
Undergraduate Science & Engineering Symposium (USES)

**7 March 2008
Santa Clara University
Williman Room, Benson Center**

2008 Undergraduate Science & Engineering Symposium (USES)

The goal of this symposium is to promote research science at Santa Clara University. We hope to achieve this goal through three strategies:

1) Encourage and recognize student research by providing a venue for formal presentation

Walking advanced students through the professional meeting process, from abstract submission through presentation, provides them with a sense of accomplishment and conveys an important aspect of the research experience: explaining results with concision & general appeal.

2) Actively expose new majors to research opportunities & ongoing projects by their peers

By exposing sophomore, and even freshmen students to studies conducted by their peers, 1-2 years ahead of them, we hope to make research an attractive and feasible endeavor. Students will be exposed to faculty research programs (I bet most have no clue what their instructors study...), while, at the same time, learning how to become involved in research.

3) Increase interaction between students and research scientists, in a casual setting

Ideally the symposium will be formal enough to demonstrate the atmosphere of a meeting, but casual enough to make newly declared science & engineering majors comfortable enough to ask student and faculty researchers about the culture of science: what types of careers one can expect? What are pros and cons of the lifestyle? What the challenges and rewards of research? How do you choose a research focus?

We hope that attendees will join us for at least one full session (i.e. Ia & b and/or IIa & b). Each session includes two breaks: the first (short panel) will allow researchers to field specific questions, during the second (long panel) break we will bring all of the researchers from the session up to answer questions, and also discuss the research experience. For this reason, please be ready to jot down questions during the course of the talks.

I realize it will be a long day, and we will have refreshments and caffeine available throughout!!! Thank you to everyone who helped and participated in this event!

Sincerely,
Sean M. Watts & Katherine A. Preston

USES Agenda: 7 March 2008

(Presenting authors are underlined, advisors in parentheses)

Introduction (Katherine & Sean) 12:00 – 12:15pm

Research Opportunity:

Iris Stewart-Frey: **Mapping Climate Change with GIS!** 12:15 - 12:25pm

“What you can do with GIS: Historical ecology of the Santa Clara Valley”

Session Ia: Ecology & Evolution 12:30 – 1:30pm

Kathleen Powers & Sarah Cook (J.Edgerly-Rooks)

“Measuring the silk footprint of embiids (Class Insecta) (Part 1)”

Whitney Knott & Khaaliq Dejan (J.Edgerly-Rooks)

“Measuring the silk footprint of embiids: Does one size fit all? (Part 2)”

Cindy Dick (E.Dahlhoff)

“Effects of temperature stress on performance and fitness of a Sierra Willow beetle”

Jessica Reimer, Melissa Uhl, Stephen Maurano, & Erin Nuccio (S.Watts)

“Multiple interacting threats challenge restoration of a rare hemiparasitic plant: *Cordylanthus rigidus* ssp. *littoralis*”

Short Panel & Break (Questions for clarification) 1:30 – 1:45pm

Session Ib: Genetics & Engineering 1:45 – 2:30pm

Scott Montgomery & Elico Teixeira (L.Miller)

“Analysis of the *C. elegans* Transcription Factor, LIN-31”

Debbie Thurtle (C.Stephens)

“Regulation of sugar metabolism in *Caulobacter* - Adapting the *lac* regulatory model to new habitats”

Zefram Marks (C.Yang & J.Jameson)

“Investigation of carbon nanofiber thermal breakdown”

Long Panel & Break (Questions & discussion with Sess. I authors) 2:30 – 3:00pm

Session IIa: Anthropology & Psychology **3:10 – 4:10pm**

Hailey Trefethen (M.Bezanson)

“Frequency and types of play in white-faced capuchin immatures”

Robert Raymond (M.Bezanson)

“Spatial memory and foraging strategy in *Cebus capucinus*”

Kellie Flint (M.Bezanson)

“Why do howlers howl? Vocalizations of mantled howlers (*Alouatta palliata*) in Costa Rica”

Victor Quintanar-Zilinskas (A.Brook)

“Effects of contingent self-worth on academic self-regulation”

Short Panel & Break (Questions for clarification) **4:10 – 4:25pm**

Session IIb: Environmental Studies Institute **4:25 – 5:10pm**

Peter Thamer (L.Cromwell)

“Pioneering carbon calculations at SCU”

Tracey Mangin (L.Cromwell)

“Promoting campus recycling in super-duper clever ways...”

Waide Hicks (K.Warner)

“Perceptions of ecological risk in biological control: A literature review”

Long Panel & Break (Questions & discussion with Sess. II authors) **5:10 – 5:40pm**

Final Comments **5:40 – 6:00pm**

Pizza, Discussion, & Awards! **6:00 – 7:00pm**

USES Abstracts: 7 March 2008

Research Opportunity:

12:15 – 12:25pm

“What you can do with GIS: Historical ecology of the Santa Clara Valley”

Dr. Iris Stewart-Frey, Asst. Prof. (IStewartFrey@scu.edu), 408.551.7186

Mountain snowpack and spring snowmelt runoff are critical contributors to surface water supplies and serve as important, regionally and spatially integrated indicators of climate variability and change. It has therefore been noted with concern that, consistent with the warmer temperatures of the past several decades, snowpack has been declining and streamflow timing has been coming earlier throughout the western United States. Curiously, though, not all streams in the region have been responding to the temperature shift in the same way. This study is undertaking a detailed investigation of the geology, soil, and vegetation for approximately 200 watersheds in California with the aim of understanding the differences in response to climatic changes. The physical setting is analyzed in conjunction with climatic factors, with potential regime-shifts from snowmelt- to rain-dominated, and with a stream's hydrologic response. Undergraduate student research assistants could help in this effort by putting together detailed GIS data bases on the geology, topography, soil, and vegetation of individual watersheds. Some of this information can be gleaned from existing data bases, but there is also the need for groundtruthing in the Sierra Nevada. An interest in water and/or climate issues and a basic familiarity with (or willingness to learn) ArcGIS software would be a prerequisite for hire.

Session Ia: Ecology & Evolution

12:30 – 1:30pm

“Measuring the silk footprint of embiid (Class Insecta) (Part 1)”

Kathleen Powers, Senior Biology & Sarah Cook, Senior Environmental Science/Biology
(Dr. Janice Edgerly-Rooks, Prof., Biology)

Embiids spin silk, produced in glands in their front feet, to protect themselves and their offspring from biotic and abiotic threats, such as natural enemies and heavy rain respectively. They spin by pressing each foot against the substratum and pulling it back as silk issues forth in multiple strands. Embiid females live with their young and often share their silk domiciles with other reproductive adult females. They live across a variety of habitats, ranging from leaf litter to arboreal environments, and from tropical to subtropical to Mediterranean. Unusual for the Class Insecta, adult females are morphologically uniform, one species to the next, showing almost no diversity across taxonomic families or environments. We seek to determine if the order has diversified behaviorally. As such, we are applying the concept of “behavioral syndromes” (suites of correlated behavioral traits) to test whether diversity has arisen in response to ecological pressures. If specific silk-spinning behaviors are symptomatic of the insects' ecological pressures, we predict that embiids living in exposed conditions (as is characteristic of arboreal lifestyles) will have a higher investment in silk than those relying more on concealing microhabitats such as leaf litter or subterranean burrows. We measured behavioral diversity in several ways. First, we looked at the propensity and amount of silk spinning, predicting embiids in more exposed habitats will be more enthusiastic

spinners. Second, we looked at the complexity of their spinning choreography, which should also increase as habitat exposure increases and their reliance on silk structures also increases. We will present the rationale for our hypotheses, predictions, and methods and will explain how to quantify spinning diversity. [Preliminary results will be presented in the next talk presented by our colleagues.]

“Measuring the silk footprint of embiids: Does one size fit all? (Part 2)”

Whitney Knott, Senior Biology/Environmental Science & Khaaliq Dejan, Sophomore Bioengineering
(Dr. Janice Edgerly-Rooks, Prof., Biology)

Embiids rely on silk to conceal themselves from natural enemies and abiotic stresses across a variety of habitats (see Part 1, above, for more information on this project). We suspect that spinning behavior, in terms of behavioral repertoire, spinning complexity, and tendency to spin, varies as a function of exposure levels. The more at risk an embiid is to environmental threats, the more complex her spinning. We quantified silk spinning diversity from a variety of species, including those from Australia, the New World Tropics, subtropical Central America, the Mediterranean, and Asia. We applied multivariate statistical techniques to identify possible behavioral syndromes and to determine if ecological factors correlate with characteristics that emerge within species-specific spinning patterns. Our preliminary results support our hypothesis that exposure and habitat selects for particular spinning behavioral syndromes. We will also explore the idea that phylogeny might explain some of the similarity in the choreography of spinning found between species.

“Effects of temperature stress on performance and fitness of a Sierra Willow beetle”

Cindy Dick, Senior Biology, (Dr. Elizabeth P. Dahlhoff, Assoc. Prof., Biology)

The willow beetle *Chrysomela aeneicollis* lives at high elevations in the Eastern Sierra Nevada. In these populations, allele frequencies at the glycolytic enzyme locus *phosphoglucose isomerase* (PGI) vary across a climatic gradient. PGI genotypes differ in enzyme kinetics, heat shock protein (Hsp70) expression, thermal tolerance, and effects of temperature on running speed among PGI genotypes may be due to differences in Hsp expression. Here I examine if differences in running speed and Hsp70 expression among PGI genotypes result in differences in male mating success. During mating season, male beetles run around and mate with as many females as possible- a strategy known as “scramble competition”. Thus, both running and mating are critical components of male fitness; however, beetles are exposed to extreme temperatures that cause physiological stress while they are trying to run and mate. In this study, running speed and male mating frequency was measured before and after a 36°C heat shock or a 20°C control. Male running speed was measured pre-heat shock, post-heat shock/pre-mating, and post-heat shock/post-mating. After second running trial, mating success of each male with four successive females was recorded. Heat shocked males ran slower than control males and mated much less with their first female than controls; however, there was no difference in mating frequency between treatment groups for the next three females, suggesting rapid recovery by heat shocked males. I also determined whether mating directly impacted running speed. Male mating effort was increased (males placed with 3 females or a 0 female control) then all male mating frequencies with four females were recorded as before. Males that ran fastest mated most, but prior mating effort did reduce subsequent mating effort. Biochemical analyses examining effects of PGI genotype and Hsp70 expression on interactions between running speed and mating success are in progress.

“Multiple interacting threats challenge restoration of a rare hemiparasitic plant: *Cordylanthus rigidus* ssp. *littoralis*”

Jessica Reimer, Junior Combined Science/Env'tal Science, Melissa M. Uhl, Class of 2007, Political Science/Env'tal Studies, Stephen P. Maurano, Class of 2007, Biology/Env'tal Science & Erin E. Nuccio, Class of 2004, Env'tal Science/Rel. Studies (Dr. Sean M. Watts, Postdoc., Env'tal Studies Inst)

Endangered species are often subject to multiple threats that limit success at different life stages. Rare parasitic plants are especially likely to face multiple threats, since they must “chase down” suitable hosts. This study was conducted to prioritize strategies to restore *Cordylanthus rigidus* ssp. *littoralis* (*C.r.l.*) a state endangered parasitic annual forb native to California. We conducted a series of experiments on five potential limitations to *C.r.l.*: availability of host shrubs, exposure to mammalian herbivores, insect seed predation, fire suppression, and competition from exotic species. We found that *C.r.l.* benefited when growing within 50cm of host shrubs (particularly *Rhamnus californica*) and when protected from mammalian herbivory. Spraying with lepidopteran-specific *Bt* (an insecticide) significantly reduced seed predation by moth larvae. As a proxy for exposure to fire, we applied charate (the residue of baked chaparral shrub stems, which improves germination in some chaparral annuals); however it did not appear to affect *C.r.l.* germination. Finally, *C.r.l.* presence, abundance, and performance were all greater in the absence of exotic species. This series of experiments also suggested potentially important interactions: 1) that with intense competition from exotic species, fencing to exclude herbivores may actually benefit exotics more than *C.r.l.* and 2) that increased herbivory from mammals sheltering in host shrubs may limit the benefits of host proximity. Because these interactions were not the direct focus of the previous experiments, we are comparing the performance of *C.r.l.* in caged and uncaged plots at three distances from host shrubs (10, 75, and 200cm) to better define the best balance of protection from herbivory, host proximity and exotic species competition. An important conclusion of this work is that the simultaneous assessment of several threats allows researchers to prioritize restoration strategies, expose potentially important interactions between threats and highlight the gaps in our knowledge about endangered species.

Short Panel & Break

1:30 – 1:45pm

Session Ib: Genetics & Engineering (3 talks)

1:45 – 2:30pm

“Analysis of the *C. elegans* Transcription Factor, LIN-31”

Scott Montgomery, Senior Biology & Elico Teixeira, Class of 2007, Engineering/Physics
(Dr. Leilani M. Miller, Assoc. Prof., Biology)

Cell fate, or how a cell decides to differentiate into a certain cell type, depends largely on which genes are expressed. Transcription factors are proteins responsible for such regulation, although the biochemical characterization of such systems is incomplete. For example, very few targets (genes regulated by these transcription factors) have been identified. The winged-helix transcription factor LIN-31 is involved in cell fate decisions during development of the vulva, an egg laying structure, in the model organism *Caenorhabditis elegans*. This protein contains a DNA-binding domain and several other regions of unknown function. In *C. elegans*, the LIN-31 protein is expressed in very few cells, making direct biochemical analysis difficult. Attempts to express and purify this protein in bacterial and insect cells have been impeded by low expression levels and insolubility. To learn more about

the role of this protein without purifying it, we are using a yeast-based system for two-hybrid analysis and yeast transcriptional assays. These molecular biology techniques are designed to screen thousands of proteins for those that physically interact with our protein of interest and how they might together regulate gene expression. Transcription factors often regulate genes when complexed with other transcription factors. Identifying these interaction partners will help us understand the function of the LIN-31 protein. Currently we are optimizing our positive controls and transformation efficiency to prepare for the large two-hybrid screen.

**“Regulation of sugar metabolism in *Caulobacter*
Adapting the *lac* regulatory model to new habitats”**

Debbie Thurtle, Senior Biology (Dr. Craig Stephens, Assoc. Prof., Biology)

D-xylose constitutes the chief subunit of xylan polymers, which are a major component of plant cell walls. The oligotrophic aquatic bacterium *Caulobacter crescentus* utilizes xylose as a carbon and energy source. Xylose metabolism in *C. crescentus* proceeds via a novel pathway that begins with the enzyme xylose dehydrogenase. The enzymes of this pathway are encoded by the *xyI* operon, and expression of these genes is induced by xylose. Xylose-dependent regulation of the xylose operon is maintained by the xylose repressor (XylR), a LacI-family transcription factor. We worked to determine the method by which the XylR regulates expression of the xylose operon. Using electrophoretic mobility shift assays (EMSA), crude extracts were combined with a fluorescently-labeled synthetic DNA molecule containing the operator sequence from the *xyI* operon promoter. If a protein-DNA complex is formed, the mobility of the synthetic operator would be retarded. Our results show that a complex is formed when no xylose is present, but complex formation is greatly reduced by xylose. No complex is observed in extracts from a *C. crescentus* strain in which the *xyI*R gene has been mutated. A shifted complex is also present in extracts from the closely related *Caulobacter* species K31, which also contains the *xyI* operon and XylR. These results support a regulatory model analogous to the Lac repressor: XylR binds to the promoter in the absence of xylose to prevent transcription of the *xyI* operon, and releases from the promoter when xylose is present to allow genes necessary for xylose metabolism to be expressed. K31 XylR binds to the same operator sequence, indicating a highly conserved regulatory system between the two species.

“Investigation of carbon nanofiber thermal breakdown”

Zefram Marks, Junior Electrical Engineering (Dr. Cary Y. Yang, Prof. Electrical Eng.,
Director, Center for Nanostructures & Dr. John Jameson, Asst. Prof., Electrical Eng.)

Carbon nanofibers (CNFs) are synthetic strands of graphite that are 1000 times thinner than a human hair. They are good conductors of electricity. This property has made them candidates to replace the copper wires in computer chips, which are suffering from performance and fabrication problems caused by the continuous reduction in the minimum feature size of chips.

An important question is how much current can be run through a CNF before it breaks. A previously proposed mechanism for this breakdown suggested that it is due to heating produced by the electrical current. It was suggested that the CNF breaks when heating causes its temperature to reach some critical temperature at some point along its length.

The present experiment aims to test this proposition. It was suggested that if temperature is the only important factor determining breakdown, then CNFs in a cold environment should be capable of carrying a higher current than CNFs in a hot environment. The present experiment tests this

proposition by externally heating the CNFs, measuring whether the critical current at which they break down decreases as the external temperature of the heater is increased.

Long Panel & Break

2:30 – 3:00pm

Session IIa: Anthropology & Psychology (4 talks)

3:10 – 4:10pm

“Frequency and types of play in white-faced capuchin immatures”

Hailey Trefethen, Senior Anthropology (Dr. Michelle Bezanson, Asst. Prof., Anthropology)

Play is an activity that characterizes many animal species. The reasons for this widespread activity still are not evident as there are very few empirical studies that assess its function. In this research, I examine social and solitary play in a wild troop of white-faced capuchins (*Cebus capucinus*). I used an instantaneous scan-sampling technique in combination with all-occurrence sampling to collect information on type of play (e.g., solitary play, object play, rough and tumble play), play partner information, rate of play, and duration of play sequences. *Cebus capucinus* at Estacion Biologica La Suerte in Costa Rica engaged in social play for 5.71% of their total activity time. Solitary exploration, including solitary play and object play, accounted for less than 1% of the total activity budget. Younger immatures were seen to engage in contact social play more often, 15.6% than older juveniles 10.1% while older juveniles tended to have longer durations of play. The bouts of social play included two main types of play; wrestle and chase. However, there was a large range of intensity, speed, and force of these two types of play recorded in this study. Social play made up a large portion of social behavior, over fifty percent. Immatures engaged in play with individuals of relatively the same size and age. In capuchins, it appears that social play is an important part of social training that may facilitate successful dispersal in males and a better understanding of within-group social intricacies in females that stay within the natal group.

“Spatial memory and foraging strategy in *Cebus capucinus*”

Robert Raymond, Junior Anthropology/Philosophy (Dr. Michelle Bezanson, Asst. Prof., Anthropology)

The objective of this study is to determine whether white-faced capuchins utilize spatial memory while foraging and traveling throughout their home range. Knowledge of this capability in white-faced capuchins (*Cebus capucinus*) contributes to our understanding of primate cognition as capuchins have shown evidence of the use of pivotal trees and core areas in experimental studies. The goal of this research is to address spatial memory using observational sampling in a free-ranging troop of white-faced capuchins inhabiting a tropical forest in northeastern Costa Rica. I conducted behavioral sampling using a two-minute instantaneous focal method, in combination with marking feeding and travel trees visited by the capuchins and later mapping and analyzing them for patterns of re-use. Capuchins spent over 70% of recorded time in two separate areas, suggesting that these capuchins do have core-areas and depend on pivotal resources during times when these resources are available. The capuchins returned to these sites on multiple days and for up to three hours and twenty minutes each time. The capuchins were not recorded to have reused any trees outside core areas, and there is little evidence in this study to suggest that capuchins reuse travel routes. These results contradict previous experimental studies suggesting that these primates do in fact utilize some form of spatial memory. However, little has been done to test this capability in natural conditions. If *C. capucinus* does have the cognitive capabilities for some form of spatial memory, it would make sense

for them to be utilizing it in the wild. Sampling protocol, seasonal differences in resource availability, cognition and foraging techniques, also are discussed.

**“Why do howlers howl? Vocalizations of mantled howlers
(*Alouatta palliata*) in Costa Rica”**

Kellie Flint, Senior Philosophy (Dr. Michelle Bezanson, Asst. Prof., Anthropology)

Primate communication is essential to gain insight into social behavior, predation avoidance, and inter-group interactions. I researched the vocalizations of the mantled howler monkey (*Alouatta palliata*) inhabiting a tropical forest in Northeastern Costa Rica. This study aimed specifically on howling vocalizations to add information to the goal of answering the ultimate question ‘Why do Howlers Howl?’ To answer this question, I collected information on types of vocalization, frequency of vocalization, sex and age-based differences in calling, behavioral and ecological context of calls, and timing (e.g., morning calls). Behavioral data were collected using instantaneous sampling of the behavior of a selected focal animal and continuous sampling of vocalizations when they occurred. Intensity of vocalizations, vocalizers, responses and location also were recorded. Results indicated that vocalizations mostly occur during rest (24.6% of total), active posture (18.1%) and foraging (18.8%) and that most vocalizations are either ‘hoots’ or the aforementioned ‘howls’. Vocalizers are typically adult and specific howling results illustrated an increased amount of vocalizations in males. Times of vocalizations were analyzed and revealed a slight pattern in early and mid morning vocalizations as well as late afternoon vocalizations. Although the study revealed important information about aspects of howler vocalizations, a great deal still needs to be done to add to the data acquired. Simultaneous multi-group studies would benefit research into the functions of inter-group communication and full day observation periods would add to any evidence of temporal patterns of howling.

“Effects of contingent self-worth on academic self-regulation”

Victor Quintanar-Zilinskas, Senior Biology (Dr. Amara Brook, Asst. Prof., Biology)

Contingencies of self-worth are areas of life in which self-esteem is staked, such as academic achievement, others’ approval, and appearance, and motivate people to act in ways that protect and enhance self-esteem. However, the behavioral effects of this motivation vary from situation to situation and person to person. Sometimes a contingency will motivate people to perform well because this raises self-esteem and feels good. However, in addition to increasing effort, academic contingency may motivate other behaviors that protect self-esteem and mood but also undermine performance, such as self-handicapping. These and other effects of contingent self-worth may vary based on self-esteem level, feedback, and task difficulty. In the present study, we sought to learn the effects of academic and other’s approval contingencies of self-worth on self-regulation in a real academic setting, and how these effects may depend on self-esteem level and exam feedback. Introductory psychology students filled out online surveys in prescreening and before their final exam. In prescreening, we measured academic and others’ approval contingencies of self-worth and self-esteem level. Before the final exam, we measured self-regulation, including ego depletion, self-handicapping, coping strategies, motivation, and effort. At the end of the quarter, we obtained student exam grades from professors. Controlling for baseline level of self-esteem, academic contingency of self-worth predicted better self-regulation at the end of the quarter, including greater academic motivation, effort and active and social coping with academic stress. In contrast, basing self-esteem on others’ approval predicted poorer self-regulation at the end of the quarter, including

lower self-control and fewer hours spent studying. We will also discuss how these effects may depend on self-esteem level and exam feedback. This study provides evidence that some effects of contingent self-worth on self-regulation found in the laboratory extend to real academic situations, and provides further evidence that different contingencies of self-worth have unique effects. We will discuss the implications of these findings for future research about the effects of contingencies of self-worth on self-regulation as well as for real world application.

Short Panel & Break

4:10 – 4:25pm

Session IIb: Environmental Studies Institute (3 talks)

4:25 – 5:10pm

“Pioneering carbon calculations at SCU”

Peter Thamer, Senior Environmental Science, Sustainability Intern
(Lindsey Cromwell, Sustainability Coordinator, Env’tal Studies Inst.)

The mounting evidence of anthropogenic causes of global climate change has raised awareness of how resource consumption affects the global biotic community and especially future generations. As a Jesuit University, Santa Clara’s mission for its students, staff, and faculty to be engaged with society and be committed to fashioning a more humane and just world expresses an inherent obligation to reduce negative environmental impacts and strive for more sustainable means of operation. One way SCU has addressed this issue is by creating the Sustainability Program. As an intern of that program, one of my primary goals has been to research SCU’s major resource consumption trends and quantify annual green house gas emissions. By signing the Sustainable Silicon Valley commitment in 2007, SCU pledged to reduce green house gas emissions to be 20 percent below 1990 emission levels by the end of 2010. After quantifying historic and current annual CO₂ emissions produced during the consumption of gasoline, diesel, natural gas, and electricity, I found that annual CO₂ emissions in 2006 were 18,551 tons and must decrease by 34 percent, or 6,335 tons, to reach our emission goal in the next three years. Together, natural gas and electricity account for over 98% of total annual emissions and have subsequently become the main targets for reduction. This research of SCU’s green house gas emissions has provided the Facilities department with better conceptualization of energy conservation measurement and targets, as well as a baseline assessment by which future progress can be measured. This research will also contribute to a nation-wide pilot program which will create a standardized method for university carbon accounting so that progress and successes of schools can be more accurately translated and exchanged.

“Promoting campus recycling in super-duper clever ways...”

Tracey Mangin, Junior Philosophy/Env’tal Studies, Recycling Intern
(Lindsey Cromwell, Sustainability Coordinator, Env’tal Studies Inst.)

When the internship was created, SCU had an established recycling system, but participation among students, faculty and staff left much to be desired. Those who did recycle were often confused by a lack of information or conflicting information regarding recycling procedures. Contamination was also a major issue; often entire recycling bins needed to be thrown away due to the amount of trash that had been mixed in. Since Facilities does not have the resources to address these problems (education, outreach and process redesign) the Recycling Internship was created. Methods include new signs in recycling/waste areas, magnets for campus residents, informative

websites, and new stickers for bins. Another strategy is to create ways in which students, faculty, and staff can get involved by developing interactive programs and projects. Additionally, online resources allow members of Santa Clara University's community to contribute questions and comments, while also acting as networking devices. Lastly, we have recognized the need to address certain barriers in order to make recycling and waste reduction more prevalent on campus. We will design a bin audit and survey, and redistribute bins and improve the recycling program based on the respective results. Although the internship has only been established for six months, there have been a number of preliminary results from the new initiatives. Student, faculty and staff involvement has been evident through participation in new programs including Facebook groups and the Recycling FAQ website. Additionally, an immediate improvement in the amount of recyclables collected at large events was observed after new stickers were attached to the bins, and students volunteered as Recycling Directors. There has been a noticeable increase in recycling rates and involvement on campus.

“Perceptions of ecological risk in biological control: A literature review”

Waide Hicks, Class of 2006, Env'tal Science

(Dr. Keith D Warner, OFM, Lecturer, Env'tal Studies Inst.)

Biological control of non-native species has become a nexus of controversial debate among scientists, practitioners, and politicians since the irruption of concern over non-target effects nearly two decades ago. The growing concern for risk of non-target effects from biological control introductions has been marked by various key articles in the biological control literature since 1991. By analyzing these major articles with various bibliometric tools and the qualitative analysis software *NVivo*, I am able to measure the impact of key authors and the novel arguments they present. Cited reference data from Web of Science provides a means to trace the “infection” of these major articles to other authors, to see who has cited them, when, and in what fields/journals, etc. A pool of over 500 respondent articles that cite these major irruptions will be analyzed with *NVivo* using keyword analysis and other methods to provide further insight into how concern for risk of non-target effects has changed, if at all, in the literature. Ethics and values discourse and moral claims in these articles are also extracted and tracked over time. Preliminary results show that, essentially, no new arguments have been made since 1997. At its core this study traces the flow of new ideas and information regarding non-target effects and risk perception throughout the biocontrol community.

Long Panel & Break

5:10 – 5:40pm

USES Participants: 7 March 2008

Name	Title/Year	Dept/Major	2nd Major	Email (@scu.edu)	Phone
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Powers, Kathleen	Senior	Biology			
Quintanar-Zilinskas, Victor	Senior	Biology			
Raymond, Robert	Junior	Anthropology	Philosophy		
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Thurtle, Debbie	Senior	Biology			
Trefethen, Hailey	Senior	Anthropology			
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NOTES
