraged before the speech to give a short address "but the interpolations and the applause his remarks brought made it at least 68 minutes." (Lawrence, 1948b, p.1) The cheering after Barkley finished continued for half an hour as the orchestra played "My Old Kentucky Home." (Davis, 1979, p. 359) Barkley's speech lifted the gloom from the convention hall in Philadelphia. Clark N. Clifford, Truman's political strategist, wrote to Barkley a few days later, on July 19, "Your keynote address was the turning point in the convention. It gave life to the meeting and hope and inspiration to the delegates. It was a masterful job and all good Democrats are grateful to you." (Barkley Papers, Box 27, Folder 13) Talk began again about replacing Truman on the ticket, but Barkley ended it, saying to anyone who proposed it to him, "If anybody puts my name in nomination before this convention for President of the United States, I will arise and renounce it, because I will not come here as a candidate." (Shallett, 1953) Barkley was much more open to the idea of running with Truman.

The delegates at the convention wanted Barkley to be selected as the president's running mate. Truman was not thrilled by the prospect. His first pick had been Supreme Court Justice William O. Douglas. The president wanted Douglas because "the liberal Democrats were about to bolt the party with Henry Wallace, the naming of such a popular liberal as Douglas could be conceived as an act of party unification." (Claussen, 1979, p. 898) Henry Wallace had served as Roosevelt's third vice president and served as Truman's Secretary of Commerce. He and many other liberals in the Democratic Party thought



Photo Courtesy of UK Public Policy Archives

Vice President Alben W. Barkley speaking. Year 1949

the administration was too conservative on issues such as civil rights and too hawkish in foreign policy. These disenfranchised progressives were encouraging Wallace to run for president with the Progressive Party. Truman hoped to counteract them by nominating Douglas as his vice president. During the convention, Clifford was in contact with Douglas encouraging him to run, but he was unsuccessful. Douglas decided to remain on the Supreme Court. (Heiss, 1971).

After his keynote address, the delegates at the convention were firmly behind Barkley for vice president. In support of their "Mr. Democrat" the delegates launched



a 28 minute demonstration to pressure Truman to select him. (Lawrence, 1948b, p. 1) The President did not want Barkley because he was seventy years old and because he brought no regional balance to the ticket. Truman's lack of enthusiasm frustrated Barkley who remarked to several reporters in Philadelphia, "I never cared for cold biscuits." (Barkley, 1954, p. 198) Truman's lack of support for Barkley did not matter after the speech because, "The convention made up the President's mind for him." (ibid.) McGrath phoned the Chief Executive to inform him that the delegates were demanding Barkley. Truman gave in to the pressure and telephoned Barkley and asked him to be the nominee. Barkley replied, "Well, I suppose I will accept it if I'm nominated, but I'm not going to lift a finger to get the nomination." (Shalett, 1953) The delegates would do all the work for their beloved Senator.

On July 13, William Wyatt of the Kentucky delegation nominated the minority leader. In his speech he described Barkley as man "to be counted on." Wyatt declared, "He has the heart for the struggle, the courage for the fight, and all that it takes to carry our banner to victory on November 2." Barkley was selected by acclamation. (Lawrence, 1948c) After his selection, Barkley gave a brief speech in which he promised to follow Truman's leadership, the party's platform, and

to work toward victory. (ibid.) Truman then gave his acceptance speech in which he promised victory and attacked the Republicans declaring "the country cannot afford another Republican Congress." (ibid.) During his acceptance speech the president announced he was calling a special session of Congress to give the Republicans the opportunity to enact their convention's platform into law. (ibid.) Truman hoped the Republicans would fail to do so, cementing public opinion against them. The Democrats left the convention hall with a ticket, but few expected the pair to be victorious in November.

The Democratic National Convention ended dramatically. The adoption of a strong civil rights plank over their objections had infuriated much of the Southern delegation. *New York Times* reporter W. H. Lawrence noted, "For the first time in many years the Presidential nominee's selection was not made unanimous." (ibid.) Half of Alabama's delegation and all of Mississippi's walked out. Hubert Humphrey had pushed through the plank and had led the effort that ended Southern attempts to add a states' rights plank. Shortly after the convention, the Democratic Party would have two schisms. The far left wing of the party led by Wallace formed the Progressive Party. (Hagerty, 1948, p. 36) The disillusioned Southerners formed the States Rights Party and nominated Strom Thurmond, the Governor of South Carolina, for president. (Popham, 1948, p. 1) Barkley was needed to limit the electoral damage of the southern bolt.

The special session of Congress worked exactly the way Truman hoped it would. The Republicans failed to enact any major initiative and Barkley led the Democrats' efforts during the session. (ibid.) On the last day of the session, the Minority Leader attempted to pass a broad anti-inflation bill. Reporter William White noted, "The last main stand of the Democrats was made deliberately to highlight a single issue, that of high prices." (ibid.) The Republicans defeated Barkley's bill and passed their own much less encompassing version. (ibid.) The defeat frustrated Barkley so much that he shouted, "The theme song of the Republican Party between now and November should be 'I've got plenty of nothing'." (ibid.) Because Republicans failed to pass any major piece legislation, "Dewey was denied the ammunition he could have used to wage an aggressively unified campaign." (Gullan, 1998, p. 110) Barkley's efforts to pass major legislation while the Republicans blocked it created the image Truman hoped it would: Democrats lead and create prosperity while Republicans only make promises, but in actuality "do-nothing." The Republicans had given the Democrats the major theme of their campaign.

During the special session, Barkley and Truman met to map out a strategy for victory. Barkley was expected



**Senator Barclay Speaking at Mammoth Cave Dedication. Congressman Earle C. Clements is seated at far left, and Kentucky Governor Simeon Willis is seated at the right of the podium. Sept 8, 1946**

to play a significant role in the campaign. Barkley commented on this:

Well of course, it was expected that I'd take an active part in this presidential campaign, as a matter of fact, more active than the President himself, because he had to remain in Washington a portion of the time. He couldn't just start out and spend six weeks on the stump without going back to Washington, but I could because Congress was not in session, and I had no other task except to help win the election. (Shalett, 1953)

Some doubted that Barkley could maintain the vigorous campaign schedule necessary because of his

age. He would prove them wrong. Early in his political career he had earned the nickname "Iron Man" because of the energy he had when he campaigned. This vitality was seen when he ran for county attorney, county judge, Congress, and Senate. It would not abandon him while he campaigned for the vice presidency. He was especially invigorated for the 1948 race. Barkley, who had recently lost his first wife, "found the campaign a tonic." (Gullan, 1998, p. 119) To deal with his grief, Barkley campaigned harder than he had before.

*President Roosevelt signing the Social Security Act, Congressman Robert L. Doughten, Senator Alben Barkley, Senator Robert F. Wagner, Frances C. Perkins (Secretary of Labor), Senator Pat Harrison, Congressman David J. Lewis, among others. August 14, 1935*



Photo Courtesy of UK Public Policy Archives

In order to meet his obligations to the campaign, he suggested a “prop-stop,” meaning he could travel the country by plane. Eventually the Democratic National Committee agreed to his request and chartered a DC-3 plane named “The Bluegrass.” (Davis, 1979, p. 264) Barkley’s extensive use of the plane for campaigning was the first time this had ever been done in the United States. The plane included a bunk, and Barkley was accompanied by two speech writers, a secretary, two journalists, two pilots, a campaign manager, and two stewardesses. (ibid.) Barkley would make the most of these resources and by the end of the campaign he had covered more ground than any of the other candidates.

Harold Gullan believes the two men determined

that Truman would, “make major addresses in cities in such states as New York and Pennsylvania that he was unlikely to carry hoping his message would resonate widely.” (Gullan, 1998, p. 116) While Truman mainly focused on large states and on national issues, “Barkley was able to tailor his appeals to more localized issues. He focused his attention not only on the South and later on the Midwest, but also on states with key Senate races.” (Gullan, 1998, p. 117) Barkley was admired within all segments of the Democratic Party. With the party split three ways, this was extremely important. His popularity with the Southern wing of the party was needed to ensure that on Election Day the Dixiecrats would not expand from their “four-state base” of Alabama,

*Clark Griffith, Vice President Alben Barkley, and Connie Mack at the opening of Baseball Season. Year 1949*



Photo Courtesy of UK Public Policy Archives



Mississippi, Louisiana, and South Carolina. (Gullan, 1998, p. 124) Truman was charged with limiting the impact of Wallace and the Progressive Party. (Gullan, 1998, p.125)

After a brief trip to Rome for a meeting of the Interparliamentary Union, the Senator returned to begin his campaign. In New Orleans on October 16, he used many of the themes that he would use throughout the South. Barkley declared, "It cannot be denied that a vote for any other ticket than the regular Democratic Party ticket is in its effect a vote for the Republican Party." In the same speech, he argued that the Republican Party, "has not understood the South or its problems, and has permitted and even encouraged the exploitation of the South by those same plutocratic interests which have always dominated the Republican Party." In his address, Barkley did not refer to Thurmond except by inference. (*New York Times*, 1948a) The crux of Barkley's argument was that by voting for a third party, the South lost and the Republicans won. Republicans, according to Barkley, had never cared for or understood the South and they never would.

In his appeals to Southern voters, the Senator was always sure to mention the historic relationship between the South and his party. In Asheville, NC, on September 27, he stated, "It would be a tragic thing if the partnership between the Democratic Party and the South were to be destroyed." Barkley mentioned the contribution of famous Southern Democrats like Thomas Jefferson in his address. While campaigning in Nashville, TN, on October 18, he offered the example of, "Woodrow Wilson who gave to the Democratic Party the world vision from which it has not departed." In these addresses Barkley showed why he had been nicknamed "Mr. Democrat" with praises of the party, declaring in his Nashville speech, "The Democratic Party is the oldest, most experienced, and most representative political party in the nation." With his oratory, Barkley built an image of the South and the Democratic Party united in their goals and in their history. He portrayed the candidacy of Thurmond as an assault on an almost holy union.

Barkley's meetings with local politicians during his southern campaign swing were an important part of his efforts. According to Gullan, "Barkley's most important exercises in persuasion were conducted off the podium, in private talks with Southern officeholders, many of whom were old acquaintances." (Gullan, 1998, p. 125) This was a logical role for Barkley to fulfill. While he had supported civil rights legislation throughout his career, he believed strongly in compromise, making him more acceptable to Southerners. Also, his work as Minority Leader in 1946 to allow Senator Theodore Bilbo of Mississippi to be seated, despite charges of corruption, had been appreciated. In large part, his popularity

Photo Courtesy of UK Public Policy Archives



*Vice President Barkley addressing the dedication of Ashland, the Henry Clay Estate, in Lexington, Kentucky. Year 1950*

with Southerners stemmed from his personality. Dean Acheson, Truman's Secretary of State, wrote of Barkley that he "was not only the most popular man in the Senate, but easily the most popular in Washington. He was warm because he had a deeply affectionate nature and really liked people." (Acheson, 1961, p.140) People responded to Barkley's warm personality, allowing him to connect with voters, gain important positions, pass legislation, and work out compromises. In his conversations with Southern politicians, Barkley would remind them that a, "Republican victory might cost them their influence, if not their jobs." (Gullan, 1998, p. 125) Barkley was mostly successful in his talks with Southern leadership.

Due to the importance of keeping the majority of the South Democratic, Barkley's speeches were methodically crafted. Gullan writes that Barkley's Southern speeches, "were carefully prepared, tailored to his specific audience, and devoid of the humor he usually employed." (Gullan, 1998, p. 124) This was the only leg of the campaign where Barkley relied heavily on his speechwriters. Once Barkley moved to other parts of the country, his natural and humorous speaking style returned. In Dover, DE, on September 22, Barkley made a rare mention of Dewey's name when it began to rain, ending his speech early, he jokingly said, "I don't want you to get wet. In fact I don't even want you to get dewey." Local issues were mentioned in his speeches. While



*Visit to Sicily and Rome, American Cemetery at Anzio, Italy, together with Senator Lucas, and Congressman Reed. Standing by an American coffin. Year 1947*

in Greeley, CO, on October 5, he focused on electrical issues, public water usage, and land development. In Greeley, the Senator stated, “of course, you know that in the Republican dialect socialization means anything the government does on behalf of a lot of people, while the American Way means anything the government does for an influential few.” Barkley’s humor made his attacks on the Republicans less mean and more effective.

An unexpected issue of the campaign was the farmer’s need for storage space for surplus crops like wheat and corn. 1948 had proven to be a good year for agriculture. In previous years the Commodity Credit Corporation (CCC) was allowed to lease extra facilities so farmers could store their surplus. In June, Congress revised the CCC’s charter so that the organization could only rent office space. (Gullan, 1998, p. 150) This change meant that farmers had to sell their surplus quickly, which in turn drove down prices. Historian Zachary Karabell explains:

Though the Republican platform alleged a commitment to price supports, by stripping the CCC of its role in renting or constructing storage buildings, Congress essentially drove down agricultural prices. At the same time, the cost of manufactured goods was rising. With less income from their farms, farmers were being pushed to the brink. (Karabell, 2000, p. 210)

The change was little noticed when it was first

enacted, but toward the end of the campaign it would prove to be a deciding factor in the election.

The Democrats were the first to realize the potential potency of this issue. Gullan asserts, “By September Clifford was fully alert to this almost providential new issue.” (Gullan, 1998, p. 151) Truman would first use the issue for partisan advantage during a campaign stop in Dexter, IA. Declaring that the GOP stands for “gluttons of privilege,” he accused Republicans in Congress of working to destroy the small farmer. (Lawrence, 1948d, p. 1) After attacking the Republicans for changing the CCC he loudly proclaimed:

There is only one way to stop the forces of reaction. Get every vote out on election day and make it count. I’m not asking you just to vote for me. Vote for yourselves, vote for your farms, vote for the standard of living that you have won under a Democratic Administration, get out there on election day, and vote for your future. (ibid.)

The people who heard the president were, in the words of one observer, “an interested crowd, but not a very demonstrative one.” (ibid.) Truman’s speech at Dexter was a good example of the president’s “weakness of political positioning and rhetorical stridency.” (Gullan, 1998, p. 119) The president’s penchant for overusing drama in his speeches often weakened their impact. Despite the lack of an enthusiastic response in Dexter, “a seed had been planted.” (Gullan, 1998, p. 152)

The seed “would be cultivated by Alben Barkley, making his impact on the second critical region that determined the outcome of the election.” (ibid.) Barkley used the farm issue to the ticket’s advantage throughout his tour of the Midwest and far West. The issue was mentioned by the candidate in Iowa, Minnesota, Kansas, Idaho, Montana, and many other places. He accused the Republicans of having no farm policy, declaring in Kansas that the Republican policy “would neither protect the gains of the last sixteen years nor provide adequate growth in the future.” (*New York Times*, 1948b) In Mankato, MN, on October 3, Barkley mentioned the CCC issue specifically and asked, “If the Republicans are elected in November, what can we expect them to do next year?” Barkley was later criticized for the tactics he used when courting the farm vote. But despite these criticisms “his campaign methods... had certainly worked.” (Gullan, 1998, p.155)

The farm vote had traditionally gone Republican until Roosevelt, but in 1940 and 1944, it started to vote Republican overwhelmingly again. Barkley had always thought that victory was possible, but he had not been sure of it until he reached the Midwest. He later told an interviewer, “And when I got out into the . . . what they

called the Corn Belt out in the Middle West, the great agricultural states, I began to feel that the tide was in our direction." (Shalett, 1953) By using the frustration of farmers to the Democrats' advantage, Truman and Barkley had managed to capture a significant portion of the Republican base. In 1948, the Republicans' mistakes on agriculture policy hurt them significantly with a normally reliable part of their base.

Throughout the race, Barkley attacked the record of the Republicans and defended the accomplishments of Democrats. According to Barkley, in 1929, Hoover had brought the country to the brink of ruin, but the efforts of Roosevelt and the New Deal saved the nation. Remarks like this helped to give Democrats a sense of pride in belonging to their party. Barkley's speeches instilled a sense of confidence in the party's base about their chances in November. Speaking before a labor union, a major part of the Democratic base, in Wilkes-Barre, PA, on September 19, he declared that Republicans were scared because, "They know they deserve to be the minority party because they represent a minority of the people, whose spokesman are the Grundys, and the Pews, and the special interests." The laborers loved the Senator's remarks and interrupted with applause several times.

Barkley managed to convey a sense of hope to the Democratic Party that they could win despite the elites of political punditry predicting their efforts were useless. Take for example a widely circulated issue of *U.S. News and World Report* (October 15, 1948) that appeared weeks before the election with the cover declaring, "Popular vote close electoral vote heavy for Dewey" says George Gallop." Largely because of Barkley's efforts, Democrats did not give up. Davis writes, "Probably the greatest contribution of the Democratic vice-presidential nominee was his ability to inspire party workers with his own optimistic outlook." (Davis, 1979, p. 266) Republican overconfidence about their certainty of victory caused laziness in their presidential ticket, their political strategist, and their party workers.

Truman and Barkley continued their vigorous campaign until the eve of Election Day when the two men returned to their hometowns. Truman gave one last radio broadcast after Barkley introduced him. Speaking from Paducah, KY, on November 1, in his introduction Barkley recalled Roosevelt's death and Truman's ascension to the presidency. Barkley stated, "Now that his [FDR's] great personality had merged with that of other great men in the eternity of the ages, all eyes and hearts turned to the man who under our Constitution grasps the pilot's wheel of our ship of state." Truman, according to Barkley, had been a magnificent leader. He declared that Truman "brought strength to our economy, expansion and per-

manence to our influence and hope to hopeless men and women throughout the world." After his introduction, Barkley placed his hands in his pockets and went into his bedroom, closing the door. He would not reappear for several hours. (Gullan, 1998, p. 174)

## VI. Conclusion

On Election Day, Americans headed to the polls convinced they would have a new president. They were wrong. The popular vote was close with 24,104,836 going to the Truman- Barkley ticket and the Dewey-Warren ticket earning 21,969,500 votes. (Davis, 1979, p. 268) In the Electoral College the Democrats had won 303 to 189. (ibid.) Despite the predictions of the press, polls, and people, Truman and Barkley emerged from the hard fought campaign as victors. Barkley later bragged to his friend, U.S. Supreme Court Justice Hugo L. Black, on November 19, that their victory "confounded the metropolitan press, the poll takers, the radio commentators, and the general assembly of pessimists who thought this election was over before the Convention met in Philadelphia." (Barkley Papers, Box 65, Folder 12) To another acquaintance, Earle Clements, Then Governor of Kentucky, he wrote the Democrats won because "the people did their own thinking and their own victory." (Clements Papers, Box 229, Folder 3)

Barkley's efforts were a major contribution to the Democratic victory. With his plane, "The Bluegrass" Barkley campaigned in 36 of the 48 states, gave 250

*Barkley watches and poses as the sculptor makes the final cuts to his bust. Year 1956*



Photo Courtesy of UK Public Policy Archives





Photo Courtesy of UK Public Policy Archives

**Alben Barkley with his daughter Marion (Mrs. Max Truitt) and Bob Hope. Year 1949**

speeches, and traveled 150,000 miles. (Shalett, 1953) Both Barkley and Truman worked hard for their victory. Once they were nominated, they met quickly to map out their election strategy. During the campaign, the communication between the two camps remained good, which allowed them to take advantage of unexpected issues like the CCC. Both men thought victory was possible, not inevitable. This attitude made them work hard because it gave them the hope that they could win, but it did not deceive them into thinking their task was easy. The Republican ticket had acted as if they had already won, causing Barkley to comment that Dewey acted like “the election was a formality; it would be just a confirmation of what the people had already made up their mind to do.” (Shalett, 1953) The American people responded positively to the energy of the president and his vice presidential nominee.

Barkley would serve as vice president under Truman for four years. He briefly attempted to gain his party’s nomination in 1952, but his efforts stalled when organized labor deemed him too old. The “Iron Man” refused to retire from the political scene and challenged John Sherman Cooper the incumbent Republican Senator from Kentucky. (Hatfield, 1997, p. 428) In 1954, he was victorious. (ibid.) Two years later he was invited to give a speech at Washington and Lee University; there

he would give his final speech before his sudden death. (*New York Times*, 1956)

Since his death, Barkley has been largely forgotten. This is unfortunate because Barkley was a major force behind many of the political decisions made in the first half of the twentieth century that continue to shape American political discourse to this day. His efforts during the 1948 campaign have been largely overshadowed by President Truman. Barkley contained the Dixiecrats to their four states and kept the rest of the South in the Democratic column. His work in the Midwest led to the Democrats capturing states that had gone for Dewey only four years earlier such as Iowa and Minnesota. He convinced the party’s base not to give up despite all polls and pundits declaring their efforts worthless. These factors contributed greatly to Truman’s victory in 1948, but have received little attention from historians. Even though Barkley has passed from the memory of most Americans, his legacy still lives on.

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*Vice President Barkley's senate desk with other memorabilia. University of Kentucky, M.I. King Library*



Photo by Evie Russell



I graduated from UK (May 2008) with a Bachelor of Arts Degree in Psychology. I was in the Honors Program.

My Honors and Awards include: Phi Beta Kappa, Diachun Award, Mary Agnes Psychology Award, Arts and Sciences Development Award, Psi Chi Psychology Honor Society, and I was on the Dean's List from fall semester 2004 to Spring Semester 2007.

I have been accepted to UK's doctoral program in School Psychology, and I will begin in the fall. Issues that adolescents are facing are an area that I am interested in, especially peer victimization, and it is an area that I intend to continue to pursue in my graduate studies.

In the fall of my junior year, I began developing my study by reading various articles about peer victimization and bullying across different age groups. After much research in this area, my faculty mentors and I decided to investigate bullying and peer victimization in high school students; specifically, the nature of teasing in high school students and how different forms of bullying are related to gender. We traveled to four different high schools across the state to collect data from approximately 1,000 high school students last spring. The purpose of this study was to investigate the methods high school students use to bully other students, such as relational, physical, and verbal aggression, and how this varies with gender. Also, we were interested in how the form of aggression used affects the perpetrator's social status.

To obtain this information, high school students were given a packet of questionnaires containing various measures. Our contribution to these measures included two narratives in which participants were asked to relate both an experience they had with participating in bullying and an experience they had being the victim of bullying. After data had been collected, we then worked on a method of coding the narratives on many different dimensions, including the form that the bullying took (i.e., physical, verbal, and relational), how the individual reacted to the incident, etc. We also included a definition of each different form of aggression that included

examples of how it might be expressed in the narrative. The lesser-known form of aggression, relational aggression, was defined as harm to relationships, such as gossip, or spreading false rumors.

Recently, the data from the study was analyzed. Results indicated that females used more relational aggression and males used more physical aggression. There was no significant interaction between the form of aggression used during the bullying incident and social status; however, we did find that individuals who used gender inconsistent forms of aggression (i.e., males who used relational aggression and females who used physical aggression) reported higher levels of depression than individuals who used gender consistent forms of aggression. This could have occurred for many reasons; however, I believe that individuals believe they should conform to gender stereotypes, and that those who go against gender norms often realize that they are different and often feel awkward and that they are different from others.

Working in a research lab these past two years, and continuing on to conduct my own study in a related area, has given me immeasurable insight into the domain of research in psychology as well as instilled a deeper desire to continue on with this work and find other areas of research that I would be interested in. My experience working on a Senior Honors Thesis has been the most influential experience on my choice of future goals as well as the most helpful course that I have taken as an undergraduate. Because of my previous work in research on child peer victimization, I have made the decision to continue working with children and adolescents.

My most important extracurricular activity would have to be working in a research lab. I have been involved in a research lab in Psychology since my sophomore year, and it has been the best experience in preparing me for graduate school.

I presented a poster on this work at the Undergraduate Showcase of Scholars this past April, 2008, as well as at the Psychology Poster Session Day.



**Faculty Mentors:**  
**Professor Monica Harris and**  
**Professor Richard Milich,**  
**Department of Psychology**



Bullying and peer victimization are becoming recognized as a national health crisis. Both the bullies as well as the targets of peer victimization are noted to be at increased risk for a variety of behavioral and emotional problems, and this seems to be especially true as children enter adolescence. Despite the importance of this problem, there is much we do not yet understand about peer victimization. This absence of understanding is especially true for possible gender differences in the manifestation of peer victimization. This question is the area addressed in Ms. Murphy's research study. She was interested in determining whether male and female high school students might use different forms of aggression in their manner of peer victimization, and how this might affect their own personal well being. Specifically, Ms. Murphy found that males and females who engage in gender-atypical forms of aggression are at heightened risk for feelings of depression and inadequacy.

## Relations Among Gender-Typical and Gender-Atypical Uses of Aggression, Popularity, and Depression

### Abstract

The purpose of this study was to investigate how types of bullying engaged in by high school students (relational, physical, or verbal aggression) vary with gender and how they may be related to a student's social status. Children in the ninth grade, from four different Kentucky high schools, were administered various measures as part of a larger study on social development in their own classroom. Measures used in our analysis included a bully and victim self-reported narrative, Bullying Questions and Belonging Questionnaire, and a Peer Nomination Scale. Results indicated that females used more relational aggression than males, and males used more physical aggression than females. Analysis did not reveal a significant relation between gender, form of aggression used, and social status. However, use of gender inconsistent forms of aggression (i.e., females using physical aggression and males using relational aggression) was found to be significantly related to levels of depression and sense of inadequacy. Additionally, females reported feeling more guilt than males during the bullying incident. These findings support past research, and suggest that females use a different form of aggression than males. Finally the results raise an intriguing question about the relation between use of a gender inconsistent form of aggression and internalizing difficulties.

### Introduction

Late adolescence and early adulthood can be a time of confusion, conflict, and experimentation. High school students have many important decisions made within a short time period. Bullying and peer victimization also tend to be prevalent in this period of adjustment. However, others take offense at the comments and do not know how to cope or respond in such an ambiguous situation. Much research looking into the effects of bullying



and peer victimization on children has been conducted, and the consequences can be negative (Nansel et al., 2001). The detrimental effects of bullying can also be seen in later adulthood. New information may provide insight into the different forms of bullying and how we might best be able to diminish the adverse affects of peer victimization. The purpose of this study was to investigate the various types of bullying engaged in by high school students, such as relational, physical, and verbal aggression; how these types vary with gender; and how they may be related to a student's social status.

Previous research has defined peer victimization as "victimization that entails face-to-face confrontation (e.g., physical aggression, verbal abuse, nonverbal gesturing) or social manipulation through a third party (e.g., social ostracism, spreading rumors)" (Juvonen & Graham, 2001, p. xiii). Peer victimization is an extensive problem. More than 10% of students are self-reported victims of moderate or frequent bullying, and 13% of students engage in moderate or frequent bullying (Nansel et al., 2001). Bullying has also been found to be stable over time. Research has indicated that the utilization of such forms of aggression has an adverse effect on both the perpetrator and the victim. Nansel et al. (2001) reported that children who are the victims of persistent peer victimization may suffer from loneliness, anxiety, depression, and academic problems.

Current research has identified the possible risk factors associated with being victimized so that we may better understand who are the perpetrators and who are the victims. Those who are bullied have often been found to have internalizing problems such as anxiety, depression, and social withdrawal (Olweus, 1993). Bullies, on the other hand, are often characterized by displaying externalizing problems, such as hostility, impulsivity, and a need to dominate others. All of these risk factors place children at a greater hazard of later being involved in peer victimization and suffering the long-term consequences mentioned above.

While much past research has been devoted to the more overt forms of aggression that peer victimization may take, recent findings have indicated that there is another form of aggression, relational aggression, that has been less recognized and studied. Relational aggression includes behaviors in which damage to relationships "serves as the vehicle of harm" (Crick et al., 2006). Relational aggression can be both direct, in which the perpetrators plainly state the intentions of their actions, or indirect, in which the perpetrators may try to undermine an individual secretly, using rumors or gossip. Relational aggression has been shown to be potentially quite detrimental to both perpetrators and victim, with long-term consequences similar to those of other forms of aggression. Many studies suggest that

females employ this method of aggression over any other form, while males primarily utilize physical and verbal forms of aggression (Crick et al., 2006).

Relational aggression plays a vital role in many young girls' social interactions. It can take the form of social exclusion from a group, or false rumors or gossip spread about individuals so as to embarrass or abase them. Relational aggression has also been used to gain the favor of other individuals so as to climb up the social ladder. Many females see it as a method of strengthening their popularity or social standing (Rose, Swenson & Waller, 2004).

Recent research on the use of this method to damage social relationships has provided evidence that girls do not experience a benign childhood as was once thought (Crick & Grotpeter, 1995). Additionally, girls who are the perpetrators of relational aggression may be at a greater risk for depression in early adolescence (Conway, 2005). Further research is needed in this area to provide insight into possible ways to alleviate these negative long-term effects.

In a recent study (Crick et al., 2006), gender was found to be related to different forms of aggression, such that males were more likely to exhibit overt or physical aggression and females were more likely to exhibit relational aggression. Additionally, individuals who exhibited gender inconsistent behavior (e.g. males utilizing relational aggression or females utilizing physical aggression) were more likely to receive more negative reactions from both peers and adults, as well as to display withdrawn behavior.

To expand on the risks associated with relational aggression, Leadbeater et al. (2006) examined the negative consequences of relational and physical aggression and how these change with gender. These investigators found that there are few social benefits of physical aggression and many costs. Those who participate in relational aggression often experience more relational victimization; this is especially true for boys. However, they also found that females who engage in relational aggression, and who were not relationally victimized, received more positive attention from their peers. Further, these individuals reported more rewards, such as popularity or peer acceptance, for participating in relational aggression. On the other hand, females who participated in physical aggression reported themselves to have lower peer acceptance and greater depressive symptoms (Leadbeater et al., 2006).

Some researchers have theorized that girls may use relational aggression as a means to gain a specific type of popularity, called perceived popularity (Rose et al., 2004). Perceived popularity differs from the conventional idea of popularity in that these are individuals who are believed by their peers to be popular but who are not

necessarily well liked. In a recent longitudinal study by Rose et al. (2004), perceived popularity was measured using a peer nomination scale. Students voted for peers whom they thought to be well liked or for peers whom they perceived as “popular.” A measure of both relational and overt aggression was also included in their questionnaire. Relationally aggressive acts were found to be more highly associated with perceived popularity, and initial perceived popularity later predicted increased relational aggression. However, the opposite was true for boys who participated in relational aggression. The authors explained this observation as due to boys participating in gender inconsistent forms of aggression that their peers do not accept.

In a similar study by Zimmer et al. (2005), researchers investigated gender differences in the forms of aggression that are utilized by boys and girls, as well as how gender-typical versus gender-atypical uses of aggression relates to peer status. Using a peer nomination scale similar to that of the study above, they found that children who engage in gender normative forms of aggression are perceived by their peers to be more well liked than those who engage in gender inconsistent behavior. Additionally, the researchers found relationally aggressive acts to increase peer acceptance when children reached adolescence.

The stability of forms of aggression and their influence on peer status were examined in a study by Cillessen and Mayeux (2004). These investigators also examined gender and age differences in these two forms of aggression and how these forms of aggression influence peer status. They found physical aggression to be more stable than relational aggression. They also found that as age increased in this sample of fifth- to ninth-grade children, relational aggression was increasingly associated with perceived popularity, such that individuals who utilized relational aggression were often found to have high perceived popularity. Further, perceived popularity was found to be a predictor of relational aggression, especially for girls. Cillessen and Mayeux deduced that this could be due to relational aggression being used by children and adolescents as a method to control their peers or to establish dominance. Their findings also suggest that this is true for males who use physical aggression as well, but not for males or females who participate in forms of aggression that are gender atypical, as previous research has also found.

The current study expands on previous research by examining how high school students bully other students, how this varies with gender, and how this may be related to a student’s social status. Given the previous findings, we predicted that girls will exhibit more relational aggression than physical aggression and that individuals who have differing patterns of aggression

for their genders will be less liked by their peers. We also predicted that high levels of relational aggression are linked with higher levels of popularity for girls and lower levels of popularity for boys. High levels of overt aggression should also be linked with higher levels of popularity for boys and lower levels of popularity for girls.

A final prediction for this study is that the form of aggression that an individual is subjected to will be related to the victim’s level of distress. We made no a priori prediction on what this relationship will be.

## Method

### *Participants*

48 males and 53 females participated in this study. Students were recruited from four different Kentucky high schools, three from central Kentucky and one from north-western Kentucky. All ninth graders from these schools were allowed to participate in the study, there were no exclusionary criteria. All participants were between 13 and 16 years of age.

### *Recruitment*

Participants were recruited from four different high schools, during their high school math class. Students were informed about their opportunity to participate in the study during their class by graduate students and research assistants who explained the purpose of the research study. Students were given consent forms for their parents to sign. They were instructed to return the consent form to their teachers before being allowed to participate in the study. Approximately 1,000 students were asked to participate in the study. Of these students, 984 returned the consent forms to participate in the study. For the purposes of this study, however, we used data from only those participants ( $N = 101$ ) who completed the narrative measures.

### *Measures*

Participants completed both a victim and a bully narrative in which they were asked to describe a time when they were bullied or teased and a time when they bullied or teased someone else, respectively. Extensive research has shown the value of using narratives, especially for relating experiences that may elicit anger or distress (Baumeister et al., 1990).

### *Victim Narratives.*

Victim narratives were used to evaluate students’ emotions during a time in which they were bullied or picked on by a peer. Participants were asked to relate a memorable time in which they were bullied or picked on in a hostile manner. Instructions included a list of topics to include in the written narrative, such as what happened, why they think it happened, what emotions they experienced, how they responded during the event, and if there were any long-term effects from the event.



Six independent raters coded the narratives on the victims' level of distress, anger, forgiveness, form of bullying (physical, verbal, relational, property offenses, physical aggression, and other), and how the victim responded to the incident. These items were rated on a five-point scale, 1 being "not at all," 5 being "very much" (except for the form of aggression and how the victim responded to the incident, which were coded by categories).

For the coding of the form of bullying, coders were given specific definitions and examples of 5 different forms of victimization. Relational aggression was defined as spreading rumors or excluding someone. Verbal aggression was defined as insults, verbal harassment, and racial epithets. Property offenses was defined as damaging or taking property. Physical aggression was defined as hitting, tripping, or shoving. Coders were also given the option of selecting an "other" category. After the raters had completed coding the narratives, interrater reliability was analyzed and found to be satisfactory (Mean Reliability = .92).

*Bully Narratives.* Bully narratives were used to assess students' emotions during a time in which they participated in bullying or teasing a peer in a hostile manner. Students were asked to describe important details of the memory, including what they did, why they think they did it, their emotions at the time, how they reacted, what was the victim's response, whether the bully told an adult, and if long-term effects resulted from the experience. Coders who rated the victim narratives also rated the bully narratives for bully's enjoyment, guilt, how much the bully blamed the victim, victim's response, and what form of bullying was employed (i.e., physical, verbal, relational, etc.) The variables of victim's response, and form of bullying that was employed were categorical in nature, while the other three variables used in the analyses were continuous variables. Inter-rater reliability was found satisfactory for the bully narrative as well (Mean Reliability = .93).

In the analyses of both the victim and the bully narratives, some limitations were included. The "other" category for the nature of the bullying incident was not used in analysis, because we were not interested in this category. Also, the category of property offenses was combined with the physical aggression category, because we considered property offenses to be another example of physical aggression.

*Social Relationship Questionnaire.* Participants also completed a peer nomination scale, called the Social Relationship Questionnaire, in which they were presented with a list of students from their school and in the ninth grade. Students were randomly selected to be on their questionnaire. Each classroom had a different list of

students from other classrooms, and no one physically present in the classroom during data collection was on the list for a given student. Students were asked to rate those students on several different measures, including "How much would you like to be in school/social activities with this person?" on a scale of 1 to 5, 1 being "not at all," 5 being "very much." Other questions asked them to check the names of students whom they believed possessed a certain attribute, such as "Please check the name of those students whom you admire or look up to."

Using this measure, students were classified on a continuous scale of high to low social status, based on the score obtained from other student's views of them. Additionally, a measure of rejection was included on this questionnaire and was also used in analyses.

*Behavior Assessment System for Children, Second Edition (BASC-2).* The final measure used in this study was the Behavior Assessment System for Children, Second Edition (BASC-2). This is a multi-dimensional measure that looks at both adaptive and problem behaviors in children. Our study used the Adolescent Self-Report measure, which has 186 items on a 4-point scale ranging from "never" to "almost always." For the purposes of our study, however, we looked only at the 87 items assessing six different internalizing problems: anxiety, depression, sense of inadequacy, school attitudes, inter-relatedness, and self-esteem. There is much evidence to demonstrate this measure's validity and reliability (Reynolds & Kamphaus, 1992).

#### *Overview of Procedure*

Questionnaires were group administered in students' classrooms by a trained graduate or undergraduate research assistant as part of a larger study on social development. Students were given instructions on how to fill out certain measures and were told to work individually on their own surveys, and not to disturb other participants. Additionally, students were told to raise their hands if they had any questions about the material, so that a research assistant could assist them. For participating in the study, students were given small incentives (e.g., small candy, soda).

## **Results**

The independent variables in this study are: (a) gender and (b) type of aggression described in the bully narrative (relational, verbal, or physical). The dependent variables include popularity, social exclusion, victim distress, depression, and sense of inadequacy. We investigated how gender and method of aggression relate to the individuals' social status, depression, and sense of inadequacy. We predicted that gender-inconsistent behavior would result in a lower level of popularity for

Form of Aggression	Males		Females		Total N	Percent
	N	Percent	N	Percent		
Relational Aggression	4	8.3%	7	13.2%	11	10.9%
Verbal Hostile Aggression	28	58.3%	39	73.6%	67	66.3%
Physical Aggression	16	33.3%	7	13.2%	23	22.8%
<b>Total N</b>	<b>48</b>		<b>53</b>		<b>101</b>	
<b>Percent</b>	<b>47.5%</b>		<b>52.5%</b>			

Table 1. Gender Differences in Frequencies of Form of Aggression Used

the individual, or a higher level of social exclusion.

When evaluating the first hypothesis — that females would use more relational aggression than males — results were found to be consistent with previous findings. Analysis revealed a significant difference for gender and form of aggression used ( $p = 0.052$ ; females reported using more relational aggression than males ( $N_f = 7, N_m = 4$ , respectively), and males reported using more physical aggression than females ( $N_m = 16$  and  $N_f = 7$ , respectively). There was no significant difference between the two genders in the use of verbal hostile aggression ( $N_f = 39$  and  $N_m = 28$ , see Table 1).

Analysis of the second hypothesis — that individuals who used gender inconsistent forms of aggression would have lower social status than individuals who used gender consistent forms of aggression — revealed no significant main effects or interaction for the individual’s mean likeability score,  $F(1, 99) = .28, p > .05$ , and the individual’s level of exclusion as reported by his or her fellow students on the peer nomination scale,  $F(1, 99) = 1.83, p > .05$ .

In the third hypothesis we predicted that individuals who experienced gender inconsistent forms of aggression (i.e., males who experienced relationally aggressive acts and females who experienced physically aggressive acts) would report higher levels of distress; however, results indicated that there was no significant interaction between gender and form of aggression used for the victim’s level of distress,  $F(1, 99) = .20, p > .05$ .

There were several unexpected results that merit attention. Analyses revealed that there was a significant interaction between gender and form of aggression used during the bully narrative on the individual’s reported level of depression; individuals who reported using gender inconsistent forms of aggression reported having greater levels of depression than individuals who

reported using gender consistent forms of aggression,  $F(1, 99) = 2.93, p < 0.05$  (see Figure 1). Males who reported using relational aggression had higher BASC depression scores ( $M = 48.75$ ) than males who reported using physical aggression ( $M = 43.67$ ). Females who reported using physical aggression had a higher BASC depression score ( $M = 54.29$ ) than females who reported using relational aggression ( $M = 42.00$ ).

The second unexpected result involved the interaction between gender and form of aggression used for the dependent variable of individual’s self-report of sense of inadequacy. Analysis revealed that individuals who reported using a gender inconsistent form of aggression reported higher levels of a sense of inadequacy than individuals who reported using a gender consistent form of aggression,  $F(1, 99) = 2.89, p = .06$  (see Figure 2).

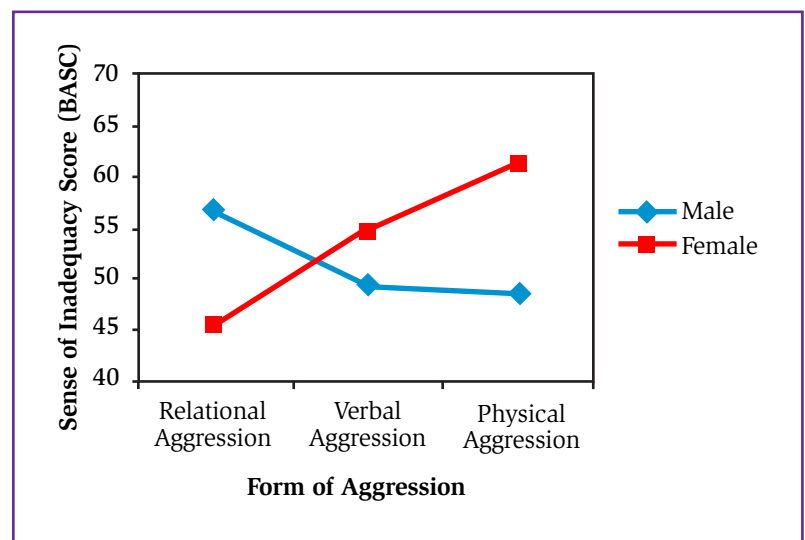


Figure 1. Interaction of Gender Inconsistent Use of Aggression and Level of Depression.

Males who reported using relational aggression had a higher sense of inadequacy ( $M = 56.7$ ) than males who reported using physical aggression ( $M = 48.73$ ). Females who reported using physical aggression had a higher sense of inadequacy ( $M = 61.14$ ) than females who reported using relational aggression ( $M = 45.71$ ).

Finally, there was a significant main effect for level of guilt in the bully narrative. Females reported feeling more guilty than males. This was assessed using a t-test  $t(112) = 2.93, p < .05$ . Females' average amount of guilt on a scale of one to five was higher ( $M = 2.63$ ) than males ( $M = 1.91$ ) (see Table 2).

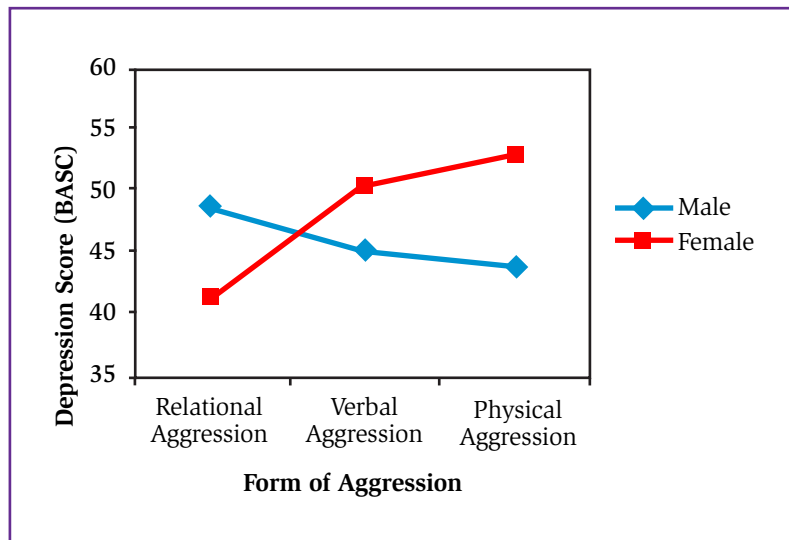


Figure 2. Interaction of Gender Inconsistent Use of Aggression and Level of Sense of Inadequacy.

## Discussion

This study investigated the different forms of aggression used by high school students as well as how use of gender inconsistent forms of aggression relates to social status. As expected, results revealed that females reported using more relational aggression than physical aggression and males reported using more physical aggression than relational aggression as determined from the bully and victim narratives. No significant gender differences were observed in use of verbal aggression. Analyses revealed no significant interaction between gender and form of aggression used on the individual's social status or level of rejection; however, individuals who used gender inconsistent forms of aggression were found to have higher levels of depression and a higher sense of inadequacy than individuals who used gender consistent forms of aggression. Additionally, females reported feeling more guilt than males during a bullying incident.

Consistent with previous findings, females reported more relational aggression than males (Crick et al., 2006). These findings suggest that females use

a different form of aggression in social interaction than males and may have externalizing difficulties as well, as opposed to only internalizing difficulties. However, these difficulties are manifested differently from typical male aggression. Also, consistent with previous studies, males reported using more physical aggression. There were few reports of relational aggression out of our large sample; however, this could be due to the covert nature of relational aggression. Relationally aggressive acts are often hidden in social context and frequently concealed to inflict more damage to social relationships. The manipulative nature of these acts could be what makes this method of aggression preferred by females.

Our second finding, that use of gender inconsistent forms of aggression was not related to social status or level of peer rejection, is contrary to previous findings. There are many possible explanations for this finding, including a low base rate of reports of relational aggression, salience of the act of relational aggression, as well as the measure used to determine both social status and an individual's level of rejection. Additionally, individuals who reported using gender inconsistent forms of aggression may do so covertly, without drawing attention to themselves. This may be done more easily with relational aggression than physical aggression because of the nature of relationally aggressive acts.

Our final hypothesis, that form of aggression reported in the victim narrative would be related to victim's level of distress, was also not supported by our data. Again, possible reasons could include the low base rates of relational aggression discussed in the narratives and the low number of narratives that were acquired.

There were several unpredicted results that are worth mentioning. Individuals who reported using gender inconsistent forms of aggression reported higher levels of depression and higher levels of a sense of inadequacy. This result is similar to previous findings that engagement in gender nonnormative forms of aggression is related to social-psychological adjustment (Crick, 1997). Other studies have found that participating in gender atypical behavior was correlated with the individual's level of depression; individuals who used gender atypical behavior reported higher levels of depression (Chevron et al., 1978). Our findings suggest that individuals who participate in gender atypical behaviors may realize they are deviating from norms and thus feel depressed or inadequate.

Additionally, another unexpected result includes the finding that females reported feeling more guilt than males in the bully narrative. This finding is consistent with previous studies that females report more guilt with incidents that violate norms of compassion and trust (Williams & Bybee, 1994). There are several possible



explanations for this finding, including that females are often thought to have more empathy than males. In addition, females are more likely to internalize blame, which leads to their experiencing more guilt. They are also often more invested in social relationships. It is interesting to note that females experience more guilt than males when participating in bullying, and yet the form of aggression that they use more often than males is targeted at harming relationships.

This study demonstrates that females utilize a different form of aggression from males, and that this form of aggression is not overt and not easy to observe. It is important to understand the use of gender inconsistent forms of aggression, as well as what the implications are for the individual. More research is needed to better understand what is occurring. Also, findings from this study have implications for individuals with internalizing difficulties as well.

Limitations of this study include the method of measuring relational aggression, because students may not be the best reporters of their own actions. Perhaps the ideal method of measuring use of different forms of aggression would be to employ an observational method of data collection. Additionally, the narratives themselves involved free recall of a bullying incident; however, the incident they chose to relate may not have been about a form of aggression that they most typically use. Another limitation of our study is the low base rate for narratives, because of the method used to distribute the materials. The questionnaires were group administered in a very large packet of questionnaires. Students may not have had enough time to get to the narratives, or did not want to spend time writing them. Finally, the low number of reports of relational aggression could have influenced results also, and perhaps our definition of relational aggression did not capture the full spectrum of that form of aggression.

A further limitation of our study that could have implications for future studies is our method of identifying the gender of the participants. Unfortunately, due to the nature of the data, our classification of gender was biologically determined, as reported by the participants, which limits our analysis to biological factors, as opposed to social constructs. Future studies should further investigate this difference and assess gender more directly, rather than relying on sex.

Future studies need to investigate the stability of the adverse effects of using gender inconsistent forms of aggression. Also, our study found little difference between genders in the number of reports of use of verbal aggression. Future studies should investigate this further. Additionally, there needs to be a better understanding of why there is a relationship between gender inconsistent forms of aggression and depression.

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I am a senior majoring in biology. The work I present here is part of an ongoing project as a 2007-2008 Beckman Scholar. Throughout my undergraduate studies, I have developed a particular interest in the human central nervous system. My work in Dr. Snow's lab has allowed me to explore the nature of failed regeneration following spinal cord injury. This work has been

instrumental in guiding my future course of study, as I will be attending medical school in the fall and ultimately intend on entering the field of neurology.

I have also been especially fortunate to have a mentor such as Dr. Diane Snow in the department of Anatomy and Neurobiology. Ever since I began working with her in January, 2007, she has been incredibly supportive and concerned with the work I do in the lab. She has given me my own project to work on and has invited me to several national meetings. I express my deepest gratitude for the time, energy, and encouragement she has given me for the entire duration that I have known her.

In addition to undergraduate research, I am also active in a number of other activities. During the 2007-2008 academic year, I was a student instructor for both the BIO 190 and CHE 197 workshop courses at UK. I was also a returning student ambassador for the College of Arts and Sciences at UK.

**Faculty Mentor: Dr. Diane Snow**

Eddie Kobraei is an exceptional student who has done exceptional research as a Beckman Scholar (2007-2008). His project in my lab entitled, "Quantification of Neuronal Growth Cone Responses to Specific Chondroitin Sulfate Proteoglycan Motifs" has been extremely challenging and represents a mature endeavor, even for more advanced students. Eddie has been diligent from day one and has done

an amazing job, accumulating data, critically analyzing the data, and presenting the results at a variety of meetings both local and national.

From observing Eddie as he progresses through this study, it is clear that he is very intelligent, highly-motivated, mature beyond his years, and capable. I have been very impressed with Eddie's work ethic and drive as he has analyzed neuronal growth cone behavior in response to inhibitory proteoglycans. This project requires great attention to detail, and extreme accuracy, as well as long hours of analysis. Eddie has given 100% on all accounts. The article he is currently submitting to

*Kaleidoscope* is written superbly and is a thorough representation of the project he has done. The depth and breadth of inquiry he describes demonstrate his integral involvement in the project and his abundant academic talents.

## Behavioral and Morphological Parameters of Neurons Predict the Inhibitory Potential of CSPG Motifs: A Novel Technique.

### Abstract

Our lab aims to systematically identify the structural elements of chondroitin sulfate proteoglycans (CSPGs) that inhibit regeneration following spinal cord injury (SCI). CSPGs are extracellular matrix molecules produced by astrocytes of glial scar tissue following SCI. Central to this project is the use of CSPGs referred to as "Designer PGs," which contain engineered modifications in the GAG chains and/or the protein core of the neural CSPG aggrecan. Using established bioassays in vitro, we qualitatively and quantitatively measure growth cone behaviors and morphology as they interact with Designer PG molecules. These measurements are then translated into a composite inhibitory quotient (IQ) score that reflects the inhibitory strength of the particular Designer PG. Scoring is completed through application of our comprehensive inhibitory quotient (IQ) system scoring criteria. The utility of the IQ system is that it allows us to evaluate and directly compare all experimental CSPGs. IQ scores can then be mapped back to the structure of the experimental CSPG, allowing us to pinpoint the inhibitory domains of CSPGs. The long term goal of this methodology is to develop clinical therapies that selectively target the most inhibitory CSPG domains while leaving unaltered the beneficial aspects of the glial scar, thereby supporting regeneration and recovery of function following SCI.



## Introduction

Spinal cord injury (SCI) is a debilitating condition currently afflicting approximately 255,000 people in the U.S. alone (NSCISC, 2008). This condition presents formidable challenges to successful post-trauma recovery of function and often results in permanent central nervous system (CNS) damage. A hallmark of regeneration failure following SCI is the up-regulation of inhibitory chondroitin sulfate proteoglycans (CSPGs) by astrocytes of the glial scar (Fitch and Silver, 2008). One member of the CSPG family that is up-regulated is aggrecan (Figure 1), which can serve as a model for this family of aggregating proteoglycans. Although studies *in vitro* and *in vivo* have localized the inhibition largely to the glycosaminoglycan (GAG; sugar) portion of CSPGs (Snow et al., 1990), the specific parts of the GAG chains or possible protein domains responsible for inhibition remain unidentified. Further, the effects of specific CSPG motifs on neuronal growth cone behaviors have yet to be systematically quantified.

In the present study, we are identifying the precise structural microheterogeneities of CSPGs that make them inhibitory to neuronal growth cones, using a novel technique involving: 1) “Designer PGs” and, 2) an “Inhibitory Quotient (IQ)” analysis system. Designer PGs are discrete aggrecan mutants that are produced with altered properties (elimination of specific sites for glycosylation, alterations in sugar chain length, or number, composition, or deletion of individual domains) to identify modifications affecting neurite outgrowth. With the IQ system, a wide variety of behavioral and morphological parameters of neuronal growth cones are qualitatively and quantitatively evaluated from time-lapse images as growth cones contact and respond to Designer PGs. The IQ system is then used to translate these responses into composite IQ scores for each Designer PG, which is an indication of the degree of inhibitory strength of each PG (see Methods).

The results of this on-going study are serving to identify the structural moieties responsible for the inhibitory action of CSPGs, and are providing insight into the ways in which growth cones respond to proteoglycan molecules. The long-term goal of these studies is to develop strategies to manipulate the most inhibitory domains of CSPGs to render them non-inhibitory. In this way, glial scars will remain intact to facilitate the normal healing and repair processes, but CSPGs will allow regeneration, ultimately promoting recovery of function in patients with SCI.

**Figure 1: Native Aggrecan.**



## Methods:

### Bioassays

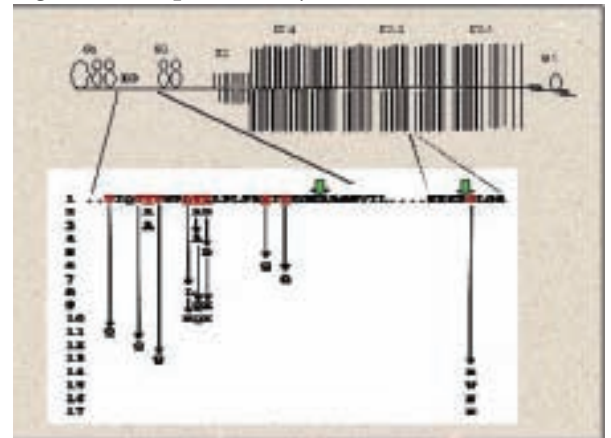
#### Sensory Neuron (DRG) Dissection

Embryonic dorsal root ganglia (DRG) neurons were dissected on ice according to AAALAC regulations governing animal welfare and transferred to culture dishes containing 500  $\mu$ l of Dulbecco's Modified Eagle Media (DMEM) with F12 HEPES in a 1:1 ratio. The DRG were cut into small explants and plated on the substratum described below. The substratum plates were incubated at 37°C for ~6 hr.

### Substratum Preparation

Glass coverslips were mounted over holes in the bottom of 50 mm polystyrene Petri dishes. A 0.1 mg/ml poly L-lysine solution was applied to the coverslip to provide an adhesive surface for the binding of other molecules of interest. The glass coverslips were then washed two times with PBS and allowed to dry. Purified CSPGs were applied using cellulose strips (Whatman filter paper) in a pattern onto the poly L-lysine background (Modification of Snow et al., 2002). Laminin (25  $\mu$ g/ml) was then applied to the entire coverslip, and incubated at room temperature for 1 hr. The substratum was then washed to remove unbound laminin or CSPGs from the substratum. The result was a patterned substratum consisting of alternating stripes of adsorbed CSPGs and laminin. (Figure 2)

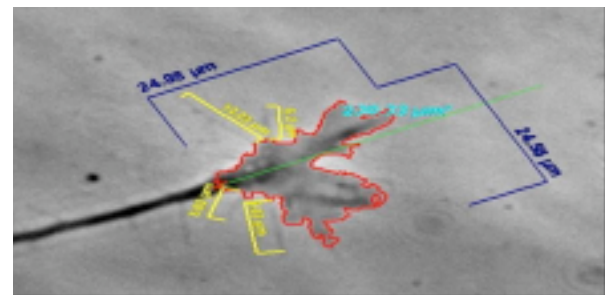
**Figure 2: Stripe Bioassay**



### Growth Cone Parameter Analysis

#### Growth Cone Measurements

A Zeiss Axiovision image analysis system was used to record time-lapse videos of individual DRG neurons as they approached and contacted CSPG stripes. The videos were then reviewed frame by frame and used to record measurements of numerous outgrowth parameters, with particular emphasis on the behavior of the leading “exploratory” component of the DRG neurons, called the growth cone (GC) (Figure 3 and Table 1).



**Figure 3: Growth Cone Measurement Analysis**



**Table 1: Partial List of Growth Cone Parameters Measured**

GROWTH CONE MORPHOLOGY	GROWTH CONE BEHAVIOR
Growth Cone Area	Growth on PG Stripe
Growth Cone Length	Growth Rate
Growth Cone Width	Growth Cone Acceleration
Number of Filopodia	Growth Cone Retraction
Max Filopodial Length	Growth Cone Turning
Total Length of Filopodia	Growth Cone Branching



**Figure 4: Four Zones of Outgrowth on Patterned Substratum in Assays in vitro**

Each of these GC parameters was measured in four different zones of neuronal outgrowth relative to the PG-adsorbed stripe. Note that Zone 1 neuronal responses were taken as the baseline values, as no contact with the experimental CSPG is made throughout this zone. (Figure 4)

### **Inhibitory Quotient (IQ) System Quantitative Assessment of Inhibition**

The IQ system is a novel method by which to translate measurements of growth cone responses to Designer PGs into a quantitative, composite IQ score for each PG, to reflect the degree of inhibitory strength of each PG tested. To set the criteria, two PG standards were used that represent the extremes of growth cone behavior in response to this class of molecule: 1) bovine [adult] articular cartilage aggrecan (Sigma #A1960), which is highly decorated with GAG chains and induces complete inhibition of growth cone elongation; and 2) recombinant aggrecan expressed in the cell line CHO-745, which is deficient in xylosyl transferase, thus the CSPG is devoid of GAG chains, and is completely non-inhibitory to growth cone elongation. Growth cone responses to these two molecules set the criteria for analysis of all

**Table 2: IQ System Scoring Criteria**

*note: zone 2 criteria are used to derive zone 2 scores, etc. for zone 3		ZONE 2 CRITERIA (X VALUES)			ZONE 3 CRITERIA (Y VALUES)		
CATEGORY	PARAMETER	2 pt	1 pt	0 pt	2 pt	1 pt	0 pt
Growth Rate	GC RATE	X < 1.17	X between 1.17 and 1.43	X > 1.43	Y < .76	Y between .76 and .92	Y > .92
	GC ACCELERATION	X < -1.71	X between -1.71 and -1.39	X > -1.39	Y < -.29	Y between -.29 and -.23	Y > -.23
Filopodial Behavior	MEAN NUMBER FP/FRAME	X < .98	X between .98 and 1.19	X > 1.19	Y > .95	Y between .77 and .95	Y < .77
	MEAN TOTAL FP LENGTH/FRAME	X < 1.04	X between 1.04 and 1.28	X > 1.28	none	none	none
	MAXIMUM FP LENGTH/ZONE	X < .92	X between .92 and 1.12	X > 1.12	Y < .87	Y between .87 and 1.07	Y > 1.07
Morphology	GC AREA	X < .92	X between .92 and 1.12	X > 1.12	Y < .86	Y between .86 and 1.06	Y > 1.06
	GC LENGTH	none	none	none	none	none	none
	GC WIDTH	X < .96	X between .96 and 1.18	X > 1.18	Y < .90	Y between .90 and 1.10	Y > 1.10

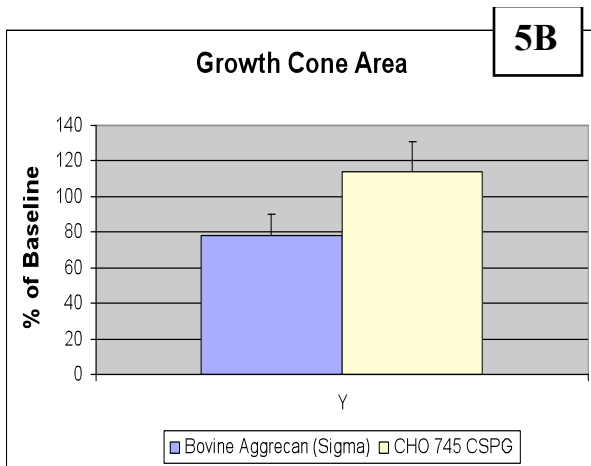
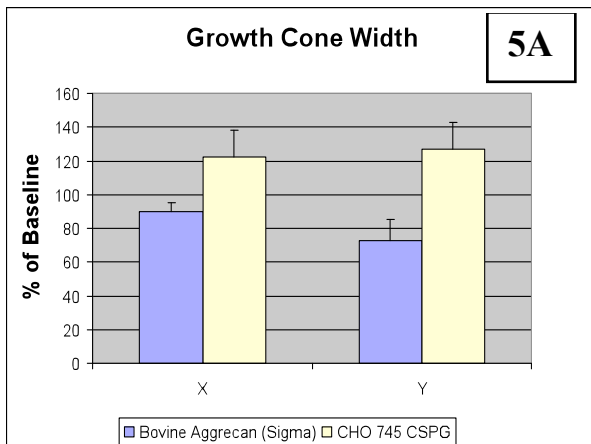


Figure 5(A-B): Growth Cone Width and Area are Reliable Predictors of CSPG Inhibition.

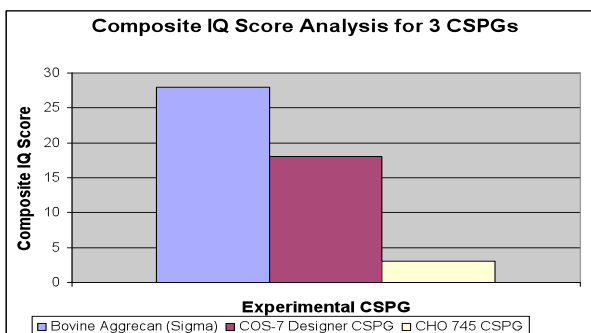


Figure 6: Composite IQ Scores for Three CSPGs.

subsequent Designer PGs, e.g., COS-7-derived aggrecan (see Results).

Development of the criteria (Table 2) for growth cone analysis required calculation of a single X and Y value for each of the two control PGs for every parameter. X and Y values summarize all experiments for a given PG (n = 3) and represent changes in behavior compared to growth on laminin alone (zone 1):

**Comparison of behaviors in Zone 2 to Zone 1:**

[ Avg. Z2/Z1 = X ] (n = 3)

**Comparison of behaviors in Zone 3 to Zone 1:**

[ Avg. Z3/Z1 = Y ] (n = 3)

Because the inhibitory trends for a given parameter were reflected in the X and Y values for each standard PG, a quantifiable basis for criteria development was established. Individual criteria were developed separately for zone 2 and zone 3 trends for each parameter and a point value of 0-2 was given depending on the extent to which the X and Y values reflected inhibitory responses (0 = least inhibitory, 2 = most inhibitory). The criteria for each parameter are integrated into category scores and then combined into a comprehensive scoring criterion that yields a composite IQ score ranging from 0-30 (least to most inhibitory). Although the raw data become compressed, the utility of the scoring criteria and computation of X and Y values is that they can be used to assign a composite IQ score to any experimental CSPG. Further, raw data is still taken into consideration, as is qualitative data for each growth cone’s response.

**Results:**

**Growth Cone Behaviors Reflect the Degree of CSPG-Induced Inhibition**

(Figure 5A) For the growth cone width parameter, both the X values (p = 0.027, t test) and the Y values (p = 0.011, t test) are significantly different for the bovine aggrecan positive control and the CHO 745 negative control. Such differences were quantified and incorporated into the IQ scoring criteria. (Figure 5B) Y values for both the positive and negative CSPG controls reveal significant differences (p = 0.039, t test) in growth cone area.

**Composite IQ Scores Differ Between Designer PGs**

The IQ system is sensitive in distinguishing the inhibitory capacity of three CSPGs with very different properties. The “COS-7 Designer PG” is a mutant form of aggrecan (see Methods). Note that its inhibitory properties are somewhat intermediate between those of bovine aggrecan and CHO-745 CSPGs. (Figure 6)

## Discussion:

Two important conclusions immediately follow from this work. First, select behavioral and morphological parameters of DRG neurons are reliable predictors of CSPG-induced inhibition. This finding was readily shown by the statistically significant differences in responses of neurons to the bovine aggrecan and CHO-745 CSPG standards for the parameters, “growth cone area” and “growth cone width.” Significant differences were also observed for a number of other growth cone parameters, reinforcing the notion that such parameters reflect the inhibitory capacity of CSPGs.

Second, the differences we observed for growth cone responses to various CSPGs can be quantified and incorporated into a comprehensive scoring criterion. Because the two CSPG standards together comprise the entire spectrum of inhibitory responses (complete inhibition to no inhibition), values calculated for the bovine aggrecan established the criteria for maximum inhibition and values for CHO-745 CSPG established criteria for minimum inhibition. Values intermediate to those observed for the two standard CSPGs were assigned scores indicating intermediate inhibitory effects. Extension of this analysis to several other growth cone parameters then facilitates calculation of category scores, which are then combined to ultimately give the composite IQ score. The IQ system thus allows for the evaluation of any experimental CSPG (“Designer PG”).

A third result of this study thus far that is quite intriguing and novel in the field is that a blinded statistical analysis of the linear data for growth cone behaviors in response to CSPGs showed that values related to growth cone morphology significantly changed in the frame just following single filopodial contact with the inhibitor. For many years, researchers have questioned whether there is a cell surface receptor for CSPGs, with no resulting data to date to support this theory. That a cell can change its morphology immediately following contact with a single filopodium suggests that a receptor-mediated event is not out of the question, and supports further research in this regard. However, an alternative explanation might be effects of charge density, given the large degree of sulfation of CSPGs, or regulation of calcium-mediated events (Snow et al., 1992). These possibilities remain to be tested.

The IQ system analysis is not only consistent among different PG samples, but is also consistent among different users. This is true with respect to both growth cone measurement analyses as well as composite IQ score formulation. As such, it can be applied repeatedly to

derive IQ scores for different CSPGs, and can be adopted for use on a more universal scale to test a wide variety of molecular cues. One NIH reviewer of this project stated the methodology “may become the standard in the field.” The results thus far support this prediction.

Further application of the IQ system of scoring with several Designer PG constructs will uncover the structural basis of CSPG-based outgrowth inhibition. The importance of this work is underscored by the fact that identification of these inhibitory domains should ultimately permit clinical applications to reduce inhibition, promote axonal regeneration, and counteract the utterly debilitating and presently irreversible nature of spinal cord injuries, to facilitate functional recovery.

## Acknowledgements

The lab would like to acknowledge support from the NIH (NINDS NS053470) and the Christopher and Dana Reeve Foundation. I would also like to thank Dr. Snow for her tremendous support and for giving me this project to undertake.

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# THE CHELLGREN CENTER FOR UNDERGRADUATE EXCELLENCE

Every top-twenty university has, as a fundamental component, an outstanding undergraduate program. At the University of Kentucky, The Chellgren Center for Undergraduate Excellence is not only the symbol, but the embodiment, of its commitment to the finest undergraduate education. The Chellgren Center embraces a comprehensive array of teaching and research programs, professors, and services designed to enhance, develop, foster, and deliver the exceptional undergraduate experience that is one of the major components of the University's mission.

## *Chellgren Fellows Program*

The Chellgren Fellows Program is for students with exceptional academic potential and aspirations who are eager to participate in a special learning community designed to cultivate extraordinary achievement. Chellgren Fellows (Chellos) are students who have the potential not only to excel at UK but also to compete successfully for the highest honors and awards within and outside of the University. The learning community consists of the collaborative interactions among students, faculty, and staff that create an intellectually stimulating environment, nurture high academic aspirations, and foster scholarly and personal development reflective of undergraduate excellence. Each spring, a new class of Chellgren Undergraduate Fellows is selected, while returning fellows serve as models and mentors to incoming fellows. Each fall, the newly selected Chellos engage in a major scholarly creative or research project under the mentorship of a faculty member, and take a course in Methods of Scholarly Inquiry in which they learn and employ advanced techniques in their own projects.

## *Mentoring*

Outstanding faculty from across campus serve as individual mentors for the Chellos as they engage in their scholarly projects. Through regular meetings and conversations, mentors help students develop strategies for engaging in the intellectual life of the University with an emphasis on opportunities available to them both within and outside the UK community, such as service learning experiences, internships,

education abroad, undergraduate research, community service, and leadership opportunities. Mentors may elect to invite students to participate in sessions with their graduate students, attend lab meetings, review and discuss papers or projects being planned, and attend scholarly talks. Mentors help Chellos identify external scholarship opportunities and assist them in preparing applications and developing skills used to acquire these awards (e.g., writing personal statements, successful interviewing).

## *The Chellgren Center Community Experience*

The learning community consists of Fellows, faculty mentors, and professional staff affiliated with the Chellgren Center for Undergraduate Excellence, all working together to make the Chellos' undergraduate experience one of an exceptionally high standard.

Chellos are expected to attend regular meetings with mentors and peers, as well as other pertinent events organized by the Center such as lectures at local colleges and universities, musical performances on and off campus, and art exhibits. At regularly scheduled meetings, Chellos learn about special educational programs and opportunities such as undergraduate research experiences, education abroad, internships, and volunteer activities.

## *The Chellgren Fellows Service Learning Project*

To help extend learning to the real world and foster responsible citizenship, each Chellgren Fellow participates in an annual service learning project or projects designed by the Fellows themselves with guidance from faculty affiliated with the Chellgren Center.

## *Selection Process and Timeline*

Chellos are accepted through a competitive application process. Students are eligible to apply to the program after their first semester at UK. Applicants must have a 3.75 GPA or above. A committee of faculty evaluates and selects Chellos based on the following criteria:

- Academic credentials and extracurricular activities from junior year in high school
- Academic performance at UK (GPA, course selections, extracurricular activities)
- Essays completed as part of the application
- Letters of recommendation



## Chellgren Center Highlights from 2007-2008

On the following pages, several of the highlights of Chellgren Center-associated programs during the previous academic year are described. Students from several eUreKa! programs relate their research, including the Beckman Scholars Program, the summer research and creativity awards, the UKURP (UK Undergraduate Research Program), support for undergraduate travel to scholarly conferences, and the Oswald Research and Creativity Program. Finally, a gallery of images from the third annual UK Showcase of Scholars, an event sponsored by the UK student Society for the Promotion of Undergraduate Research (S.P.U.R.), is presented.

### *Paul W. Chellgren*

The benefactors of the Chellgren Center for Undergraduate Excellence are Paul W. Chellgren and his family. A UK graduate, Mr. Chellgren was an Honors Program student and star intercollegiate debater. He subsequently earned a Harvard MBA and a D.D.E. from Oxford University, where he has been named an Honorary Fellow. In addition to a celebrated career in business, one that



*Paul W. Chellgren*

included service as the CEO of Ashland Inc., Mr. Chellgren has been a particularly active UK alumnus, having served for eleven years on the UK Board of Trustees. The generous gift from Mr. Chellgren and his family helped establish the Chellgren Endowed Chair and five named professorships.

## BECKMAN SCHOLARS PROGRAM



*Andrew Lynch*



*Edward Kobraei*

The Beckman Scholars Program, established in 1997, is an invited program for accredited universities and four-year colleges in the US. It provides scholarships that contribute significantly to advancing the education, research training, and personal development of select students in chemistry, biochemistry, and the biological and medical sciences. The sustained, in-depth undergraduate research experiences and comprehensive faculty mentoring are unique in terms of program scope, content, and level of scholarship awards. The University of Kentucky has been invited to apply for the program three times, and was selected to participate for three years beginning in 2002, in 2005, and again in 2008.

The Beckman Scholars Program provides support for no more than three outstanding undergraduate researchers per year. Scholars receive support for two summers and the intervening academic year, including a generous scholarship award plus stipends for supplies and travel. Scholars must conduct their research in chemistry, biochemistry, the biological and medical sciences, or some interdisciplinary combination of these disciplines, in the laboratory of and under the mentorship of a University of Kentucky faculty member approved by the Beckman Foundation. The currently approved Beckman mentors are listed below.

Being named a Beckman Scholar is an extraordinarily high honor. The process by which a scholar is selected is quite rigorous. The selection is conducted by a committee of research faculty members each with a strong record of mentoring undergraduate researchers. The selection process evaluates 1) the ability of the candidate in both written and oral communication by considering a required research essay and conducting an interview of each finalist; 2) the past achievements of the candidate by reviewing the entire undergraduate transcript, academic honors received, and all previous research experience; 3) the candidate's intellect, character, and potential to excel as a researcher by appraising a required written research plan and at least

# BECKMAN SCHOLARS PROGRAM

three letters of support from current and prospective faculty mentors and 4) the candidate's potential for a career in research by evaluating a required written statement of educational and career plans.

To apply to become a Beckman Scholar, a student must be a sophomore or junior at the University of Kentucky, majoring in Chemistry, Biology, or a closely related discipline (such as chemical engineering or agricultural biotechnology), and have already completed at least one semester of research experience.

The Beckman Scholars for the year 2007-2008 were Andrew Lynch (mentored by Professors Dibakar Bhattacharyya and Allen Butterfield) and Edward Kobraei (mentored by Professor Diane Snow). The Beckman Scholars for the year 2008-2009 are Clay Turner (mentored by Professor Robin Cooper) and Lesley Mann (mentored by Professor Christopher Schardl). In the following articles, the 2007-2008 Scholars explain and discuss their research.

## Approved Beckman Mentors

Faculty/Mentor Name	Department	Current Undergrads in Labs	Undergrads in Labs since 2002	Total Undergraduate Journal Articles since 2002	Total Different Undergraduate Co-Authors since 2002	Total Undergraduate Presentations since 2002
John E. Anthony	Chemistry	1	10	12	5	6
Leonidas G. Bachas	Chemistry	5	14	7	7	13
Dibakar Bhattacharyya	Chemical Engineering	4	19	3	3	28
D. Allan Butterfield	Chemistry	1	6	8	6	1
Robin L. Cooper	Biology	11	39	21	26	60
Sylvia Daunert	Chemistry	4	18	16	9	12
Rebecca Dutch	Biochemistry	2	10	4	4	2
Robert B. Grossman	Chemistry	1	10	2	2	0
Robert L. Houtz	Agricultural Biotechnology	2	5	2	2	5
Bruce O'Hara	Biology	2	11	6	5	9
Brian C. Rymond	Biology	0	8	2	3	0
Christopher L. Schardl	Agricultural Biotechnology	2	19	0 *	0 *	2
Diane M. Snow	Anatomy & Neurobiology	5	13	2	4	4
S. Randal Voss	Biology	4	10	5	8	2
Bruce A. Webb	Agricultural Biotechnology	3	12	4	4	1

\* Most of Dr. Schardl's undergraduate students have worked on his fungal genome-sequencing project, which is extremely large and will take a long time to come to fruition. He expects to write it up and publish it within the year, and to include many undergraduate co-authors.

For more information on the Beckman Scholars Program at the University of Kentucky, visit [www.uky.edu/beckman](http://www.uky.edu/beckman).





**Mentors:**  
 Prof. Dibakar  
 Bhattacharyya,  
 Department of Chemical  
 Engineering, and  
 Prof. Allen Butterfield,  
 Department of Chemistry

## Following My Nose

I cannot remember a time when I couldn't swim. Because my parents were "yachties," I spent the first three years of my life on a thirty-three foot sloop sailing around Southeast Asia. If I wasn't just swimming I was snorkeling; if I wasn't snorkeling I was fishing or playing in the surf. When I was a little older, I started swimming competitively, bodysurfing, and SCUBA diving. All my activities centered on water.

When I lived in Asia, my friends were local children. I have memories of swimming with these friends in estuaries so choked with garbage that one could hardly see any water at all. The surface was an undulating sheet of plastic bags, Styrofoam, and assorted junk. I also remember playing in streams that functioned as glorified sewers, witnessing cyanide used to stun fish for the market, and watching my friends fall ill from what I learned to be water poisoning.

These experiences impacted me. From a young age I developed a love for water and a tangible appreciation of the threat posed by water pollution. As I grew older and began taking classes in geography, chemistry, and biology, this appreciation only intensified. I was shocked to learn that according to World Health Organization estimates approximately 10,000 people per day die from ingesting contaminated water.

Entering college, I had little idea of what I wanted to do with my life. Because I enjoyed science and mathematics, I decided to major in engineering. Although my interest in water quality endured, I really had little direction. The best thing that ever happened to me was when my father pressured me to get a summer research job here at the University of Kentucky after my freshman year. Working in the Kentucky Geophysics Laboratory as an assistant, my job was to scan through thousands of tiny seismic readings from around Kentucky and figure out which ones were true micro-earthquakes and which

were caused by falling trees, lightning strikes, and closing garage doors. This task was a fascinating puzzle — a treasure hunt. I quickly became enamored of "scientific investigation."

After my sophomore year at the University of Kentucky, I discovered an opportunity to combine my interest in water quality with my interest in research. I interned at New Mexico's Los Alamos National Laboratory under a scientist who worked to promote the health of the local community's water supply. The primary problem we faced was groundwater contamination; historic chemical dumping near the laboratory had resulted in toxicity problems in the drinking water aquifer. With the help of this scientist and several other generous team members, I designed a chemical protocol for rapid, thorough screening of groundwater samples for contamination. I am delighted that this protocol has now been implemented at Los Alamos and is used to screen all new groundwater samples.

During my junior year of college I received an even greater opportunity: the Beckman Scholarship gave me the chance to continue groundwater quality research right here in Kentucky. Since my junior year, I have worked under Dr. Dibakar Bhattacharyya, Alumni Professor of Chemical Engineering, to remediate groundwater contamination in Paducah, Western Kentucky, resulting from activities at the Paducah Gaseous Diffusion Plant. My efforts are a small part of a larger Department of Energy SuperFund project aiming to remove industrial solvents and other contaminants from the local environment.

Public Enemy Number One in my work is trichloroethylene (TCE), an organic compound commonly used as a de-greaser. I research new ways of destroying the TCE molecule — of actually breaking it apart into less toxic pieces. To accomplish this, I use hydroxyl radicals, which are highly reactive, to help rip off chlorine atoms. Most recently I began working on a system for delivering and sequestering these hydroxyl radicals in the tiny pores of the plastic beads used to soften shower water. I am inspired by the fact that, if hydroxyl radicals can be applied effectively enough, they have the potential to safely destroy many of the world's water pollutants.

With the assistance of the Beckman Scholarship, I have been able to not only support my research but to share it. At conferences in California, Utah, Washington DC, and Louisiana I have been able to present my results, gain valuable feedback, and attend lectures by some of the world's greatest scientists. I have even been able to present my work internationally, and could attend the bicentenary meeting of the Geological Society of London in the United Kingdom last year. Memorably, at the last conference I attended I had the opportunity to personally present my work to one of Kentucky's Nobel Prize winners, Harry Gray of the California Institute of Technology. He informed me that I had mistakenly used a zero (0) instead of a letter o (O) for the compound H<sub>2</sub>O on my poster. After a moment of embarrassment, Harry assured me that I shouldn't worry about it. With a sparkle in his eye, he chortled, "I do it all the time."

As I leave the University of Kentucky, I am once again without clear direction. Just as I did as a young college student, I intend to follow my nose. I am again entering a program in engineering, though this time a graduate program and in a very different "UK." I have received the prestigious Gates Cambridge Scholarship to study chemical engineering for the next three years at the University of Cambridge in England, starting in October. Following my interests in water quality, engineering, and research I nurtured as a college student and a Beckman Scholar, my long-term goal is to make advances that promote public health.



Mentor: Prof. Diane Snow,  
Department of Anatomy and  
Neurobiology

### My Experience as a Beckman Scholar at UK

With a physicist for a father and a biologist for a mother, it could be argued that I was genetically predisposed to excel and take interest in the sciences. Yet it wasn't until my undergraduate experience at the University of Kentucky that I felt challenged and encouraged to realize my potential. After taking an introductory biology course, a professor of mine encouraged me to pursue scientific research. With the summer approaching, he made arrangements to get me a research project working in the Department of Internal Medicine at the Kentucky Clinic. In this exciting project, I worked in collaboration with post-doctoral scholars to explore changes in VLDL, LDL, and HDL lipoprotein composition and how these changes relate to the development of atherosclerosis. While I started out only performing biochemical assays and lipid analyses, my efforts were soon recognized and I was encouraged to play a larger role in the laboratory, most notably in the characterization of acute phase protein Serum Amyloid A and Cholesteryl Ester Transfer Protein (CETP). It was this experience that initiated my

interest in the world of research, and proved especially beneficial in preparing me for more independent research endeavors that would follow.

As my study of biological science at UK progressed, I began to take particular interest in the human central nervous system, and felt compelled to find a lab that studied diseases and dysfunctions of the human CNS. After exploring a few labs, I met with Dr. Diane Snow in the Department of Anatomy and Neurobiology. I began working in the Snow lab in January of 2007 on a project evaluating neuronal responses to glial scar chondroitin sulfate proteoglycans. I was immediately encouraged by Dr. Snow's tremendous support and concern with the science I was conducting. After a few months of working in the lab, Dr. Snow gave me a related project to conduct independently. She also encouraged me to apply for the Beckman Scholarship award for my work on this project, an award I received in April, 2007.

Since then, I have made a tremendous amount of progress in this investigation. I have worked to refine some of the more fundamental aspects of the project, including the thorough development of a quantitative component, and have made key changes in experimental design. Such changes have led us to a new and improved approach to data analysis. In addition to technical progress, I have also sought to make the project particularly streamlined and amenable to assistance by other students who enter and leave the lab. These efforts have proved useful, as I have had the pleasure of training high school, undergraduate, and graduate students to work on various aspects of this project.

My experience doing research as a Beckman Scholar has had a profound impact on both my scientific and personal development. With regard to scientific matters, I am much more confident and have a new sense of initiative in the laboratory. This program has also fostered my innovation and has allowed me to give lasting contributions to this project. I am also grateful to the Beckman Foundation for supporting my travels to several scientific conferences throughout the United States. These experiences have provided for scientific collaborations and other unique opportunities. For example, I attended 12th International Symposium on Neural Regeneration (ISNR) in California this past December, 2007, where I was the first undergraduate to attend and present in the history of the meeting. As I prepare for my study of medicine in the fall, I know that the critical thinking and analytical skills I have developed

in my experience as a Beckman Scholar will serve me well in both the clinical and research components of my career. (For a formal presentation of his research, see Kobraei's article on p. 101 this issue of *Kaleidoscope*.)

### **Presentations & Conferences:**

10th Annual Beckman Scholars Symposium. July 26-28, 2008. Irvine, CA.

14th Annual Kentucky Spinal cord and Head Injury Research Trust Symposium (KSCHIRT). June 12-13, 2008. Lexington, KY.

Clinical and Translational Science 2008 Spring Conference (CTS). June 3, 2008. Lexington, KY.

22nd National Conference on Undergraduate Research (NCUR). April 10-12, 2008. Salisbury, Maryland.

235th American Chemical Society National Meeting. April 6-10, 2008. New Orleans, LA. Presidential Event: Celebrating Ten Years of Beckman Scholars in Chemistry.

Spring Neuroscience Day. March 12, 2008. University of Kentucky. Lexington, KY.

12th International Symposium on Neural Regeneration (ISNR). December 5-9, 2007. Pacific Grove, CA.

9th Annual Beckman Scholars Symposium. July 26-28, 2007. Irvine, California.

13th Annual Kentucky Spinal cord and Head Injury Research Trust Symposium (KSCHIRT). June 7-8, 2007. Louisville, KY.

### **Research Awards as Beckman Scholar:**

Oswald Research and Creativity Program Award:  
Honorable Mention Biological Sciences

International Symposium on Neural Regeneration (ISNR)  
2007 United Spinal Association Poster Award finalist

### **Research Manuscript in Preparation:**

Snow, D.M., Kobraei, E.M., Calulot, C.M., Huynh, T., Garnett, C., Troese, M., Curinga, G.M., Kohler, K., Cole, D., Westerfield, B.E., Carlson, S., and Hering, T.M. "Designer PG" constructs identify maximally inhibitory regions of chondroitin sulfate proteoglycans: a novel method for the analysis of inhibitory structural motifs.

## Showcase of Undergraduate Scholars

On April 23, 2008, eUreKa! and SPUR (the Society for the Promotion of Undergraduate Research, UK's undergraduate research club) presented the third annual Undergraduate Showcase of Scholars, organized and run entirely by students. All of the refreshments were prepared and served by undergraduates in nutrition and food services, and a bound volume of abstracts was prepared and distributed by SPUR. Over 125 students made poster presentations, approximately 20 students gave oral presentations, and the UK debate team conducted a demonstration debate.

A number of students who participated as presenters at the Showcase have articles or abstracts published in this issue of *Kaleidoscope*. The gallery below includes scenes from the Showcase. An extended version of the gallery is available in the on-line edition of the journal at [www.uky.edu/kaleidoscope](http://www.uky.edu/kaleidoscope)









# eUreKa!

Experiences  
in Undergraduate  
Research and  
Kreative Activities

# UK

UNIVERSITY OF KENTUCKY

**eUreKa!** (Experiences in Undergraduate Research and Kreative Activities) is one of the units comprising the Chellgren Center for Undergraduate Excellence.

The purpose of eUreKa! is to provide coordination and leadership for the many programs designed to encourage and support undergraduate research, scholarship, and creativity at the University of Kentucky. When united, these programs benefit from the symbiosis of cooperation, and the University receives strengthened programs and more efficient administration.

**eUreKa!** includes the following programs:

- *Kaleidoscope*
- The NSF-funded AMSTEMM program
- The Beckman Scholars program
- The Showcase of Scholars
- The “Posters at the Capitol” program
- The undergraduate research and travel support program
- The summer research and creativity awards program
- The Oswald Research and Creativity Awards
- SPUR (the Society for the Promotion of Undergraduate Research) club
- The UK Undergraduate Research Program (UK URP)
- The “Bucks for Brains” summer research mentorship
- Coordination with undergraduate recruitment of students having an interest in research, scholarship, and creative activities.

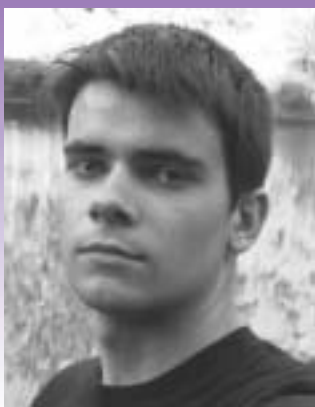
Each of these programs provides students with special opportunities and support for extended scholarly experiences, beyond the classroom. A number of students who have participated in these programs are represented on the following pages. For more information about eUreKa! and its programs, please visit [www.uky.edu/eureka](http://www.uky.edu/eureka)





# Summer Research and Creativity Grants

*The following abstracts were submitted by students who received Research and Creativity Awards for the summer of 2008. Many are not final reports, because the projects were still 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.*



## **Effect of Endocrine Disruption on Male Reproduction in Guppies (*Poecilia reticulata*)**

**Sean Allen, Biology**

Guppies (*Poecilia reticulata*), a tropical fish species native to Trinidad and a fish with a highly promiscuous mating system, were studied to determine what effect endocrine disrupting agrochemicals had on reproductive characteristics of males. Reproductive characteristics examined included size and intensity

of carotenoid based orange spots, competitiveness for females, and attractiveness to females. Before that, preliminary experiments were conducted to understand what, if any, preference male fish had toward females with respect to size, in the presence of competition from another male, and how the presence of competition altered their behavior. Previous experiments in this lab showed males had no size-specific preference for females in the absence of competition. Next, we investigated male mate preference in the presence of competition. The data from this study showed that brighter male fish (containing more carotenoid) were dominant and consistently displayed more to females, as well as spent a larger percentage of time near the larger female. This data shows that male fish perceive larger females as more capable of producing larger, healthier broods. Once we understood the mating behaviors and preferences of these fish, we focused on studying the effects of exposure to hormone disruptors on these reproductive characteristics. Adult males exposed to hormone disruptors via diet manipulation for 6 weeks were measured for carotenoid-based color changes (if any) and behavioral changes as a result of hormone disruption. Experiments scoring competitiveness between control males and treatment males for females, as well as female preference between control and treatment males, were conducted. This study is important to understand the effects of exposure to sub-lethal doses of endocrine disrupting agrochemicals on the reproductive systems of vertebrates.

## **Research Progress Report for Development of a GIS-Based Model to Predict Amur Honeysuckle Presence in Mature Forests in the Bluegrass Region**

**Emily Bruner, Forestry**

I was given a summer research grant to investigate constructing a GIS-based model to help identify target areas for eradication of Amur Honeysuckle in Mature Forest Stands in the Bluegrass Region of Kentucky. In order to help familiarize myself with Geographic Information Systems (GIS) software, I teamed up with Dr. Mary Arthur and one of her graduate students, Heather Wilson, in the Forest Ecology lab to continue research that they have already begun, investigating Amur honeysuckle presence in fifteen mature forest sites.

I hope to identify statistically significant landscape variables that will help to paint a bigger picture of invasion and help land managers promote forest health. So far this summer I have gained invaluable experience getting to know the software itself and have begun to understand its limitations and possibilities. I have begun working with one particular site to import specific soil and habitat data from various GIS databases and have begun to quantify a suite of spatial parameters in order to identify invasion correlates across the landscape.

I have situated myself at a permanent work location and continue to familiarize myself with the capabilities of the software to incorporate all 15 sites into my research. Once all sites have been measured for the landscape variables identified, I will begin statistical analyses to classify which landscape indicators are applicable in diagnosing invasion of Amur Honeysuckle.

## **Hormonal Control of Gene Expression in Undifferentiated Cells**

**Amie Chan, Biology**



A number of regulatory factors control the development of undifferentiated stem cells. Availability of stem cells, stem cell fate, and host rejection all must be overcome before the therapeutic potential of such undifferentiated cells can be realized. These challenges require a better

understanding of the signaling pathways that control the fate of undifferentiated cells, toward an improved ability to manipulate their proliferation and differentiation. The process of differentiation is controlled by factors intrinsic



and extrinsic to the cell. Cell-permeable molecules such as steroid or terpene-based hormones have proven to be extremely useful tools for inducing differentiation of various cells into neurons, glial cells, and fibroblasts.

Our aim is to discern how extracellular molecules, such as hormones, induce the genetic programs for selective cellular differentiation. This question is being approached by elucidating, through promoter mutational analysis, what promoter DNA sequences of a model gene are necessary for hormone action in undifferentiated insect Sf9 cells. The cultured cells, into which the wild type and mutant promoter constructs are transfected, are then exposed to steroid and/or terpenoid hormones.

So far, in my research I have grown and maintained undifferentiated Sf9 cells from three different cell lines from various research supplier companies: Orbigen, Novagen, and ATCC. I performed transfections using selected DNA constructs and healthy cells from the three different cell lines. The purpose of these transfections is testing and determining which cell line would present the best promoter interaction concerning gene expression, transcriptional activity, and comparable hormone responses, based on the quantitative data collected by luminometric assay of its production of 'reporter luciferase.' Results have shown that Sf9 cells from Novagen's cell line have acceptable firefly and renilla luciferase counts and normalized activity of promoter analysis. I will be using this cell line for transfections, testing specifically designed DNA wild type and mutant promoter constructs from four selected model genes.

On the basis of the results obtained thus far in the ongoing experiments, it is anticipated that specific promoter DNA sequences will be discerned that are necessary for the genetic action of these hormones that control cellular differentiation. Obtaining this new basic understanding of how hormones act to control gene expression will enable the manipulation of cellular differentiation for specific practical purposes.

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## Django Reinhardt Festival 2008

### Agatha Clixby, Music

My knowledge of the Django Reinhardt festival before May 28, 2008 wasn't much. The minimalist website offered a few details of the Who, What, and Where nature, but little else. Setting out to research the elusive gypsy jazz, I hopped aboard a jet plane and found myself in Paris, France, where I thought I knew exactly what lay ahead of me. In a small village named Samois-sur-Seine, a quaint, local music festival annually celebrates some of the last remaining traces of jazz manouche. As best as I could gather, there would be few people in attendance, and the acts would be solo guitarists or quintets

carrying on the tradition Django Reinhardt created with his Quintette du Hot Club de France. My intentions were to meet musicians who could help me understand this unique breed of music and who could help a classical violinist like myself find a way to bridge the gap from Dvorak to Django.

Feeling trapped within the confines of calculated classical music had lead me to explore the exciting world of jazz, and I was certain the Django Reinhardt festival was exactly the place to do so. Armed with daydreams of interviewing the headlining acts, I began an inspiring journey that taught me the valuable lesson of listening with my ears and my mind open.

Roughly four days had passed since I arrived in French territory. Four days filled with unforeseen complications, overly stuffed suitcases (Why hadn't I listened to my father?!), and, of course, inexplicable happiness to be in such a beautiful country. The glamour and frustrations of independent travel were weighing on my shoulders as I boarded the RER D in Paris, direction Melun. Unsure of what exactly awaited me at the end of the line, I prayed only that the shuttles promised by the website were in fact at the train station. I tried to keep at bay the fear of coming all this way only to be unable to find the festival. To my dismay, no one at the train station had ever heard of Samois-sur-Seine, and not a single shuttle was in sight. As I began to lose all hope, a nearby taxi driver came to my aid.

The taxi was a beautiful black Mercedes with clean leather seats cooled by the air conditioning Paris so sadly lacks. The driver was actually wearing a red and white striped shirt, and engaged me in polite French conversation the whole ride. Now, this was much closer to my daydreams of my Eurotrip. A mere ten minute drive from the train station, he let me out as close as cars are allowed to approach the festival, and instructed me to follow the roads down toward the river, wishing me luck. The scenery was breathtaking. Not hard to imagine why a musician would find himself so inspired here. As I neared the festival, I began to hear the sound of a muted trumpet wailing in the air. It rose higher and higher as I turned the final corner and got my first glimpse of the festival. Almost unreal, the festival stage itself was on a small island, surrounded by the river Seine on all sides. The island was covered in lush trees that shaded the masses of people below, standing hip to hip, just as they do on the crowded Paris metro. Apparently I was the only one who had trouble finding this island concert! I joined the huddle of people waiting to cross the bridge, pay their admission, and find themselves in jazz nirvana.

Overcome with the happiness and relief of having found myself just where I wanted to be, I squeezed my way into the unorganized line, as festival staff carried a sign that read "COMPLET." The festival is sold out. Shouldering my way past some moseying Frenchmen, I barely made the cut with the sign going up only inches behind my back. I made my way toward the stage where Stefano di Batista and his quartet were working the crowd into a frenzy, each member soaring through dazzling solos. However, this was not the jazz manouche I had travelled many miles to study and observe. A new fear set in — the fear that I would not find true gypsy jazz at this festival... perhaps it really was long gone? Just then, a young man around my age introduced himself as Jeroen and inquired if I were a journalist, because he had seen me taking notes. With his unkempt curly hair and backpacker's garb, he reminded me of an old high school friend, and invited me to sit with him. He and his three brothers, all jazz fanatics and amateur musicians, had driven from Belgium to spend the weekend at the festival. We began to speak in equal parts French, English, and Flemish, discussing music and jazz and Django Reinhardt. I explained

## Summer Research and Creativity Grants (CONT.)

the characteristics of jazz manouche and my concerns that I wouldn't find much of it at this festival, after all. Jeroen suggested I take a walk through the rest of the festival grounds to see what I might find.

Around the corner was a vast array of booths, with everything from beer taps that didn't stop flowing to on-site custom made jazz manouche picks. In between the booths, guitar circles were spontaneously forming and strumming rhythmic chord beds — individuals taking turns with their nimbly fingered improvisational solos. A few lucky circles were joined by violinists who stood and moved between guitarists, latching onto harmonic progressions to dazzle onlookers with lightning fast fingers. Now this was exactly what Django and Stéphane had devised, and what I had come to observe. Relief washed over me as I studied a young violinist and caught his attention.

Once he finished his piece, Arnaud introduced himself and took a break to speak with me for awhile about playing the jazz violin. I told him that, as a classical violinist, I was extremely impressed and amazed by his ability to jump freely up and down the fingerboard with such tonal accuracy while improvising. Curious as to how someone could take what is to me a familiar instrument and create music with a freedom so unfamiliar to me in classical violin lead me to ask Arnaud how he learned to play jazz manouche. The response I got was not what I could have expected. Beginning his violin studies on his own, he had listened to recordings of Django Reinhardt and his Quintette du Hot Club de France and began to improvise along with what he heard. As he got older, he discovered something that helped him gain control of his technique and master his instrument: Kreutzer etudes — the very same etudes my violin teacher recommends. The lines between classical music and this exotic gypsy jazz were beginning to blur.

Arnaud continued to explain the importance of daily routines, such as scales and technical exercises, in order to move freely around the violin with confidence and accuracy. To watch him play, I never would have guessed that his fingers were classically trained, because the overwhelming feeling is of freedom from the rules, and the creation of something new and personal. I thanked Arnaud for his time as he sent me away with the suggestion of a jazz violinist to study, Florian Niculesu, and a completely different outlook on gypsy jazz. Barely five feet away from that guitar circle, I was already stumbling into a new one, lead by some of the most impressive violin playing I had ever heard. Standing on tiptoe to get a look at this virtuoso, my mouth fell open at the sight of a young redheaded boy in baggy jeans and a white undershirt. He was absolutely wowing the growing crowd with his violin, and his hands moved with such speed yet he was having the time of his life. The group was playing a gypsy rendition of the Spiderman theme song, over and over, and each time they neared the final cadence he yelled 'One more!' in a British accent and spiraled into a new solo.

This was exactly what I had been searching for. Those young violinists were playing the jazz violin tunes Stéphane Grapelli had lent to the Quintette du Hot Club de France, and the guitarists strummed along to the echoes of Django himself in their ears. Ecstatic to have found true jazz manouche after all, I returned to my Belgian friends in front of the main stage to find a Portuguese woman on stage singing flamenco. The crowd appeared to have grown, despite the "sold-out" sign still posted at the bridge and, as the sun was going down, the island took on a whole new feeling. With the sultry Latin music booming from the speakers, it was becoming more and more difficult not to move along with the singer. Normally an incredibly timid dancer, I found myself laughing and joining in with Jeroen who was shaking

his hips with the best of them. I told Jeroen that I had never imagined hearing flamenco at a jazz festival, and that if it weren't for the amateur guitar circles, I never would have found jazz manouche at this festival. His answer was without a doubt the most valuable lesson I learned that day at the festival. "It is all the same esprit, spirit. Those guitarists have memorized Django's solos, but this woman is using her voice the same way the violinists use their fingers. She is creating something new, and that is why she is on the stage with a poster behind her head that says Django Reinhardt." He was right. I had been trying so hard to pin down jazz manouche as one specific sound from one particular instrumentation, that I had forgotten to think about what it all means.

Why had I come to this festival? To learn more about a style of violin playing that allowed innovation and encouraged break from convention. I came because I wanted to discover something new, something inspiring. But I was mistaken in believing that only the young amateurs with the impressively memorized Django solos were jazz manouche, or that the only knowledge to gain would come from the headlining acts that graced the pages of the program. Yes, those gypsy jazz musicians imitated the Quintette du Hot Club de France, but they are no more in the style of jazz manouche than Pee Wee Ellis & Fred Wesley, who played later on that night — an American big band style jazz ensemble that couldn't sound much further from Mr. Reinhardt's quintette. Perhaps the bereted guitarists with percussive rhythms have been replaced by pinstriped suits and amplifiers, but the spirit is still the same. Everyone gathered at Samois-sur-Seine that weekend to hear innovative music, and everyone on stage and in the audience recognizes Django Reinhardt as a founder of music that breaks boundaries and blurs lines between genres and styles. I went to the festival to learn why jazz manouche had taken a back seat, but I left understanding that it had not disappeared at all. In fact quite the opposite! My mistake was in assuming that it had to sound and look the same, because music is not a caged animal that mimics and repeats. Music is a living thing that grows and evolves, and that is how it should always be.



## Synthesis and Characterization of Degradable Hydrogel Polymer Systems

**Juan Carlos Cordova,**  
Chemical and  
Materials  
Engineering

Crosslinked degradable hydrogel polymer systems are promising biodegradable materials for medical applications as well as tissue engineering. So far, my research has concerned the development of 3mm thick degradable hydrogels with an estimated starting degradation time of three weeks. After trying various polymerization techniques, I have been able to determine that for the systems that best fit my project, Thermal-Polymerization is the process that yields the best conversion of the macromer to the crosslinked hydrogel. The molecular weight of the macromers was tested through Gel Permeation Chromatography (GPC), the conversion was examined through Infrared analysis (FTIR), and degradation has been analyzed through degradation studies. Currently, I am in the process of developing highly porous hydrogels by introducing different particles into my macromer and, upon crosslinking, removing these particles to leave a porous hydrogel matrix. The degradation products and properties of these porous systems will also be analyzed and compared to the original gels developed at the beginning of my summer project.

## Children in Housing Distress: Their Health and Well Being

**Alecia Fields, Sociology**

National research recognizes nutritional deficiencies, sleep disorders, and increased prevalence of health conditions, such as Asthma, among homeless children. However, throughout a semi-structured series of interviews with families living in homeless shelters, parents repeatedly reported that their children were in good health and had an overall good quality of life. These inconsistencies indicate a disconnect with reality that homeless parents may face when it comes to the health and well being of their children.

My mentor, Prof. Badagliacco of the Sociology Department, conducted interviews over a period of eight years from 1993 to 2001 with eighty-six families living in homeless shelters. Each of these families had at least one child and these children and their health are

the focus of this research. While no children were interviewed, parents were asked questions regarding their children's health and well being. It is the discrepancies between parental opinion and nationally reported health statistics that are being examined in relation to homeless children's health, well being, and opportunity for success. Such disparities raise questions such as: what is the likelihood for success of homeless children if their health is compromised by distorted parental judgement? Additionally, how is the health of homeless children jeopardized by lack of parental education, resources, and security?

The potential outcomes of such differences in parental opinions versus reality could put children at risk for more serious advancing conditions. If parents cannot recognize early stages of advancing health conditions, children miss the opportunity for preventative or early intervention care. Furthermore, health factors such as sleep, nutrition, and mental well being can develop into behavior problems and problems in school. This cycle of developing conditions among homeless children puts them at a greater disadvantage for success. In proposing policy to address such disparities facing children in housing distress, interventions must include a combination of educational programs for parents and families as well as readily accessible primary care services.

## Project Guignol

**Sarah Fogerty, Theatre**



With the 100th anniversary of theatre at the University of Kentucky growing closer, it is necessary to examine the past to fully understand the sacrifices that the founders of dramatic culture at the university made. There are endless resources that document that past in the UK archives; however, they are not organized in a way that tells the story of the rich history of dramatic arts at the University. This project's purpose is to rediscover the Theatre Department's roots, by searching through newspaper clippings, playbills, photos, and scrapbooks in the UK archives to tell the story of the growth of theatre on campus, and establish a greater camaraderie between those in the past and present.

As a result of my findings, I have discovered that the students at the University of Kentucky were so interested in theatre that for almost ten years there were two student groups on campus that were producing plays simultaneously. One of those groups, which began in 1910 under the title "The Strollers," prompted the English Department to begin offering theatre related coursework. The Guignol Theatre, whose heritage we can trace directly to the current theatre department, was the first University-civic theatre to be established during the "Little Theatre" movement in early 1920s America. We have a rich history of dramatic art at the University of Kentucky; it is my intention that through uncovering, organizing, and interpreting that history we can preserve and celebrate it, and use the principles learned from the past so that we may continue in the tradition established in the last century.



# Summer Research and Creativity Grants (CONT.)

## Inter-Species Face Discrimination in Infancy

Whitney Gore, Psychology

Past studies have shown that infants are experts at processing faces and that, as they get older, they specialize in human faces. They become better at processing information from human faces than faces of other species. In this study, we will determine whether 9-month-olds exhibit this type of face specialization. Specifically, we are examining whether infants are sensitive to spatial relations among facial features (such as the distance between the eyes) in chimpanzee faces. This spatial information is important because infants, as well as adults, use it in part to identify faces.

Initial results suggest that 9-month-olds are also sensitive to spatial relations in chimpanzee faces. This may mean that face processing is not specialized enough in infants to prevent the 9-month-olds from processing the same information in human and chimpanzee faces. In addition, we are studying whether inverting the faces will interfere with the processing of chimpanzee faces like human faces. Preliminary results suggest that 9-month-old infants are processing the inverted chimpanzee faces differently from human faces in these conditions. Therefore, some level of specialization may be present in 9-month-olds.



## Results to-date for objective 1

In the initial experiment, I sprayed 25mM, 50mM, and 75mM glycerol on soybean plants for three consecutive days. On the fourth day I extracted fatty acids and RNA from the plants and then inoculated them with the pathogen *P. sojae*. The fatty acid data indicated a decrease in levels of oleic acid in plants treated with glycerol. The extent of reduction in oleic acid levels increased with increasing concentrations of glycerol. No change was observed in water treated plants.

Treatment	18:1 levels (mol%)	H2O	2.18
		25mM	1.85
		50mM	1.8
		75mM	1.65

RNA analysis found increased expression of pathogenesis-related genes with increasing concentrations of glycerol, confirming that the low oleic acid-related resistance responses were induced in glycerol-treated plants. Finally, *Phytophthora* disease progression was monitored in water and glycerol-treated plants by counting the number of dead versus total number of inoculated plants six days post inoculation with *P. sojae*.

Treatment	Dead/Total	% Survival
H2O	4/7	43%
25mM	3/5	40%
50mM	2/4	50%
75mM	2/5	60%

The following experiment consisted of spraying plants with a 100mM glycerol for three days. *P. sojae* inoculations were carried out on the fourth, fifth, sixth, seventh, eighth and eleventh day after glycerol treatment. This was done to test the length of glycerol efficacy in inducing plant resistance. The following results were observed:

Days after glycerol treatment	Plants dead/ Total	% Survival
4	3/4	25%
5	4/6	33%
6	4/5	20%
7	4/6	33%
8	4/6	33%
11	5/5	0%

## Studies of Soybean Plants

Hildallcia Guerra, Plant Pathology

Glycerol mediates several vital physiological processes in prokaryotes and eukaryotes. Studies from Dr. Aardra Kachroo's laboratory have shown that glycerol and its metabolites participate in plant defense, signaling against microbial pathogens. Soybean plants treated with glycerol exogenously induced cell death-like lesions, levels of the defense-related phytohormone salicylic acid, and pathogenesis-related (PR) gene expression. These plants also showed a reduction in the levels of the fatty acid oleic acid (18:1). Inoculation with the oomycete pathogen *Phytophthora sojae* showed that glycerol treatment enhanced to *Phytophthora* rot in soybean (Kachroo et al., 2008).

The first objective of my project was to test the efficacy of glycerol as a tool for disease management in soybeans. I treated soybean plants with varying concentrations of glycerol and then assayed the plants for their fatty acid content, PR gene induction, and response to *P. sojae*. I also treated soybean plants with glycerol for varying amounts of time and assayed the plants for all the above characteristics. In addition to *P. sojae*, I tested the efficacy of glycerol application on resistance to the fungus *Sclerotinia sclerotinium*.



To test similar patterns of resistance in another experiment, one pot was sprayed with 75mM glycerol for three days. Likewise, the glycerol-sprayed and control plants were inoculated on the fourth day, however, on this occasion *S. sclerotinium* was the pathogen. After several days of observation it was evident that the glycerol treated plants had undergone more extensive damage from the pathogen than the control counterparts. The results indicated increased susceptibility in the presence of glycerol, contrary to the previous findings. Experiments with *S. sclerotinium* will be repeated to confirm results.

A second objective of my project is to use yeast two-hybrid (Y2H) analysis to identify soybean proteins interacting with the soybean mosaic virus (SMV) elicitor protein, P3. Dr. A. Kachroo's laboratory is studying soybean response to SMV. Their work has identified several components that are required for resistance to SMV. In an effort to further understand host response to SMV, Dr. Kachroo is interested in identifying host components that respond to the SMV elicitor of defense-P3 protein. A Y2H vector (pEG202) containing the SMV P3 gene was available from Dr. Kachroo's lab. I have used this vector as a bait to screen a soybean cDNA library in the pB42AD vector (kindly provided to Dr. Kachroo by Dr. Madan Bhattacharya, Iowa State University).

### Results to-date for objective 2

Bacterial transformation was carried out using the pEG202 vector containing SMV P3. Transformants were checked for the P3 insert, using PCR followed by gel electrophoresis. Colonies were inoculated into Luria Bertani medium and then used for plasmid DNA extraction. The extracted plasmid DNA was used to transform yeast and transformants selected on media lacking histidine (His<sup>-</sup>). Next, a soybean cDNA library was used to transform the yeast cells carrying pEG202-SMVP3 and transformants selected on media lacking histidine and tryptophane (His<sup>-</sup> Trp<sup>-</sup>). This medium would only allow yeast cells carrying both plasmids to grow. Approximately 600 yeast colonies were obtained on the non-selective medium (His<sup>-</sup> Trp<sup>-</sup>). Each colony was transferred to selective media lacking leucine (Trp<sup>-</sup>His<sup>-</sup>Leu<sup>-</sup> + 2% galactose). Twelve colonies were able to grow on the selective media. These 12 colonies will be further processed to identify soybean inserts potentially interacting with SMV P3. The subsequent step in this process is to isolate the yeast plasmids and sequence the soybean cDNAs inserts to identify the candidates and eventually confirm interaction by protein studies.

### Reference:

Kachroo A, Daqi F, Havens W, Navarre, R, Kachroo P, Ghabrial S. (2008) "Virus-induced gene silencing of stearyl-acyl carrier protein-desaturase in soybean results in constitutive defense and enhanced resistance to pathogens. *Mol. Plant-Microbe Interact.* 21: 564-575.

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## GIS and Archaeology: A Marriage on Monte Palazzi

### Stephanie Houck, Archaeology

More than 2,700 years ago Greek colonists settled in Locri Epizephryii and occupied a mountaintop in the region of Calabria, Italy, now known as Monte Palazzi. According to the earthenware found there, the site may be of some religious importance. However a mystery started to unfold when in 2005 the excavation team under the leadership of Dr. Paolo Visona unearthed a fortified wall surrounding the site. The wall seems to be too thick to be a residential structure but, in bulk and strength, is insufficient to withstand a full military siege. So, for what purpose could this strange site have existed?

The spatial distribution of artifacts as well as the layout of the site will be determined through the combination of archaeological ideas and the technology of GIS (Geographic Information Systems) and global positioning systems employed by geographers today. The research proposed here will incorporate the development of GIS maps to assist in the exploration of the Mount Palazzi archeological site in southern Italy. This information will be displayed over a never-before-produced detailed map of the local terrain, including the land slope, vegetation, soil type, and other landscape features. The goal of this study is to provide a new interpretation of the spatial usage and layout of the site, utilizing geographical methods along with new mapping technologies.

With all the information on the location and dates of each unique find — these being cluster of potsherds, ecofacts, and artifacts displayed upon a graph of the site — it was concluded that the site on Monte Palazzi probably functioned as a sanctuary and garrison for mine hands working at a newly discovered iron mine nearby. The theoretical and analytical implications of geographical tools such as GIS and GPS when combined with the tools of archaeology are immense and sure to produce a much more thorough story of the history of Monte Palazzi and of southern Italy as a whole.

# Summer Research and Creativity Grants (CONT.)



## E-Beam Dosed Teflon AF Waveguides

**Phillip “Donnie” Keathley,  
Electrical Engineering**

Although my original grant proposal outlined e-beam dosed Teflon AF waveguides for surface plasmon resonance (SPR) sensing, my actual work has been in slightly different directions this summer. Since the writing of that proposal, I have tied the loose ends on another work in progress (optical properties of sputtered Teflon FEP) and presented that work at the Electron Ion and Photon Beam conference on Nanotechnology (EIPBN) in Portland, Oregon. Accompanying this presentation, and with the help of Dr. Hastings, I also authored a journal article on the topic to be published in *J. Vacuum Science* in November, along with other conference works. It was upon returning from this trip at the early part of the summer that I realized much more potential in two other projects this summer.

The first project, on which I have spent most of my time thus far, is the deposition and patterning of SiO<sub>2</sub> strips (30 μm wide) on top of a conventional dual mode SPR sensor (essentially a sandwich of a glass substrate, 400 nm thick Teflon and 50 nm thick gold). This project has been conducted with a graduate student who is pursuing her Ph.D. in the area of SPR sensing. Much of my contribution has been with sputtering and characterizing good SiO<sub>2</sub> films. With knowledge and experience gained in past sputtering projects, it was possible to achieve very good SiO<sub>2</sub> layers, as confirmed with spectroscopic ellipsometry. The problem thus far is the final etch step. To remedy this, we have designed a new photolithography mask, and changed our etch process.

The project I plan to spend most of my time on in the remaining half of the summer is one that just grabbed me when brainstorming with Dr. Hastings after the conference. As of now, SPR sensors require a bulky prism and complicated optical setup that is far from being portable. However, with the creation of a diffraction grating at the gold surface (at the gold-Teflon interface) it is possible to induce surface plasmons with nothing more than a light source and detector. This innovation would enable the use of quite cheap and portable sensing equipment to work with the sensors, which could apply in applications outside of a laboratory. Thus far, this has just been heavily brainstormed, and I am still gaining a solid background, but I plan to get started with some preliminary fabrication and testing within the next

## Development of Transgenic Plant Lines to Support Cell Biology Research

**Kristin Kopperud,  
Plant Pathology**



The research that I am conducting this summer in the Goodin Lab is contributing to a significant project funded by the National Science Foundation. The goal of this project is to identify plant factors that interact with viral proteins in the course of infection leading to disease. These experiments require the use of transgenic *Nicotiana benthamiana* plants that express fluorescent markers at specific cellular loci, such as nuclei, as a means of establishing localization of the viral proteins within the host plant cell. Micrographs depicting these interactions are captured using state-of-the-art microscopy and serve as a validation of the research conducted by lab members, and will be used in publications. My eUreKa!-funded grant is related to three essential objectives.

### **Objective 1: Identifying the best plant lines for use in experiments**

The level of fluorescence varies with the expression of the plant's transgene, thus, all plants to be used for experimentation and microscopy must be screened for the presence and degree of fluorescence. In order to obtain the highest-quality micrographs for publication, only those plants that exhibit an intense and consistent level of fluorescence are retained for seed amplification or use in experiments. I keep diligent record of each plant tested to ensure that only the best plants are available for use by lab members.

### **Objective 2: Maintaining plant stocks to support experiments**

In conjunction with the plant screening process, I must also maintain a continuous supply of the various transgenic plant lines in the optimal size and age ranges for experiments. In order to meet the demand of the lab, I plant approximately sixty plants per week and transplant the seedlings at 21 days after germination. The optimal age of plants for use in experiments is 29 days after germination.

The various transgenic lines in greatest demand at present are those with fluorescent subcellular markers targeted to the endoplasmic reticulum, nucleoli, and nucleus, expressing different colors or fluorescence. Each line of plants is cultivated to express one color in a specific locus and is designated by a number on a seed stock list. Transgenic plants that contain a red his-



tone marker (RFP:H2B) are used by the Goodin Lab for nuclear localization signal (NLS) mapping experiments. Those with blue histone markers (CFP:H2B) are used for bimolecular fluorescence complementation (BiFC) experiments to study protein:protein interaction in vivo. Finally, plants with red markers on the endoplasmic reticulum (RFP:ER) are used to observe changes in the host cell membrane as a result of viral infection.

### **Objective 3: Amplifying seed stocks of homozygous plant lines**

As a result of genetic assortment, the acquisition of a plant line that exclusively produces progeny positive for the expression of the desired transgene may take several generations. Prior to “true breeding” status, a fraction (approximately 1/3) of the progeny are negative for transgene expression and must be discarded. True breeding is achieved through the collection of seeds from those plants with the highest level of fluorescence and repeating the cultivation process until the yield of progeny positive for expression is 100%. This indicates that no segregation is occurring and the plant line is homozygous for the expression of the transgene.

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## **Youth Culture and *The Nightmare Before Christmas***

**Nigel Lepianka,  
English**

In October of 1993, Touchstone Pictures released a stop-motion film, pulled from Tim Burton’s imagination, titled *The Nightmare Before Christmas*. The film was celebrated when it was released, garnering several award nominations, including two Oscar nominations, and some positive reviews from critics. *The Nightmare Before Christmas* continues to be an immensely popular cult film whose popularity has been revived in recent years, earning a three-dimensional re-release in theatres during 2007.

*The Nightmare Before Christmas* is a very different film, and not just in its use of stop-motion filming and clay figurines, but also in the story itself. The movie



follows the citizens of Halloweentown’s attempt at hijacking the Christmas holiday, kidnapping Santa Claus, and spreading terror throughout the world. From that summary, one would think the film was a horror movie, but instead, the film is really an imaginative children’s musical. The film depicts some of the most archetypal childhood fears in a particularly adorable, and a definitely not scary, manner. Creatures like the “boogie-man,” the monster under the bed, vampires, witches, skeletons, and mad scientists make up the cast of *The Nightmare Before Christmas* and, for all of the most certainly dark motifs that create the movie, the film remains lighthearted.

My research focuses on the peculiarity of this film and how the film itself could have affected today’s young adults and teenagers, because the intended audience of this film, young children, is now today’s high school and college-aged population. I am concerned with how people in the age group of 16-24 could have interpreted the film as children, how it affected them as they were growing up (primarily their childhood fears and imagination), and if the film inspired certain trends in fashion and ideology (inspired by the success of alternative clothing stores such as Hot Topic — which continues to sell *The Nightmare Before Christmas* paraphernalia), and the study of today’s counter-culture, where the film’s largest number of cult followers tend to associate themselves.

Currently, I am surveying high school students and college-age adults to find out what trends could possibly occur as a result of viewing *The Nightmare Before Christmas* at a very young age. Some trends have begun to emerge; some of the subjects surveyed had some of their childhood fears absolved because of the film (about half of the subjects who claimed they were afraid of the dark, of monsters under their bed, and of the “boogie-man” claimed they were no longer afraid of these things after viewing *The Nightmare Before Christmas*). For some of the listed fears, nearly all of the subjects who claimed that fear said they were no longer afraid after viewing the film (this occurred in subjects who claimed they were afraid of shadows and monsters in general when they were growing up; after viewing the film, 86% claimed they were no longer afraid of monsters and 67% claimed they were no longer afraid of shadows).

The statistics reported above are preliminary, because surveying is still a work in progress. Other trends are also being studied, including fashion, how dark motifs are viewed symbolically, and the relation between youth counter-culture and *The Nightmare Before Christmas*.

# Summer Research and Creativity Grants (CONT.)

## Research Concerning Pediatric Sedation and Complications

### Madison Allen, Pediatric Critical Care



The education of medical practitioners is based on didactic lectures and clinical “hands on” experience. In recent years, the sedation of children for painful and diagnostic procedures is increasingly being performed by non-anesthesiologists such as pediatric intensivists, emergency department physicians, and pediatric hospitalists. Although these specialists have extensive training in their fields, which includes airway skills training and resuscitation training, training specifically in procedural sedation is not often a part of the structured educational program. Although the ability to respond to complications or events is not of question for these practitioners, the ability to avoid complications and events is unknown. Several studies have shown that increased patient volumes in hospitals leads to better outcomes. We hypothesize that with increasing experience, non-anesthesiologist pediatric sedation practitioners (pediatric intensivist) will report fewer complications/events during pediatric procedural sedation.

At the University of Kentucky, Kentucky Children’s Hospital pediatric patients who require diagnostic or invasive procedures may be referred to the Pediatric Sedation Service for sedation and analgesia. The Pediatric Sedation Service has performed procedural sedation for diagnostic or painful procedures for children since 1999. Since that time, this service has performed approximately 9000 procedural sedations. This service is staffed by a pediatric intensivist and pediatric nurses. The physicians are credentialed and privileged to provide moderate and deep sedation to children. They conform to the requirements as outlined in the hospital sedation policy for assessment, documentation and monitoring.

All records of children who presented for sedation within the eight-year period will be retrospectively evaluated for the physician performing the sedation and the complications/events related to sedation that occurred. For each physician, the first quartile number of sedations will be examined for the frequency of complications or events and compared to the most recent quartile of sedation complications.

For each sedation performed, we will record what number of procedural sedation it is for the practitioner performing the sedation since the start of his or her practice at UK (i.e., first, second, third, .....100<sup>th</sup>, 101<sup>st</sup>, etc.) Each practitioner will be identified by a unique number

and, when data is collected, only the unique number will be written on the data collection sheet. Analysis will group the first 25 sedations of all practitioners and compare in 25 sedation increments up through numbers 250-300. Therefore, there will be 12 groups of sedations over time to compare events based on numbers of sedations performed. If six practitioners consent to participate, each group of 25 sedations per practitioner will have 150 sedations total.

The number of “expected” events or complications has not been described for this group before (pediatric intensivists performing deep sedation), therefore it is not known the number of sedations that will need to be evaluated to achieve significance. With the small number of potential participants, this study will likely serve as a preliminary tool for future research studies in this area. The one large study to describe complications and events that occur during pediatric procedural sedation is from the Pediatric Sedation Research Consortium (Dr. Cheri Landers is the PI for the UK site of this multi-center study: IRB protocol #06-0764-P1G).

## Selective Melting and Evaporation of Gold Nanoparticles

### Robert Martin, Mechanical Engineering



We are developing a new concept, based on atomic force microscopy (AFM), to pattern and assemble metallic nanoparticles on a substrate. We take advantage of the unique thermal and optical properties at the nanoscale to pattern the particles. Initially we have been able to melt and evaporate 50 and 100nm particles using a pulsed laser beam with a 532 nm wavelength of light and a Silicon AFM tip brought in proximity to the particle. Extensive computer modeling has been done using multi-physics software to show the particle’s enhanced energy absorption in the presence of the probe. After certain energy thresholds, the particles will either be melted together or evaporated entirely. This method is unique compared to other patterning methods, because it is flexible and requires less energy.

## The Relationship Between BART Scores and Low Anxiety

Amanda Metze, Psychology

Under Dr. Milich's supervision, my summer research project has progressed nicely. On a weekly basis I meet with Dr. Milich to discuss studies that have already been conducted, to build a foundation for what will become my Senior Honors thesis. Thus far, I have been immersed in the literature investigating the links between psychopathy, impulsivity, anxiety, and the use of behavioral tasks that are used to measure these characteristics. One such behavioral task, the Balloon Analog Risk Task (BART) has been my main focus as of late. The BART is a computer task in which a participant is instructed to pump the balloon to collect money per pump. If the balloon pops, the participant loses the money, but if he or she banks the money before the balloon pops he or she gets to keep the money. This task has been used to predict impulsive behavior and is, consequently, being used in research investigating psychopaths who seem to suffer from chronically unstable behaviors such as impulsivity.

I have also had the opportunity to begin analyzing some previously collected BART data. For this task I added the total number of balloon pumps and then subtracted the balloon pumps in which the balloon actually popped. These adjusted values are preferred in the analysis of BART data because they eliminate the inclusion of trials in which the participant was forced to stop pumping due to an explosion.

Because my ultimate goal in starting research this summer is to lay a firm ground work to be able to continue this research into the fall, I have begun drafting an introduction for my Senior Honors thesis project. I am currently compiling research for this endeavor. As the summer continues, I hope to do more analysis and will continue to research psychopathy, anxiety, and impulsivity to ensure that I get the most I can out of this opportunity.



## Sunscreen: The Reason for the Segregation of the Sexes?

Jonathan Moore, Biology

As anyone who has spent a little too much time at the beach in the sun can attest, high sunlight levels can damage living tissue. Unlike humans, plants do not have the luxury of simply moving out the sun to a shady spot or slathering on a sunscreen lotion. Plants use the physiological method of producing sunscreen pigments (carotenoids and anthocyanins among others) to deal with excess solar radiation. For plants that are exposed to higher amounts of solar radiation, it is important to maintain a higher ratio of sunscreen pigments to major energy gathering pigments (chlorophylls) than plants exposed to lower amounts of radiation, in order to dissipate excess absorbed energy. This phenomenon has not only been observed in seed plants but also the nonvascular plants (e.g., mosses and liverworts).

The study species for this project is the liverwort, *Marchantia inflexa*, which consists of a flat horizontally growing photosynthetic thallus and vertical sexually reproductive (and photosynthetic) structures. Males of *Marchantia* are more likely to be found in high light environments than are females. Thus, the goal of this study is to test the hypothesis that males will produce more sunscreen pigments than females.

To test the hypothesis, I traveled to Trinidad, where *Marchantia* is indigenous, with my mentor, Dr. Nicholas McLetchie. At four field sites, pairs of males and females not more than half a meter apart were located and sampled. Because of their close proximity, each pair was considered to be in the same light environment. From each male or female, a sex structure, the thallus that produced the structure, and a thallus not producing a sex structure but connected to the sex expressing thallus were collected. These samples were dried and brought back to the University of Kentucky and assayed for sunscreen pigment content. Pigment content was correlated with light environment (% open sky and light level), which was estimated using hemispheric canopy photographs. Average light intensity over the previous three months was used as light level.

The data is still under analysis, but some preliminary patterns have emerged. In all three tissue types, the ratio of carotenoids to chlorophyll increases with light level, supporting the expectation that the relative amount of carotenoids would increase with light intensity. There seems to be essentially no difference between males and females with respect to the pigment content of the two types of thalli. However, females actually produce relatively more carotenoids in their sex structures than males, which is unexpected and contrary to the hypothesis.

The relative elevated levels of carotenoids in female sex structures compared to males may relate to protection not only of the female gametes but also the subsequent diploid sporophytes and the spores they produce. Males need only to protect their gametes and may be doing so with other pigments such as anthocyanins, which we were unable to extract. These possibilities bear investigation in the future.



# Summer Research and Creativity Grants (CONT.)

## Black Bear Foods and Family Dissolution in South Central Florida

Sean Murphy, Forestry

The black bear (*Ursus americanus floridanus*) is a threatened species in Florida (Maehr and Wooding, 1992). The small population in Highlands County, Florida, is comprised of fewer than 100 individuals (Bentzien, 1998) and exists in a fragmented landscape (Maehr, 2007). To obtain data on black bear family dissolution and food selection in this population, I have captured two adult females (F3 and F5) using a culvert trap and an Aldrich spring-activated snare (Seibert et al., 1997). Both females were fitted with Lotek (Lotek Wireless, Inc., Newmarket, Ontario, Canada) GSM (Groupe Spécial Mobile) GPS (Global Positioning System) collars in May, 2008, to enable tracking. A maximum of 96 locations per day will be acquired from F3 and F5's individual collars. These locations will be entered into ArcMap 9.2 (ESRI, Inc., 2006) and plotted on aerial photographs to show each family's movements. Food selection has been monitored opportunistically. Multiple scats have been collected and visual confirmation has been acquired as well. Combined, they will give insights into spring and summer choices of food.



Sean Murphy carrying a black bear cub.

These two females, F3 and F5, were chosen as study subjects because they have offspring in two different age classes. Bear F3 has two yearlings (bears between 1 and 2 years-of-age); whereas bear F5 has two cubs (bears less than 1 year-of-age). Because bear F3's yearlings are close to the dispersal age of 1.5 years-of-age, and the family will soon disband, I hypothesize that F3's family will have much wider-ranging movements in comparison to F5's family. Due to bear F5 having two young cubs, I hypothesize that her family will have relatively small movements, because her cubs may not be able to make long trips.

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Sean Murphy and the late Dr. David Maehr fitting a GPS collar on a black bear in Highlands County, Florida.

## Realizing Text Signals

### Whitney, O'Rourke, Psychology

Signals are writing devices that emphasize the organization or specific content in a text. Signals include headings, overviews, outlines, highlighting, boldfacing, and other typographical variation, summaries, and other devices. Although signals take a wide variety of forms, a recent theory has analyzed all signals as having a common underlying form of representation, called "metasentences." A metasentence is a statement by the author directed at the text (as opposed to a statement concerning the subject matter of the text). For example, a sentence such as "The next topic to be discussed is firefighting" is a metasentence. The theory further claims that any signal communicates one or more of only six types of information, which are termed "information functions." The present study tests two hypotheses derived from the theory. (1) Participants editing a text containing metasentences will be more likely than participants editing the same text with metasentences omitted to (a) insert headings and to (b) preserve the information functions of the original metasentences. (2) Participants editing a text containing metasentences that communicate information about text organization will be more likely to correctly insert paragraph breaks between subtopics.

Sixty students in psychology courses were asked to edit a text that contained no formatting beyond conventional sentence punctuation. The students were asked to add formatting to make the edited text "look like a chapter in a textbook." Across the 60 participants, there were two versions of each of two texts on different topics. One version of a text contained metasentences that communicated information about text organization and the other version omitted the metasentences. Edited texts will be scored with respect to (1) the number and types of headings that are included in the revised text; (2) the correspondence between the information functions communicated in the metasentences and the information functions served by the inserted headings; and (3) the placement of paragraph boundaries in the edited text, by comparing the number of paragraph breaks inserted in the correct positions within the text by the participants with metasentences to the participants without metasentences.

## Archaeological Fieldschool Educational Outreach

### Jessica Schmitt, Anthropology



For my eUreKa! grant project, I coordinated community outreach in conjunction with the University of Kentucky Department of Anthropology's Archaeology Fieldschool in Lee County, Virginia. Along with other UK students, I assisted in the excavations of the Carter Robinson mound site, a late prehistoric (A.D. 1300-1500) Native American mound and village site.

My time at the site was split between learning archaeology field methods and actively doing community outreach. The community outreach had three goals. First, I coordinated site visits from interested groups such as local camps and elementary school teachers. Approximately 35 visitors, including schoolchildren, visited the site over the course of the excavations. Visitors learned about archaeology field methods, Native Americans of Lee County, and the dangers of looting archaeological sites. Second, I worked with local teachers to create posters for distribution to local schools, which will highlight Lee County archaeology, the Carter Robinson site, and the damaging effects of looting on archaeology sites. This work is ongoing throughout the summer, and posters will be delivered to schools in Fall, 2008. Third, I worked with the Wilderness Road State Park, located adjacent to our site, to organize a Community Archaeology Outreach Day. This activity included coordinating with park officials to use their facilities, creating fliers about the event, and advertising the event widely in the community.

Held on July 4th, the Outreach Day was a great success. Approximately 200 people attended over a 4-hour period. We had tables with basic information about archaeology, a display of artifacts from the site, information about the dangers of looting, and a kids' activity table where children could create clay coiled pottery, bead necklaces, and play Native American games. Additional tables included a display of archaeological field tools and information about Native American history. The most popular table was the artifact identification table, where local residents brought their private collections to be dated and identified. The park's chief ranger is now interested in making this outreach day an annual event for the community. Overall, this grant project enabled me to make information about the region's rich archaeological heritage available to the community in a variety of forums.

# Summer Research and Creativity Grants (CONT.)



## **We Have to Go Everywhere, and We Will, We Will: Baseball in China as Part of America's New Manifest Destiny**

**Mark Smith, History/Spanish**

Earlier this year, in March, Major League Baseball (MLB) played its first games ever in China — two Spring Training games between the San Diego Padres and the Los Angeles Dodgers. When asked where else the MLB would go, Commissioner Bud Selig states, “We have to go everywhere. And we will; we will” (Schlegel, 2008), which indicates that the MLB will not stop with China. Although those in the sports industry glorify this move as one of inevitable globalization, one has to wonder if that is true. Is it globalization or Manifest Destiny? With Latin America as evidence, one questions whether this is simply a benevolent gesture of generosity or simply an American business looking to exploit China.

Since 1864, when Nemesio Guilló claimed to have brought baseball to Cuba, baseball has become a key part of the culture of Latin America. At first, MLB took only lighter-skinned Latinos, who could be passed off in the states as white; later, after Jackie Robinson broke the color barrier in 1947, darker-skinned Latinos were brought as well. However, the largest jump in the number of players brought to the United States occurred after free-agency was introduced in the mid-1970s, because Latinos suddenly became much cheaper than American players. Now, there are baseball academies throughout Latin America, especially in the Caribbean in the Dominican Republic, where scouts for different organizations analyze players, bring them in for try-outs, give them a bed for a month while they see if the player has a future, and then, maybe, send them to a minor league team. However, they fail in teaching these Latinos more about American culture and the language, which are so vital when they come (Klein, 1991).

Even though March's Spring Training games were the first professional baseball games in China, they were not the first the country had seen of baseball. Brought by Henry William Boone in 1863, baseball flourished into the mid-twentieth century, until the Cultural Revolution purged itself of everything of the West (“Baseball Has Deep Roots in China,” 2008). Now, baseball is back in China, and they are looking for money and players. Major League Baseball experienced a spike in revenue with the addition of just a few Japanese players (“MLB a Success in Japan,” 2008), so one can only imagine, with the massive population and blossoming wealth of China, how much MLB stands to garner if baseball becomes a success there. Also, with more and more Latin players hiring agents to advertise their talent and negotiate contracts, Latinos have become more expensive. Moving into China, MLB could find a new wealth of cheap talent to steady soaring salaries.

Major League Baseball revels in its expansion into China, but my question becomes should the Chinese be excited to see MLB arrive. In Latin America, baseball has already created a false hope of rising above the poverty of the region while carelessly bringing more players to the United States who have very little chance of making it to the Majors. I fear that China will endure the same path. Is the United States a benevolent leader attempting to welcome a new, more capitalist China or is the United States a more experienced, economic adversary awaiting its prey? In order to prove

my point, I will use the historical perspective of MLB in Latin America to explain how MLB might use China. I will document how this has affected Latin America socially, politically, and economically.

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## **Analysis of Stable Gene Expression Across Different Tissues**

**Marlène Tremblay, Animal Sciences**

This study is the analysis of the annotation characteristics of genes that display stable expression, as well as a search for endogenous control genes (i.e., housekeeping genes) for use in normalizing quantitative polymerase chain reaction (qPCR) data, using two independent technology platforms.

The first platform is a technique called Whole mRNA Resequencing, with which the entire transcriptome of six equine tissue samples were determined. The millions of 32-base sequencing reads that were generated from total RNA of each sample were assembled on the predicted gene structure of the equine genome to provide both a quantitative and qualitative assessment of all mRNA transcripts expressed in that sample. The six samples analyzed were: 1) normal articular cartilage, 2) articular cartilage from an inflamed joint, 3) brain, 4) testes, 5) placenta and 6) embryo. Data generated and the subsequent analysis will be used both to annotate the expressed gene structure of the equine genome and to generate gene expression data. In addition, the MacLeod laboratory has completed transcriptional profiling experiments using an equine-specific 9,367 element



cDNA microarray. More than 300 microarray slides have been hybridized over the past two years generating transcriptional expression data from a wide variety of equine tissues and cell culture samples.

These two independent technology platforms, mRNA resequencing and microarray based hybridizations, were used with the original objective of identify differential gene expression across a diverse set of equine tissues. The analysis can also be used to identify genes with stable levels of steady state mRNA across these samples. We hypothesized that genes with stable expression would cluster in functional pathways that define fundamental cellular processes in all tissues.

A technique called “quantile regression” was applied to microarray results to identify genes having a stable pattern of expression across the 11 tissues compared. The tissues were cerebellum, bladder, spleen, muscle, placenta, lymph node, liver, testis, kidney, lung, and articular cartilage. The determination of specific gene ontology (GO) categories over-represented in the stable expressed gene list compared to all the genes analyzed by microarray was performed using the Expression Analysis Systemic Explorer (EASE) software application. We selected GO categories that had an EASE score  $< 0.05$  and found a majority were involved in transcription. This finding indicates that transcription is a fundamental cellular process that requires a steady level of activity independent of the tissue type.

Our current priority in this research includes analyzing Whole mRNA Resequencing data to again identify genes having stable levels of expression. With the assessment on a genomic level, major patterns should be more apparent and we will be able to answer how many genes in the mammalian genome have a stable expression pattern at the transcriptional level. Once the experiments generate a list of genes with stable levels of steady state mRNA across a diverse set of equine tissue and cell culture samples, these can be evaluated as potential endogenous control genes that are needed to normalize cDNA levels between samples and as an exogenous control between experiments.

## Does Alcohol Abuse Increase HIV-related Brain Damage?

### Kelly Wehle, Psychology



Recent clinical findings indicate that individuals who abuse alcohol and are HIV seropositive are at risk for developing significant neurological abnormalities, including cognitive and psychomotor deficits. Separate lines of investigation suggest that the alcohol withdrawal syndrome and brain injury related to HIV infection may involve excessive activation of N-methyl-D-aspartate (NMDA) type receptors for the neurotransmitter glutamate. Thus, the current studies in Dr. Prendergast’s laboratory are designed to examine the hypothesis that alcohol exposure enhances the neurotoxic effects of exposure to HIV proteins known to activate NMDA receptors.

Studies on alcohol abuse indicate an increase in the expression of NMDA glutamate receptors in the brain. NMDA receptors are ionotropic receptors that are thought to play a critical role in synaptic plasticity, which is a cellular mechanism for learning and memory. Excess activation of these receptors is known to contribute to the development of cytotoxicity in the brain. This study looks to determine if one of the viral proteins, Tat, produced by HIV-1 may contribute to the development of HIV-associated dementia (HAD) in patients who are known to abuse alcohol. HAD is seen in HIV patients on medication for the virus because the medication has difficulty penetrating the blood brain barrier, thereby allowing the virus to replicate and infect neurons uncontrollably in the brain. The primary hypothesis of this work is that by abusing alcohol, which causes the proliferation of these NMDA receptors in the brain, a person with HIV-1 has more targets for some HIV-1 proteins to excite and cause brain injury.

These studies will use a cellular model to examine the effects of exposure to binge-like doses of alcohol on the excitatory and toxic effects of the HIV-1 protein Tat on neurons in the hippocampus, a brain region involved in learning and memory. All studies will involve the use of fluorescent dyes to measure: (1) the amount of calcium that accumulates inside neurons during and after exposure to alcohol and Tat; (2) damage to the nuclei of these neurons and; (3) expression of NMDA receptors on these neurons.

Changes in cell function are monitored using high-powered fluorescent microscopy. The research taking place this summer is a continuation of the ongoing research and is funded by the National Institute on Alcohol Abuse and Alcoholism. The goal of this work is to identify NMDA receptors as therapeutic targets in the treatment of HAD in alcohol dependent HIV-1 patients.

# Undergraduate Research and Travel Fund

*eUreKa! offers undergraduate students travel support. The purpose of this support is to help students gain experience in showcasing their work at and participating in professional conferences on a national and international level. Keep in mind that research takes place in many different forms and in all disciplines. The study of social problems, the creation of a piece of fiction or poetry, the study of a scientific theory or historic period of time, and the solution of engineering and mathematical problems all qualify as research, among many other activities.*

Students may apply for travel support to attend national or international professional conferences or competitions. To be eligible, a student must:

- be a full-time undergraduate student at the University of Kentucky
- have a faculty sponsor
- be registered for the conference or competition
- present (i.e., paper, poster, research, performance) and/or participate (orally)

During 2007-08, the Undergraduate Research and Travel Fund provided support to 31 undergraduates attending 19 different conferences and competitions. The students, 16 females and 15 males, were from 14 different departments in six different colleges, and ranged from first- to fourth-year students, demonstrating the ubiquity of scholarly inquiry at UK. This year, students traveled to conferences and competitions in Kentucky, Alabama, Alaska, California, Illinois, Louisiana, New Mexico, Texas, Scotland, and South Korea.

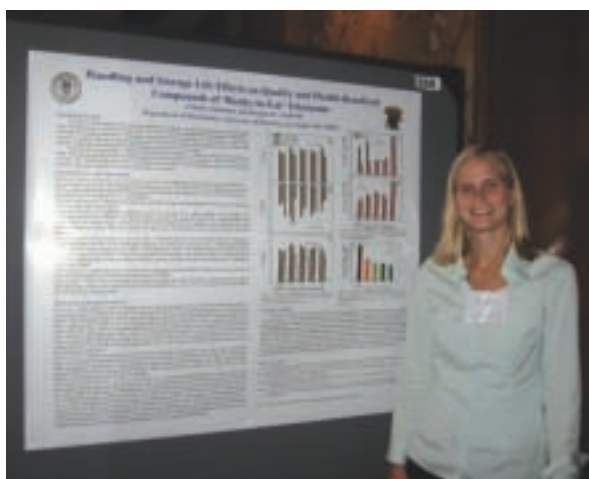
In addition to these 31 students, eUreKa! supported 21 students who were accepted to present their research at the National Conference on Undergraduate Research (NCUR). NCUR is an annual conference of approximately 2000 undergraduate scholars who are selected competitively from among several thousand applicants. UK students have traditionally been highly successful in being chosen, compared to other peer research institutions, and eUreKa! is proud to be able to support those who attend. Several of the projects reported elsewhere in this volume of Kaleidoscope were presented at NCUR this year.



*Will Faulkner (third from left) participating in research on nanofibers at Keimyung University in Daegu, South Korea. Field day with South Korean students and faculty.*



*Tony Koehler designing the props and theatre set creation for the DRACULA performance at the International Fringe Festival in Edinburgh, Scotland, August, 2007.*



*Chlodys Johnstone presenting at the 2nd International Symposium of Human Health Effects of Fruits & Vegetables in Houston, Texas, October, 2007.*

# UK Undergraduate Research Program

The UK Undergraduate Research Program (UKURP) provides undergraduates, especially first- and second-year students, with the opportunity to identify and connect with faculty members who are seeking undergraduates to work with them on their scholarly projects. Projects are available in all disciplines and require varying levels of experience and sophistication.

Students who are actively engaged in a mentored scholarly inquiry project and who are spending an average of approximately ten hours per week on that project are eligible to register for a course on *Methods of Scholarly Inquiry*, DSP 200, taught each year. The final project in that course is for the student to prepare an abstract of his or her scholarly inquiry. The following are samples of those abstracts from the spring semester, 2008, class.

## **Too Young to Die: The Execution of Minors and the Role of International Law in Constitutional Interpretation**

**Jenna Brashear, International Studies**

**Mentors: Dr. Melynda Price,  
Dr. Robert S. Tannenbaum**

In light of the ongoing discussion of the role of the courts and the process by which they interpret and apply the law, this paper contains an examination of issues of interpretation. The Supreme Court has decided cases using domestic and international law as sources of authority and has made decisions in which those areas of law have sometimes clashed. This intersection and conflict of laws is especially evident in the Court's decisions on capital punishment.

In *Stanford v. Kentucky* (1989), the Supreme Court decided that the death penalty for juveniles was Constitutional, before later overturning that decision in *Roper v. Simmons* (2005). The United States was the only country in the world to legally permit the execution of juveniles when *Roper* was decided — an indication of the disapproval by other nations of capital punishment for minors and also of the growing condemnation of the death penalty in general in the international community.

In 1998, the decision of *Breard v. Greene* examined the role of international politics and multinational courts in domestic death penalty decisions, and the United States' obligation under treaties. *Breard* was not a minor, but was a citizen of Paraguay living in the United States at the time of his crime. He was eventually executed, signaling the U.S.'s rejection of international treaties and affiliations, particularly the parts thought to be inconsistent with the U.S. Constitution or other domestic laws.

Seven years later, *Roper* became the first case to significantly cite international norms as an argument against domestic law, specifically death penalty statutes. In this relatively short time, the approach of the Supreme Court shifted, and shifts such as this one often bring up the question of judicial activism. This paper includes an attempt to explain the complexities of these decisions and to examine the implications for the future of capital punishment deliberations in the United States Supreme Court.





## **Maternal Mortality in Sub-Saharan Africa: Global Effort and Achieving the Millennium Development Goals**

**Alecia Fields, Topical Major in Women's Health Advocacy**

**Mentor: Dr. Joanna M. Badagliacco**

Half a million women die every year due to complications of pregnancy or childbirth (UNICEF, 2008). These deaths are not evenly distributed around the world and correlate to regions of high poverty. Developing countries account for 99 percent of maternal deaths worldwide and Sub-Saharan Africa accounts for slightly more than half of these maternal deaths (UNICEF, 2008). These numbers have not changed noticeably over the past two decades.

At the Millennium Summit in 2000, a set of time-bound goals was established to address extreme poverty and related issues. These goals are known as the Millennium Development Goals (MDGs). The fifth goal addresses maternal health. The target for goal five is to reduce the maternal mortality ratio by 75 percent by the year 2015. In Sub-Saharan Africa, where obstetric risk is the highest, little progress has been made on improving maternal health and reducing the maternal mortality ratio. Currently, the maternal mortality ratio in Sub-Saharan Africa is falling at only 0.1 percent annually compared to the 5.5 percent of annual decline needed to achieve goal five by 2015 (UNFPA, 2008).

Sub-Saharan Africa is currently at the greatest risk of not achieving the MDGs by 2015. In my research, I am investigating why individuals of developed countries should be committed to addressing the high maternal mortality ratios in Sub-Saharan Africa in light of goal five of the MDGs. In addition to two other arguments, an argument for global health was made for why countries should care about the women of Sub-Saharan Africa. The global health argument holds the entire global community accountable for achieving goal five of the MDGs. The success of this argument depends on international partnerships, which first must be created and maintained. The function of a global health network is to address epidemics, public health emergencies, natural disasters, and conflict areas that overwhelm health systems on a national level. It is then the obligation of the international system to provide assistance. Currently some regions, such as Sub-Saharan Africa, need more assistance than others. However, by investing in the global health system and the health systems of developing nations, the United States utilizes the most effective strategy for protecting itself from threatening epidemics. Improving global health is synonymous with reducing

poverty, improving education, and strengthening the global economy.

The question of why countries, particularly those wealthier nations, should care about the high maternal mortality in Sub-Saharan Africa does not have a linear answer. There are many arguments; however, it is the global health argument that holds individual countries responsible for the well being of everyone. Currently, there are not sufficient resources available in Sub-Saharan Africa to improve maternal health without aid. As a member of the global health community, the United States must become more actively involved in offering assistance to Sub-Saharan Africa. Improving maternal health and eradicating extreme poverty is only possible with the corporation of the entire global network.

My experiences this past semester with Undergraduate Research have been invaluable. I would highly recommend being actively involved in scholarly work and research to any undergraduate with a passion and enthusiasm for learning. The complete process, from developing a research question to presenting your research to others, is an extremely rewarding experience.

### **Sources:**

UNFPA. (2008). United Nations Population Fund. <http://www.unfpa.org>

UNICEF. (2008). Unite for Children. <http://www.unicef.org>

WHO. (2008). World Health Organization. <http://www.who.int/en/>

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## **Exploration of Membrane Fusion pH Dependency of Vesicular Stomatitis Virus Glycoprotein G**

**Angela Marie Jones,  
Agricultural Biotechnology**

**Mentor: Dr. Robert Geraghty**

Vesicular stomatitis virus, commonly referred to as VSV, is an arthropod-borne virus in the family Rhabdoviridae (which also includes the well-known Rabies virus). It is a zoonotic agent for humans, causing influenza-like symptoms. More notably, it is an important cause of vesicular disease in cattle, swine, and horses, and is clinically identical to foot-and-mouth disease.

Rhabdoviruses typically carry genes for five different proteins. It has been reported that VSV membrane fusion is pH dependent and is induced by the membrane glycoprotein G at an acidic pH. However, previous research in the Geraghty lab has found that, in CHO cells, glycoprotein G seems to initiate fusion at a neutral pH as well as at an acidic pH.

Experiments were designed to produce general preliminary data to determine whether or not fusion occurs at pH 5.0 and pH 7.0 in three different cell lines: CHO, B7, and Vero. The selected cell lines were transfected with the VSV glycoprotein and Green Fluorescent Protein and then allowed to grow and express the protein on the cell surface. Cell membrane fusion was indicated by the formation of large, multi-nucleated cells called syncytia. Syncytia could be seen in all cell lines in acidic conditions at pH 5.0, but only in the CHO and B7 cells in neutral conditions at pH 7.0. This suggests that CHO and B7 cells are not fusion pH dependent.

The overall hypothesis is that the pH dependence of fusion activity in VSV is cell line dependent. This is an interesting and potentially valuable observation considering that virus fusion pH requirements rarely differ among cell lines for any one virus. Studies in the future will try to discover characteristics or properties CHO and B7 cells lack or possess that cause a variance in VSV fusion pH dependence.

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## Differential Gene Expression in Fungal Endophytes

**Lesley Mann, Agricultural Biotechnology**

**Mentor: Dr. Christopher L. Schardl**

Several endophyte-host symbiotes exist that involve a fungus inhabiting a plant. The interaction between the species varies considerably, spanning from pathogenic to mutualistic. *Neotyphodium coenophialum* is a seed-transmitted fungal endophyte that benignly colonizes the intracellular spaces of cool season grasses. It offers a variety of fitness-enhancing characteristics to its host, including enhanced biotic and abiotic stress tolerance, associated with highly efficient stand longevity. *N. coenophialum* is related to *Epichloë festucae*, which also inhabits cool season grasses. *E. festucae*, however, is capable of benign seed transmission as well as disease development (production of stromata that choke inflorescences) on different tillers within the same host plant. This study has been aimed at finding key genes that are involved in disease development versus benign plant colonization.

Expression analysis was conducted using 454 sequencing of mRNA from endophyte-infected inflorescences and stromata. In total, 1734 differentially expressed genes were identified (1268 potentially upregulated in inflorescences and 466 potentially upregulated in stromata). To verify these findings, a high-throughput real-time PCR protocol was developed. For that protocol, mRNA samples from fungal mycelium and endophyte-infected plant tissues (pseudostem, inflorescences, and stromata) from four different *Festuca pratensis* / *Epichloë*

*festucae symbiotes* were extracted. Reverse transcription was performed, and real-time PCR conducted. Because *tefA* is not differentially expressed in the various tissues, it was chosen as an endogenous control. For high-throughput analysis, a standard curve is generated for each gene, and if amplification efficiency is comparable with that of *tefA* (slope within 0.2),  $\Delta\Delta C_T$  analysis is conducted on stromata and inflorescence samples. Of the 29 genes tested so far, 16 genes had comparable standard curve slopes.  $\Delta\Delta C_T$  analysis showed that, in most cases, real-time PCR results validated significant 454 results ( $p \leq 0.05$ ).

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## Cartilage Regeneration for Growth Plate Defects and Degradation in Poly-lactic-glycolic Acid (PLGA) Scaffolds

**Aparna Nigam, Biosystems and Agricultural Engineering**

**Mentor: Prof. David Puleo**

Tissues require certain mechanical and structural characteristics in order to sustain proper bodily functions. Tissue engineering covers a broad range of applications including repairing or replacing portions of whole tissues. One particular tissue, cartilage, is the subject of our study. Cartilage is a type of dense connective tissue found in many places of the body including the growth plate. The growth plate is the area of growing tissue at the end of the long bones in children and adolescents. The growth plate cartilage is frequently injured as a result of sports related trauma, but because cartilage is not associated with blood, it has very limited capability for repair. The primary goal in our lab is to regenerate cartilage for injured growth plates.

Scientific advances in biomaterials have created unique opportunities to fabricate tissues in the laboratory. A combination of cells and biologically active molecules (DNA and growth factor proteins) help create the proper environment for cartilage regeneration. Cells are made up of poly-lactic-glycolic acid (PLGA). These cells are used to make the initial framework, or scaffold, for cartilage regeneration. Cartilage cells grow when initiated by biological molecules (DNA and growth factor proteins) found in the PLGA cells of the scaffold. The objective of this particular study is to find the time of degradation in varying concentrations of PLGA scaffolds. Concentration in scaffolds is measured in mass by PLGA. PLGA and salt are mixed to make a one hundred percent mixture scaffold. A scaffold with more salt will degrade faster than a scaffold with less salt. The time for degradation is important because, as a scaffold degrades, the cartilage cells must multiply and replace

# UK Undergraduate Research Program

the scaffold's implantation site (implantation site in the growth plate).

During the first several weeks of my study, I made two types of cells: blank cells and cells with growth factor protein. The cells were then used to make scaffolds for the degradation part of the study. Circular scaffolds were quartered and placed into vials. The vials were filled with a buffer solution so that all of the samples maintained the same pH. The pH can change degradation of a scaffold; therefore, it is important to maintain a steady pH. After thirty days of monitoring the samples, it was easily observed that higher salt concentrated scaffolds had lost their framework. Lower salt concentrated scaffolds still maintained some structure.

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## **Delayed Non-matching to Place Acquisition in Water T-maze Following Traumatic Brain Injury**

**Peter Rock, Biology**

**Mentor: Prof. Steven Scheff**

Traumatic brain injury (TBI) is a common occurrence, with new injuries in the United States being diagnosed every year in the millions. This increasing occurrence of TBI demands a better understanding of pathophysiology and the development of possible novel treatments for neurotrauma. To observe the effects of TBIs on working memory, I studied a rat model that applies a TBI to the rat and then tests the cognitive working memory of the rat.

Key to this research is having adequate animal models and behavioral tests sensitive enough to monitor changes in cognitive status. The purpose of this experiment was to analyze the effects of experimental TBI on a delayed non-matching to place (DNMP) task, which evaluates working memory. The DNMP task was adapted to a water T-maze to effectively monitor memory retention in rats in this study.

Because TBI does not always occur in the same brain location, different animal models have been developed. This research incorporates two common animal models, unilateral lateral cortical contusion (ULCC) and bilateral frontal cortical contusion (BFCC), to better illustrate the commonality of separate brain injuries to memory deficiency.

The experimental rats were randomly assigned to one of four different groups: a) unilateral lateral cortical contusion (ULCC), b) unilateral lateral sham (ULS), c) bilateral frontal cortical contusion (BFCC), d) bilateral frontal sham (BFS). Initial training of the DNMP task began 7 days post-surgery. The procedure consisted of 5 days of acquisition training (15 trials/day) followed by 3 days of delayed testing phase with 15, 30, and 120

sec. delays respectively. The sham groups, BFCC, and ULCC all performed equally well during acquisition and in the initial 15 sec. delayed testing phase. The two injury groups (BFCC, ULCC) demonstrated significant impairment when the delay was increased to 30 and 120 seconds. The results support the idea that the DNMP task, a sensitive behavioral measure that targets working memory, may be useful in screening possible therapeutic interventions following TBI.

The research I participated in this previous semester allowed me to experience a whole new view of college. I had no prior experience in laboratory studies and did not know it was even possible to do research, but I am now fully involved in all the steps of research. I have learned a great deal about the process and the significance of conducting research. This opportunity has led me to develop a greater appreciation for being allowed to be part of this research community and I feel that my term at the University of Kentucky has more significance than just obtaining a degree. I believe that all students should become involved in research within their individual fields if possible. Research allows a student to experience firsthand what their field of study is truly about and can help them decide if a career in research is a possible option.

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## **Developing High Efficiency Solar Cells**

**Joshua Shank, Electrical and Computer Engineering**

**Mentor: Prof. Vijay Singh**

Because of the increasing criticism of fossil fuels with regard to their environmental impact and price, clean and renewable energy sources have recently become a frequent subject of research. Of the developing technologies, solar energy has perhaps received the most attention and criticism with regard to cost and efficiency. Efficiency is defined as the percent of solar energy exported from the cell as electrical energy. Traditional silicon solar cells are reasonably efficient (14-24%) but are expensive to create, and thin-film solar cells are inexpensive but not very efficient (13-20%).

Solar cells work by optically exciting electrons to a higher state of energy. The difference in energy between these two levels is called the bandgap. Ideally, the bandgap energy should be approximately 1.4eV. Any variance from this ideal, reduces the solar cell's efficiency. Crystalline silicon has a bandgap of 1.1eV and CIS (Copper Indium Diselenide), a common thin-film material, has a bandgap of 1.04eV. We believe it is possible to adjust this property by exploiting known quantum effects. Aside from the bandgap there are several other device characteristics that determine the



cell performance. My research does not address these other characteristics.

For the last two semesters I have been involved as an undergraduate researcher in Dr. Singh's solar cell project group. Our goal is to produce low cost solar cells that are more efficient than current commercial models. We have proposed that this can be accomplished by exploiting the quantum-mechanical property of quantum confinement. The theory of quantum confinement states that an electron confined to a very small space may possess energy levels different from the energy levels allowed when the electron is free to move. This causes changes in the particle's optical and electrical properties. By restricting the size of each solar cell to a quantum wire, we can manipulate the quantum confinement effect to increase the bandgap of CIS and make it a more ideal solar cell material.

In order to restrict the size of each solar cell, we deposit the photovoltaic material into a nanoporous template (AAO). My research has been to aid in the development of a system to mass produce these templates. We produce these templates by means of an electro-chemical anodization of aluminum, which can take anywhere from 2 to 50 hours and may or may not produce a useable template. One of the obstacles faced by many nanoscale researchers has been the creation of these templates in a timely manner. The system we have developed should be able to produce up to 30 templates at once and, if successful, could be expanded to a significantly larger scale.

The impacts of this research will not be limited to the solar cell industry. Once developed, the resulting AAO templates will be a marketable product that could impact nanoscale research. Nanoscale research is currently being conducted in fields as varied as medicine and computer power.

Aside from societal benefits, this research has been very beneficial to me. Classrooms are an effective way of getting a small amount of information to many students. Apprenticeship is the effective way of getting a large amount of information to a small group of students. Because of this research, I have developed a deeper understanding of solar cells, a deeper understanding of material from classes, and friendships with students and faculty who are willing to assist me if I ever need help. I recommend that any student who wishes to fully develop his or her mind engage in a research project with a faculty mentor.

## **Forgotten Fathers: Homeless in Kentucky**

**Jennifer Strange, Accounting**

**Mentor: Prof. Joanna M. Badagliacco**

Until the present study, homeless fathers in Kentucky and the Appalachian region who remain with their families have not been the subjects of research. This work is part of an ethnographic study of 86 homeless families in Kentucky. Only 18 husbands/fathers were present. Having 18 husbands/fathers present is quite significant, because the number nationwide who remain with their families is small, so this is a reasonable sample. In this study we attempt to understand who these men are who remain with their families, when leaving is not only easier but also indirectly is encouraged by some homeless shelters and agencies; often times, shelters do not allow men to stay in the same facility as women and children. In this study, we address the following research questions: how are these men coping with their housing distress? How do they approach fathering? What is their perceived quality of life?

The men were interviewed about various aspects of their lives, using in-depth interviewing. They explained their life histories, and were questioned about growing up, their current relationships, as well as their parenting. Overall, the men have quite distressing lives. In addition to having had unstable childhoods that involved at least one family member with alcoholism, the men had few skills for sustained employment. Several men suffered physical and sexual abuse in the past, and acknowledged that violence continues in their lives. It is clear, however, that these men are exceptional, because they chose to stay with their families. Even though these fathers desire to be with their wives and children, they face many obstacles that keep them from being the types of fathers they wish to be. There are multiple examples of obstacles, including the difficulty of providing for their children, working, and helping to break the chain of intergenerational poverty and violence. In examining the lives of these fathers, we are attempting to expand on theoretical understandings of fatherhood under severely constrained political, personal, and structural situations.

I assisted Dr. Badagliacco with her research. I did mostly bibliographic work for her, including creating citations and maintaining a library of sources. I traveled to my first conference, the Appalachian Studies Association Conference, at which I learned more about research and conferences. Before I began working on this project, my research skills were only somewhat proficient and my knowledge of the library resources was limited. Through this experience, my research skills have improved significantly and I have become more familiar with the library resources. Working on this research project has been a great experience; I encourage all undergraduate students to become involved in research.

# Undergraduate Awards and Honors

## Astronaut Scholarship for Research

### Philip “Donnie” Keathley

Philip “Donnie” Keathley, an Electrical Engineering student, was awarded a \$10,000 scholarship by the Astronaut Scholarship foundation (ASF). The scholarship is presented to dynamic undergraduates or graduate students who exhibit motivation, imagination, and exceptional performance in the fields of science and engineering. ASF honors students whose talent foreshadows a career leading to advancement of scientific knowledge and technology. Established by the original astronauts in 1984, the foundation has grown to include more than 50 astronauts from the Gemini, Apollo, and Shuttle programs. The foundation is dedicated to helping the U.S. retain its world leadership in science and technology by providing scholarships to students pursuing careers in those fields.



Donnie Keathley

## Beckman Scholarship Recipients for 2007-2008

### Lesley Mann

### Ashby Clay Turner

Mann, a sophomore from Calhoun, Ky. majoring in agricultural biotechnology, has titled her research project “Gene Expression of Endophytic Fungi during Benign Plant Colonization and Stromata Development.” She is conducting her project under the mentorship of Christopher L. Schardl, professor in the department of plant pathology. Mann’s activities outside of her project include the Society for the Promotion of Undergraduate Research (SPUR), the Honors Program, and the Chellgren Fellows Program.



Leslie Mann



Ashby Clay Turner

Turner, a sophomore majoring in biology from Lexington, Ky., will perform his research, titled “The Effects of an Altered Dopaminergic System on Behavior, Development and Physiology in *Drosophila Melanogaster*,” under the mentorship of professor Robin Cooper in the department of biology. Turner, who is also majoring in music, has been conducting research in Cooper’s lab for the past four years, beginning in high school.

Established in 1987, The Beckman Scholars Program is an invited program for accredited universities and four-year colleges in the US. It provides scholarships that contribute significantly to advancing the education, research training, and personal development of selected students in chemistry, biochemistry, and the biological and medical sciences. The sustained, in-depth undergraduate research experiences and comprehensive faculty mentoring are unique in terms of program scope, content, and level of scholarship awards. (\$19,300 for two summers and one academic year. (See pages 100-110 for reports from this year’s Beckman Scholars)

## Cambridge Scholarship

### Andrew L. Lynch

Andrew Lynch received the prestigious Gates Cambridge Scholarship to study chemical engineering for the next three years at the University of Cambridge, starting in October. Lynch was selected



Andrew L. Lynch

from among 600 applicants and has maintained a 4.0 GPA throughout high school and college. The Bill and Melinda Gates Foundation awards about 100 Gates Cambridge Scholarships worldwide each year and students can pursue studies in any discipline offered. Lynch is among about 45 U.S. students who received the scholarship, which provides full tuition and living expenses for study at Cambridge, England.

## Truman Scholarship

### Corinne Keel

The Truman Scholarship was established to find and recognize college juniors with exceptional leadership potential who are committed to careers in government, the nonprofit or advocacy sectors, education, or elsewhere in the public service; and to provide them with financial support for graduate study, leadership training, and fellowship with other students who are committed to making a difference through public service. Keel is a political science junior from UK and received \$30,000 to conduct graduate work in areas of public service. She is the 13th UK student to receive the honor from the Harry S. Truman Scholarship Foundation. She is the only Truman recipient this year from Kentucky.



Corinne Keel

## Goldwater Scholarship

### Sam Nicaise

Nicaise, a UK junior, majoring in chemical engineering has won a Barry M. Goldwater Scholarship worth \$7,500. The recipients were selected on the basis of academic merit nationwide. The scholarship covers expenses for tuition, fees, books, and room and board up to a maximum of \$7,500. Nicaise plans to pursue a master’s degree in electrical engineering and a doctorate in engineering. He plans to focus his work in renewable energies in the field of nanotechnology.



Sam Nicaise

## COLLEGE OF AGRICULTURE Department of Biosystems and Agricultural Engineering

### Michael Hagan

Monetary award given to the highest achieving Biosystems & AG Engineering Student

### Frank Woeste Award

## COLLEGE OF ARTS & SCIENCES

### Julie Kretzer

Julie Kretzer is an AMSTEMM student majoring in biology in the College of Arts and Sciences. She has been named an American Physiological Society Undergraduate Summer Research Fellow in 2008 and will be competing for the David S. Bruce Undergraduate Research Award in April at the 2009 Experimental Biology Conference in New Orleans.

### American Physiological Society Undergraduate Summer Research Fellow recipient

### Susan Matsubara

Susan Matsubara received the George Rogers Clark Outstanding Young Officer Award for her performance as a military intelligence officer in the Kentucky National Guard. Matsubara is a member of the 63rd Theater Aviation Brigade.

### Honorable George Rogers Clark Outstanding Young Officer Award

### Jordann Sullivan

Sullivan is a senior studying political science and Middle Eastern studies. She received a \$20,000 award to cover her expenses as she spends a year studying Arabic at Birzeit University in Palestine’s West Bank. David L. Boren Scholarships offer a unique opportunity for U.S. undergraduates to study abroad. NSEP awards scholarships to American students for study of world

### National Security Education Program David L. Boren Undergraduate Scholarship

regions critical to U.S. interests (including Africa, Asia, Eastern Europe, Eurasia, Latin American & the Caribbean, and the Middle East).

## Department of Psychology

**Samanthia Farthing** **Adelstein Award**  
The Adelstein Award is named for the late Carole S. Adelstein, wife of retired UK English professor Michael Adelstein. Carol, who used a wheelchair because of polio, was an inspiration to persons with disabilities by leading a meaningful, successful life at a time when individuals with disabilities were not encouraged to be independent and contributing members of society. The Adelstein Award is given by the UK Disability Resource Center to students with disabilities who are inspirations to others. Samanthia, who is visually impaired, is majoring in Psychology. She is an honor student and a Robinson Scholar.

## Department of Sociology

**Craig Eric Locke** **2008-2009 Coleman Award**  
The Coleman Award is presented at the end of each spring semester to a graduating senior and carries a certificate and cash prize. Professor Coleman (1913-1995) was a long-time faculty member in the Sociology Department at UK and remained active in instructional activities. He conducted groundbreaking research on the diffusion of agricultural technology and promoted the cause of civil rights in Kentucky and the south. The selection process is based on scholarship, leadership and involvement in sociological activities in research. Eligibility requires nomination by a faculty member or student, a GPA of at least 3.50, and the submission of an application and an example of an independent research project or course paper from a sociology course.

**Melissa Pettit** **Doris Wilkinson Award**  
Petit is a Sociology major. She received the Doris Wilkinson Award for the outstanding undergraduate paper in Medical Sociology.

## COLLEGE OF DESIGN

**Danny Ruberg** **AIAS Pediatric Outpatient Rehabilitation Center Design Competition**

Danny Ruberg is a senior architecture student. He received the first place design award in the 2007 American Institute of Architecture Students' (AIAS) Pediatric Outpatient Rehabilitation Center Design Competition. The 2nd-annual national student design competition challenged students to design a pediatric outpatient rehabilitation center and family support facility using architectural aluminum building products and systems.

## COLLEGE OF FINE ARTS

**John-Morgan Bush** **2nd prize at the International Horn Society Annual Symposium**

UK Symphony Orchestra principal horn player, John-Morgan Bush, was awarded second prize in the international solo competition of the 40th International Horn Society Annual Symposium. Bush is a senior from Madisonville, KY, and a French horn student at the UK School of Music. The award was the top honor in his category, because the panel decided not to award the first prize.

## COLLEGE OF HEALTH SCIENCES

**Anne Olukemi Ogundele** **Harry Jerome Award**

Ogundele, a physical therapy student, was honored by Canada's Black Business and Professional Association (BBPA) with the Harry Jerome Award for outstanding achievement in athletics.

**Amanda Culp-Roche,** **CLARION 2008**  
**Tyler Whisman,** **Interprofessional Team Case**  
**Paul Koshgerian,** **Competition**  
**and Luke Murray**

Amanda Culp-Roche is from the College of Nursing, Tyler Whisman is from the College of Pharmacy, Paul Koshgerian is from the College of Dentistry, and Luke Murray is from the College of Medicine. The team placed third and demonstrated knowledge and expertise working as a team in the national competition focused on patient safety.

## Office of Student Activities, Leadership & Involvement (Student Volunteer Center)

**Jennifer Alonso, Kristina Buchler,** **Maurice A. Clay**  
**Michael Hagan, Anne Hickman,** **Award Recipients**  
**Joanna Howerton, Troy Johnson,**  
**Marie Nartowicz, Megan Tolley,**  
**Jason Wattier, Brittany Wilkinson,**  
**and Ashley Woodruff**

The Maurice Clay award is sponsored by the UK Chapter of Omicron Delta Kappa (ODK), presented to a graduating senior in each UK college, and based on leadership among the student body. As a testament to the loyalty and dedication of Dr. Maurice A. Clay, the Maurice A. Clay Leadership Development Initiative exists to provide financial support to individual circles seeking to establish specific programs to enhance leadership development on the campus and in the community.

**Amanda Beckman,** **Joseph P. Kennedy Student**  
**Joshua Carter,** **Development Scholarship**  
**Chris Crumrine, Lisa Hill,** **Recipients**  
**Shamekia Mason, Carson Massler,**  
**Julie Meador, David Ritchie,**  
**Clayton Spiceland, and Ashley Woodruff**

The Student Development Council has the opportunity to award ten \$1,000 scholarships each year thanks to generous gifts made by Kennedy Book Store. The selection process for the Joseph P. Kennedy Student Development Council Scholarships is highly competitive. The criteria for this award include a strong history of academic achievement as well as a demonstrated dedication to leadership and service both on campus and off.

**Nathan Belt,** **Charles T. Wethington, Jr.**  
**Rachel Dunnagan,** **Fellowship**  
**and Nathan Simon**

In honor of Charles T. Wethington Jr., the president of the University of Kentucky from 1989 to 2001, the University annually provides funding for fellowships up to \$20,000 to be awarded to UK graduating seniors who plan to continue their post-baccalaureate education in one of the University's graduate or professional programs. The fellowships are awarded for a first year of graduate or professional study at UK and are not renewable for subsequent years. Preference is given to Kentucky residents who are first-generation college students.



# Undergraduate Awards and Honors

## Zachary Brake

The award is given to one student and one staff member or other person who is dedicated to the preservation of student rights. The award is based on what the nominee has done to further student rights at UK. In the nomination it is important to describe exactly what the nominee has done to protect, enforce and further student rights. Each recipient will receive a \$300 gift.

**Kathryn Braun,  
Brittany Langdon,  
Scott McIntosh,  
Nick Phelps,  
Megan Tolley**

Langdon and McIntosh were named Outstanding Seniors. Braun and Tolley were the Female Finalists for this award. Phelps was the Male Finalist for the award.

## Cristyn Cannon

A selfless spirit award. For fourteen consecutive years, UK has recognized a student for The Darrell VanMeter Award in honor of Darrell A. VanMeter. Darrell, (a sophomore at the time of his death in 1991), was recognized by the University community and his home community for his positive contributions dedicated to serving others. The impact of his "good Samaritan" approach to helping others was apparent to faculty, staff and students alike. He touched the campus community with his selfless heart and continual acts of service.

## Whitney Gore

At least three thousand dollars (\$3000) will be allocated toward University of Kentucky Student Government Association Student Scholarships. The Senate shall elect a committee of five to establish criteria and applications for the scholarships.

## Lesley Mann

This prize was first awarded in 1986 and is for outstanding service to the Honors Program and the University community at large.

## Benjamin Osborne

At least three thousand dollars (\$3000) will be allocated toward University of Kentucky Student Government Association Student Scholarships. The Senate shall elect a committee of five to establish criteria and applications for the scholarships.

## Nirmal Ravi

The Viji Jeganathan Scholarship for Cross-Cultural Understanding is an endowed scholarship in memory of an outstanding international student who died of leukemia while studying at UK. The \$1,000 award is presented to an individual who demonstrates leadership and ability in bridging cultural differences and who promotes communication among students of diverse nationalities at UK or in the Lexington community.

## Melissa Riddle

The Stephen Diachun Award, named after the first director of the Honors Program, has been presented since 1982 to a graduating senior who has "demonstrated outstanding research talent in the form of his/her Independent Project and who holds high promise for further professional development in graduate school." The Diachun Award comes in the form of a check for \$1000 to be used for expenses in graduate or professional school.

## David Ritchie

This award is bestowed each academic year on a student who has, by his or her actions, exemplified a high degree of personal integrity and a commitment to the betterment of the community or campus. The recipient is awarded a fifteen hundred dollar (\$1500) academic stipend in both the fall and spring semesters of the following academic year. The award is in honor of Lyman T. Johnson, the first African-American student to be admitted to the University of Kentucky.

## Robert G. Zumwinkle Student Rights Award

## Otis A. Singletary Outstanding Senior Award

## Darrell VanMeter Award

## Student Government Academic Scholarship

## Raymond Bett Crystal Award of Service

## Student Government Constitutional Scholarship

## Viji Jeganathan Award for Cross-Cultural Understanding

## Diachun Award for Research

## Lyman T. Johnson Odyssey Award

## Andrea Russow

The Board of Directors of the University of Kentucky Athletics Association established quasi-endowment funds in memory of Otis A. Singletary and W. L. Matthews, Jr. The funds provide fellowships of \$12,000 to be awarded annually to UK graduating seniors who plan to continue their education in one of the University's graduate or professional programs. The fellowships are awarded for a first year of graduate or professional study at UK and are not renewable for subsequent years.

## Katherine Thompson, Brittany Zwicker

This award is given to residence hall staff and/or government hall leaders. In particular, the award is based upon exceptional leadership contributions to Residence Life.

## OFFICE OF INTERNATIONAL AFFAIRS

## Suzanne Emmert UK-University of Caen Scholarship

Suzanne Emmert is a sophomore in the College of Arts and Sciences with a double major in French and education. She is spending the 2008-2009 academic year in France. The UK-Caen Scholarship is awarded to a UK student with the equivalent of three years of college-level French. It covers tuition, housing, and fees at the Centre d'Enseignement Universitaire pour Etrangers at the University of Caen near Deauville, France.

## Undergraduate Education

## Megan K Tolley

## Joseph David Ritchie

## Recipients of the Sullivan Community Service Award

Two seniors, Megan Tolley and Joseph David Ritchie, received the 2008 Algernon Sydney Sullivan Medallions. The Sullivan Medallion recognizes students whose commitment to community service shows characteristics of heart, mind, and conduct that evince a spirit of love for and helpfulness to other men and women. Tolley was recognized for her efforts in the DanceBlue event to benefit the UK Pediatric Oncology Clinic fundraising. Ritchie was recognized as overall chair of the event and ongoing time serving in DanceBlue and as a volunteer for the Clinic.

The Sullivan Awards were established by the New York Southern Society in 1925 in memory of Mr. Algernon Sydney Sullivan, a southerner who became a prominent lawyer, businessman, and philanthropist in New York in the late nineteenth century. The award seeks to perpetuate the excellence of character and humanitarian service of Mr. Sullivan by recognizing and honoring such qualities in others and demonstrating the spirit of love for helpfulness to other men and women through their heart, mind, and conduct. The first medallion was presented in June, 1925, at the George Peabody College for Teachers in Nashville, Tennessee, now a part of Vanderbilt University. The University of Kentucky is one of several southern universities that present the Algernon Sydney Sullivan award — sponsored by the Algernon Sydney Sullivan Foundation.

# Oswald Research and Creativity Program

Any current UK undergraduate (full- or part-time, enrolled for either semester) who does not already have a four-year degree is eligible for the Oswald Research and Creativity competition and is invited to submit papers and other projects in the following categories:

1. Biological Sciences
2. Design (architecture, landscape architecture, interior design, etc.)
3. Fine Arts (film, music, painting, sculpture, videotape, etc.)
4. Humanities: Creative
5. Humanities: Critical Research
6. Physical and Engineering Sciences
7. Social Sciences

Entries are judged on originality; clarity of expression; scholarly or artistic contribution; and the validity, scope, and depth of the project or investigation.

The following are representative winners in the 2007-2008 competition:

(Extended versions of some of these entries are available at [www.uky.edu/kaleidoscope](http://www.uky.edu/kaleidoscope).)

## **CATEGORY 1: Biological Sciences**

### **1st Place**

**NAME: Megan Culler**

**Agricultural Biotechnology major**

**TITLE: Cellular Protein Interactions with the Cytoplasmic Tail of Paramyxovirus Fusion Proteins.**



This project is the result of independent research done in the laboratory of Prof. Rebecca Dutch in the Department of Molecular and Cellular Biochemistry. Paramyxoviridae, a family of negative-strand, enveloped, RNA viruses, is composed of several important human pathogens, including measles virus and human respiratory syncytial virus, as well as the newly emerged Hendra and Nipah viruses, making the study of these viruses pertinent to human health. In the life cycle of enveloped viruses, membrane fusion is necessary for the survival of the virus, allowing viral entry into the host cell and the release of the viral genome. The fusion of these viruses to the cell membrane is promoted by two surface glycoproteins, an attachment protein needed for primary receptor binding, and a fusion protein that promotes fusion between the viral envelope and the cell membrane. The specific hypothesis tested was that the Hendra virus F protein cytoplasmic tail interacts directly with cellular components, which regulate the expansion of the fusion pore. This hypothesis was tested by identifying mammalian proteins that interact with the cytoplasmic tails of the virus. Accomplishing this goal will provide crucial information on the fusion pore formation of a critical Henipavirus protein, potentially leading to a target for anti-viral therapy against the Hendra virus.

## **Honorable Mention**

**Edward Kobraei**

**Biology major**

**TITLE: Using Designer PGs to Reveal Inhibitory Motifs of Glial Scar Chondroitin Sulfate Proteoglycans In Vitro and In Vivo.**

See pages 100-105 for Kobraei's article about this project.



## **CATEGORY 2:**

### **Design**

#### **1st Place**

**NAME: Katherine McOwen**

**Architecture major**

**TITLE: Rebuilding New Orleans/Dunbar's Restaurant.**

Dunbar's Restaurant was a small, yet widely known soul food restaurant located in the center of New Orleans. The eclectic spirit of the restaurant developed as a direct response to the dynamic attitudes of the surrounding community and the close-knit values of family. Tina Dunbar and her famous restaurant have been featured in many national and international magazines and brochures. Everyone from politicians to movie stars to your local person went there, not only for the delicious cuisine, but also because of the warm, spirited atmosphere created by Mrs. Dunbar and her family. When Hurricane Katrina hit and the levees broke, Dunbar's was submerged under six feet of water. The family's only source of revenue was destroyed and, to make matters worse, the roof was heavily damaged and never received the proper preventative measures to keep out the ongoing elements; so, for over two years it has been closed up and weathering beyond its years. As a result, the condemned building must be demolished. Our goal was to design a new restaurant to replace the current building. It needed to be a place that will be relaxed and fun, but also gives a new direction for the surrounding neighborhood. Because it is the only restaurant in its vicinity, we wanted it to be a place that created the idea of community where neighbors and friends could come together. Therefore, we proposed an architectural form that will aide Mrs. Dunbar in reestablishing the characteristics and values that made the restaurant an iconic destination.

## 2nd Place

**NAME:** Erin Hathaway  
**Landscape Architecture major**  
**TITLE:** Vine Street Corridor: Energy Through Infrastructure

## Honorable Mention tie:

**NAME:** Aaron Scales  
**Architecture major**  
**TITLE:** Bottle Stop

**NAME:** Collin Linebach  
**Landscape Architecture major**  
**TITLE:** Corridor Revitalization: Bringing Vitality to Twelfth Street

## CATEGORY 3: Fine Arts

### 1st Place

**NAME:** Corey Gregory  
**Theatre major**  
**TITLE:** 1880's Day Dress

The dress has hand embroidered panels and construction. The embroidering alone took two months to complete. Once finished, the embroidering was matched to where it would be on the bodice. The brocade on the bodice had to be pattern matched so that it would line up correctly. Once the bodice was finished, construction began on the petticoat and overskirt. After that, work began on the over drape that is a green wool crepe. See pp. 64-69 for pictures of the dress and a more complete discussion.



## 2nd Place

**NAME:** Ben Drewry  
**Art Studio major, Theatre major**  
**TITLE:** Manifold

**CATEGORY 4:**  
**Humanities: Creative**  
No awards this year

**CATEGORY 5**  
**Humanities:**  
**Critical Research**

### 1st place

**NAME:** Amanda Cothorn  
**Art History major**  
**TITLE:** The Perfect Machine: The Reason Behind the Anatomical Studies of Leonardo da Vinci.

The legacy of Leonardo da Vinci is most often characterized by the works of his brush; however, there is more to Leonardo than what meets the art lover's eye. His notebooks overflow with scientific studies, the most amazing of which are his meticulous studies of human anatomy. Scholars have long assumed that Leonardo dissected corpses in order to better represent the human form in his painting. My research counters this assumption, providing evidence from Leonardo's drawings and writings that suggests he was primarily a scientist and engineer. This paper demonstrates that Leonardo's detailed dissections and application of the laws of physics to human physiology would have been unnecessary to a career artist. I hope to unveil Leonardo as an anatomist who painted, not a painter who studied anatomy. See pages 20-29 for the full paper.



## 2nd Place

**NAME:** Michelle Combs  
**Anthropology major**  
**TITLE:** Of Piety and Lineage: A New Reading of Devotional Images of Mary of Burgundy

The most famous depiction of Mary of Burgundy (1457-1482) is undoubtedly the illuminated miniature in which she sits with her book of hours contemplating the Virgin Mary, pictured inside the window to her left. Another important devotional image of Mary is found within the Guild Book of the Confraternity of St. Anne (after



1476), of which Mary and her stepmother, Margaret of York, were patrons. This work can also be viewed in conjunction with the devotional images in the Hours of Mary of Burgundy; both sets of images convey common themes of piety, childbirth, and marriage. These themes hinge upon the patronage of the works, visual analysis, and historical context.

#### **Honorable Mention**

**NAME: Alice Heinz**

**Art History major**

**Anna Sewell**

**TITLE: You Can't Stop Us: Why  
Censorship Doesn't Work in America**

#### **CATEGORY 6:**

**Physical and Engineering Sciences**

**No 1st Place award**

**2nd Place**

**NAME: Sarah Vessels**

**Computer Science major**

**TITLE: Gbrowse Modifications for  
Improved Usability and Ease of  
Customization**

#### **CATEGORY 7:**

**Social Sciences**

**1st Place**

**NAME: Brenton Kenkel**

**Political Science major.**

**TITLE: Debt, Tuition, and Growth at the Research  
University: An Analysis of Kentucky's Proposed  
Bonding Authority Policy**

A time-series regression was performed on 12 years of financial data from 166 public research universities to conclude that higher debt levels at universities do not lead to lower tuition rates, contrary to the assertions of political actors and student-mobilization leaders in Kentucky.

**2nd Place**

**NAME: Charlee Doom**

**Agricultural Economics major**

**TITLE: Evaluation of the Flove Leaf Oil Industry on  
Pemba Island**

**Honorable Mention**

**NAME: James Adams**

**Landscape Architecture major**

**TITLE: Anthropogenic Land-use Change: Problems,  
Programs, and Predictions**

