Texas A&M University Department of Entomology
Seventh Annual Graduate Student Forum
Reflections from the Chair

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Chair, Graduate Student

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Excellence…

As many of us participated in the International Congress of Entomology 2004 in Brisbane, Australia, another international event, the Olympic Games caught the world's attention.

For eight hours a day at the conference we participated in intellectual discussions, results sharing, conscious or unconscious evaluation of presentations. It was exciting, stimulating and by the end of the week… exhausting.

At night, if the reception allowed (my TV was not very good) we saw a couple of Olympic events and share the emotions of the winners and felt sad for the disappointment of those that left without a medal.

Before I left to Brisbane I thought that the theme for this Forum should be Excellence. How do we achieve it? What is it? How do we maintain it? Our keynote speaker will help us with these questions.

One thing was clear to me from both the ICE 2004 and the Olympics: while many of the participants might have experienced "fun" while preparing to achieve their level of performance, FUN was really not the first word that came to my mind. Those words were talent, persistence, effort, tenacity, motivation, the fire within, and long, long hours of work, perhaps losing sleep and with some physical injuries and pain to endure in the case of the athletes. There is this new current in academia telling us, the teachers, that students should have "fun". Yes, hopefully their area of expertise should bring them satisfaction and happiness in the future. More realistically, however, before the "fun"…*Have you sweat yet?*

Keynote Speaker

William D. Park
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Dr. Bill (William D.) Park received his Bachelor of Science degree from the University of South Carolina in 1973 and then in 1977 was awarded a Ph.D. from the University of Florida. Dr. Park became an Assistant Professor at Purdue University in 1980 and joined the Texas A&M faculty in 1984.

Dr. Park is currently a Professor in the Biochemistry and Biophysics Department at Texas A&M University and Leader of the Rice Laboratory at the Texas A&M Crop Biotechnology Center.

Most of his work in the last few years has focused on manipulating starch biosynthesis in plants. This has led to the identification of a number of specific DNA polymorphisms that have a profound impact on the structure and functional properties of starch granules. He has also worked with an industrial partner and a breeder to develop the first commercial rice varieties specifically tailored to work with a new type of processing technology and to identify the genes responsible for optimal raw material/process interactions. Other work in his lab is focused on the identification and manipulation of DNA polymorphisms associated with disease resistance and with herbicide resistance in the wild relatives of crop plants.

Dr. Kevin M. Heinz
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Welcome to the 2004 Department of Entomology Graduate Student Forum. The Forum provides an opportunity for the graduate students to exchange ideas, data, and scientific interpretations with colleagues, faculty, staff, and guests in a semi-formal setting. Each participant has spent at least a year in preparation for this event in terms of planning, conducting, analyzing, and interpreting experiments; as well as developing their own style of presentation. The Department and its guests, greatly appreciate your efforts in making this the best Forum ever. Enjoy your day of interaction before you are swept away by the demands of the semester. The environment for the day is dynamic, exciting, and discovery-driven as your accomplishments and queries are showcased.

One value of science resides in the fact that it provides knowledge that is unassailable. The results of experiments are communicated in such a manner that anyone can reproduce the experiment to see if the same results occur. While communication of results is an essential component to science, it is also the component that most often puts students on nerves. During such times, it might be useful to consider several observations. The scientific story woven by a speaker frequently generates animated discussion that bubbles over into questions to the speaker. Success! You have stimulated your audience to think more deeply on your subject than they had ten minutes previously. Also recall that curiosity and inquiry are necessary components to science, and most likely components you have practiced yourself. It is that curiosity that carries a research program through hours, days, months, or years of replication. Finally, there is a bit of scientific reality. Our confidence in experimental results is directly related to how often an experiment is verified by an independent worker (or how likely we feel it is that the experiment may be reproduced). Communication of research methods and results are the first step toward independent verification. Communicating research within a single discipline is admirable; communicating research across multiple disciplines is profound. Sharing scientific knowledge is truly a challenging task in both written and spoken words. Many scientists will tell you that communication is an art, a discipline in itself that takes years of patience, practice, and a willingness to learn from others. The Entomology Student Forum provides an easily accessible condutit for graduate students to learn how to effectively communicate research across disciplines.

To close, a note of gratitude to Dr. Pietrantonio, EGSO, and the Department Support Staff for making this event a success. Their hours of hard work are often masked by the smoothness of the proceedings.

Christine E. Gray
Major Professor: Dr. Craig Coates
Ph.D. Candidate

"Cloning and Characterization of Mosquito CTCFs"

CCCTC-binding factor (CTCF) has been well-characterized in vertebrates as a ubiquitously-expressed, multivalent and multifunctional transcription factor with key roles in insulator function and gene imprinting. Long thought to be restricted to vertebrate species, study of genome sequence data supports its presence in multiple invertebrate species as well.

Putative CTCF orthologues have been cloned and characterized from the two medically-important mosquito species *Aedes aegypti* (L.) and *Anopheles gambiae* Giles. The mosquito CTCFs are constitutively-expressed, single copy genes and appear to bind a C/G-rich core sequence of approximately 14 base pairs experimentally-determined by a PCR-assisted *in-vitro* binding site selection. *In-silico* analysis of the *An. gambiae* genome reveals multiple putative binding targets consistent with CTCF function in vertebrates.

Eventual identification of endogenous CTCF-dependent insulators would provide valuable elements for protection of transgenes from the silencing effects of neighboring regulatory elements and unfavorable chromatin structure.

Catherine M. Zindler
Major Professor: Dr. Jimmy Olson
Ph.D. Candidate

"Mapping West Nile Risk in Bryan/College Station, Texas"

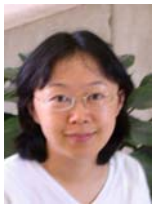
Personnel associated with the Texas A&M Mosquito Research Program have performed mosquito vector surveillance for the West Nile virus (WNV) in Brazos County since June 2002, when the virus was first detected in the State of Texas. Based on the data gathered from these surveys and other information, a risk map depicting areas at high risk for infection by West Nile Virus was created for Brazos County to aid in the WNV survey program. ArcGIS, a Geographic Information System, and ENVI, a platform for Remote Sensing, were used to decipher risk factors. The risk factors were determined to be density of manhole covers, vegetation and floodplains. The spread of the disease was determined by mapping the location of dead birds by date as reported to the Brazos County Health Department by local citizens. Results indicate the incidence of disease extends from the north to the south in the county, so it is advised that the weekly mosquito survey sites be chosen in the same manner, focusing on the high risk areas as depicted by the risk map and moving from the north to the south in the county as the season progresses using dead birds as indicators.

Darren E. Hagen
Major Professor: Dr. Craig Coates
Ph.D. Candidate

"Identification and Characterization of Germline-specific Promoters for Remobilization of Transgenes in the Mosquitoes, *Aedes aegypti* and *Anopheles gambiae*"

Aedes aegypti (L.) and *Anopheles gambiae* Giles are vectors for pathogens that have a dramatic effect on world health. Currently, methods of transformation are being developed for these species in order to create transgenic lines incapable of transmitting disease-causing pathogens. The creation of genetic transformants relies on the expression of a transposase protein in the germline cells to promote integration of transgenes into the insect chromosomes. The creation of a line of transgenic mosquitoes that will be capable of producing germline-restricted transposase will be of great importance to the disease vector research community. The use of endogenous germline tissue-specific promoters within *Ae. aegypti* and *An. gambiae* will allow for increased rates of transcription as well as ensuring germline specificity of the transposase. This will lead to increased transformation efficiency along with increased remobilization of the integrated element within the mosquitoes, creating a meiotic drive mechanism required for future successful integration into large populations.

My work is directed towards the identification of genes expressed strictly within the cells of the germline. By identifying these genes, the promoters can then be cloned and used to drive transposase expression.



Yilin Liu
Major Professor: Dr. Keyan Zhu-Salzman
Ph.D. Candidate

"Transcriptional Regulation in Southern Corn Rootworm Larvae Challenged by Soyacystatin N"

Southern corn rootworm, *Diabrotica undecimpunctata howardi* Barber, is one of the most damaging pests in the United States. Cysteine protease activity accounts for most digestive activity in the midgut of southern corn rootworm larvae. Inhibition of this enzymatic activity results in growth retardation and increased mortality. It is possible to engineer plants with naturally-occurring plant defense genes like those encoding protease inhibitors. The soybean cysteine protease inhibitor soyacystatin N (scN) suppresses digestive enzymatic activity as well as the growth and development of some coleopterans such as cowpea weevil, *Callosobruchus maculates* (Fabricius), western corn rootworm, *Diabrotica virgifera virgifera LeConte,* and Colorado potato beetle, *Leptinotarsa decemlineata* (Say).

Biochemical and insect feeding assays suggest that scN- could be an additional candidate protein potentially useful in transgenic approaches for rootworm control. However, insect adaptation to engineered plant resistance has become a major concern in using plant protease inhibitors for management of pest insects. Numerous crop plants have been transformed with protease inhibitors, but control has been relatively limited or at best, only transient. Determination of the transcriptional regulation of inhibitor-responsive genes is, thus, a necessity in understanding insect adaptation to plant defense, as well as in employing insect resistance genes in transgenic plants.

When fed on a diet containing a soybean cysteine protease inhibitor soyacystatin N (scN), southern corn rootworm larvae exhibited increased mortality and reduced growth rate. scN impacted mortality in a dose-dependent manner, and its effect on insect growth was more severe at early developmental stages. Subtractive hybridization and cDNA microarray analyses identified 29 transcript species responsive to scN. Southern corn rootworm larvae over-expressed cysteine and aspartic proteases to compensate for inhibition of digestion. Induction of a peritrophin gene suggests that strengthening the peritrophic membrane plays a role in coping with protease inhibitors. scN down-regulated genes encoded proteins involved in insect metabolism and development, reflecting the insect's ability to reallocate resources to prioritize its defense response. Further, protease and the peritrophin genes were also developmentally-regulated, which may explain the lower toxicity in older larvae than in neonates when first encountering dietary scN. Multiple regulatory mechanisms of counter defense-related genes may allow insects to evade the effect of plant defense proteins and impose an obstacle to biotechnology-based insect control.

Stephanie A. Stephens
Major Professor: Dr. Anthony Cognato
Ph.D. Candidate

"Bark Beetle (Coleoptera: Curculionidae: Scolytinae) Diversity in the Ecuadorian Rain Forest Canopy."

The diversity of bark beetles (Coleoptera: Curculionidae: Scolytinae) from multiple sites in the Ecuadorian rain forest canopy is presented. Beetles collected by insecticide fogging were sorted to morpho-species and identified to the lowest possible taxonomic level. Bark beetle diversity was compared among collecting sites. Biodiversity at each site was also associated with vegetation type. Species accumulation curves were calculated for each site to estimate the amount of collecting effort needed to arrive at an accurate representation of the bark beetle fauna.

Jeremiah M. Dye
Major Professor: Dr. Kevin M. Heinz
M.S. Candidate

"Implications of Natural Enemy Strain Difference for Biological Control of Aquatic Weeds (*Salvinia* spp.)"

The aquatic weeds, *Salvinia molesta* Mitchell and *Salvinia minima* Baker are free floating aquatic ferns native to South America that have become pests in the U.S. These plants grow rapidly and become problematic as they cover slow-moving water bodies. *Salvinia molesta* has been controlled in Australia using the weevil, *Cyrtobagous salviniae* Calder and Sands. In Florida, a genetically-distinct strain of *C. salviniae* reduces the severity of *S. minima* infestations.

In the current study, the suitability of each plant species as a host plant for each weevil strain and the amount of damage done by each weevil strain to each plant species were compared under three different temperature regimes representing a range of water temperatures typical of conditions experienced by these plants in the southern U.S. At winter temperatures, no evidence of oviposition or larval development was observed. At summer temperatures, both strains readily accepted both host plants for oviposition, but very few Australia strain larvae developed to adulthood on *S. minima*. Thus, the Florida strain was the better control agent for *S. minima.* On *S. molesta*, there was not a consistent difference between the two strains. At warmer than optimal summer temperatures, both strains effectively utilized and damaged *S. molesta.*. However, at below optimal summer temperatures, more Australia strain than Florida strain adults were collected from *S. molesta*. The differences between these two strains indicate the Florida strain is the better release candidate for *S. minima* infestations, while the Australia strain is the better release candidate for *S. molesta.*

Jennifer A. Murrell
Major Professors: Drs. Jimmy Olson and Craig Coates
M.S. Candidate

"The Distribution Patterns of the *Anopheles quadrimaculatus* Species Complex in Texas: A Preliminary Study"

Malaria is caused by a protozoan parasite that accounts for approximately 500 million clinical cases of human disease in the world each year. Different species of *Anopheles* mosquitoes are involved as vectors for malaria, in each region of the world. The main vector of malaria in the eastern United States, *Anopheles quadrimaculatus* Say was recently discovered to be a complex of five different cryptic species (A - *An. quadrimaculatus*, B - *An. smaragdinus*, C1 - *An. diluvialis*, C2 - *An. inundatus* D - *An. maverlius*). Researchers believe that some of the species may be more likely to vector malaria than others, so it is important that the geographic, habitat and temporal distribution of these species is known. The goals of this project are to discover which species are found in Texas, establish the geographic and environmental distribution of those species, and observe any shifts in the species due to seasonal changes during this study. The species in this complex are virtually impossible to discern using morphological characteristics, so PCR primers designed by A. J. Cornel in 1996 based on ribosomal DNA ITS2 region are being used to differentiate species in the *An. quadrimaculatus* species complex.

Collections in the early Fall of 2002 in the Bryan/College Station area were determined to be comprised of species A (*An. quadrimaculatus*). Collections in the 2003 and 2004 season are being processed and most of the *An. quadrimaculatus* have been differentiated as species A, but a few were discovered to be species B (*An. smaragdinus*). *An. quadrimaculatus* mosquitoes collected from numerous mosquito control agencies in Texas have been sent from the Texas Department of Health (TDH) to Texas A&M and are being analyzed to determine the species. Preliminary analysis of habitat data showed that both species A and B are found in combined forest, grass land, and marsh land, but that only species A has been found in urban areas. To complete the goals of the project additional collections will be made around Texas and more mosquitoes will be sent from TDH and the Harris County Mosquito Control District. Seasonal and habitat data from these collection sites will then be analyzed to determine any patterns.

Michael (Walker) Hale
Major Professor: Dr. Brad Vinson
MS. Candidate

"Temperature Effects on a Microsporidian Parasite in the Red Imported Fire Ant"

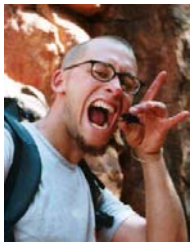
This study was conducted to assess the effects of temperature on spore production by the intracellular parasite, *Thelohania solenopsae* within its host, *Solenopsis invicta* Buren. Colonies of the polygynous Red Imported Fire Ant were subdivided into functional colonies consisting of five queens, two grams of workers and two grams of brood. Eighteen of these experimental colonies that were positive for *T. solenopsae* and 9 control colonies that screened negative for *T. solenopsae* were equally divided between three environmental chambers with temperatures of 16ºC, 26ºC, and 31ºC ±1.5ºC respectively. Over a 10 week study period, spore types and numbers of each type were measured. There was a significant positive correlation of binucleate free spores to spores derived from octospores in all groups (0.000) Pearson's correlation, and significant differences between temperature groups on spores derived from octospores (0.016) and free spores (0.001) ANOVA. At the 31º C temperature there was a mean increase of free spores from 1.896E+06 to 1.004E+07. Generally, there was a mean decrease in spores derived from octospores in all temperature groups by week 10. The primary reason for spore reduction may lie in the transovarial transmission contributing a key factor in disease proliferation.

Jeremy L. Hudgeons
Major Professor: Dr. Kevin Heinz
M.S. Candidate

"The Biological Control of Saltcedar (*Tamarix* spp.) Using the Leaf Beetle *Diorhabda elongata* (Coleoptera: Chrysomelidae)"

Like many other riparian systems of the southwestern United States, the Colorado River of Texas has been severely infested with saltcedar (*Tamarix* spp.), an exotic, invasive species from the Old World. Saltcedar consumes large quantities of groundwater, increases soil salinity and displaces native vegetation. For saltcedar control along the Colorado River system, large-scale herbicidal treatments are planned. While an effective control strategy for some situations, herbicide treatments are non-selective and are susceptible to re-growth and re-infestation by the weed.

Biological control may potentially offer an effective supplement to control methods based on herbicide treatments. The release of a biological control agent can be highly specific to saltcedar, relatively inexpensive, and may provide long term suppression in areas susceptible to re-infestation. The leaf beetle, *Diorhabda elongata* (Brullé)(Coleoptera: Chrysomelidae) was released at two locations along the Upper Colorado River in 2003 and an additional location in 2004. The adverse effects of beetle feeding on saltcedar growth will be measured to determine the efficacy of the biological control component of the program. In addition, the beetles' establishment will be documented and its dispersal from the release sites will be described.



Aaron Wexler
Major Professor: Dr. Pete Teel
M.S. Candidate

"Effect of Adult Males on the Attachment Aggregation Behavior of Immature Gulf Coast Ticks, *Amblyomma maculatum* Koch""

Gulf Coast ticks, *Amblyomma maculatum* Koch, are significant pests of pastured cattle that require new strategies of population surveillance and control. Gulf Coast ticks not only cause considerable economic losses to the United States cattle industry, but also this species is a recognized vector of heartwater the causal agent of *Ehrlichia ruminantium*, formerly *Cowdria ruminantium.* Heartwater is a lethal rickettsial disease of emerging importance, since both the putative vector and the causal agent are currently increasing their geographic range. Evidence suggests that *A. maculatum* is either spreading through inland states in the U.S., or its natural range is much more extensive than originally thought. At the same time heartwater is spreading globally, exposing itself to naïve cattle populations parasitized by apt vectors.

In regard the development of better surveillance methods for the Gulf Coast tick, males of this species are known to emit aggregation-attachment pheromone (AAP) that elicits attraction and attachment responses among males and females. The pheromone is also thought to attract and initiate aggregation and attachment responses from nymphs, as was found with *A. hebraeum*. The current study will test the hypothesis that AAP or other stimuli from the adult male ticks will attract the immature stages of the Gulf Coast tick as well as provide fundamental ecological information of the on-host phase of the adults and immature stages. Data from this study will provide the vital link in producing a reliable surveillance technique to find immature stages in the field. Such information is crucial in developing new tactics in Gulf Coast tick surveillance and suppression techniques that will incorporate strategies preventing young ticks from maturing into reproductive adults.

Amy E. Bader
Major Professor: Dr. Kevin M. Heinz
M.S. Candidate

"Competitive Interactions Between Two Parasitoids Attacking *Liriomyza langei* in Chrysanthemum"

Liriomyza langei Frick (Blanchard) (Diptera: Agromyzidae) is one of the most economically-important pests of many vegetables and ornamentals throughout the world. Damage is caused by larval feeding in the spongy mesophyll and by the feeding and oviposition punctures of the females, which is both aesthetically displeasing and can decrease photosynthesis. Cut chrysanthemums are grown for their flowers resulting in a high aesthetic value and zero tolerance of insect damage.

In an ongoing field experiment, the control of *L. langei* attacking chrysanthemums by the commercially-available parasitoids, *Diglyphus isaea* (Walker) (Hymenoptera: Eulophidae) and *Dacnusa sibirica* Telenga (Hymenoptera: Braconidae) is being examined. Although the parasitoids are currently available to be released alone or in tandem, their competitive interactions have not been closely studied. Releases of *D. isaea* and *D. sibirica* were made alone and together into field cages containing chrysanthemum plants infested with *L. langei*. This will allow for the determination of the feasibility of producing a marketable crop without insecticidal input and the level of leafminer control resulting from single species, releases and simultaneous and sequential releases of the multiple natural enemies.

Bradley W. Hopkins
Major Professor: Drs. Julio Bernal and Allen Knutson
M.S. Candidate

"Sampling and Economic Thresholds for Stink Bugs Infesting Cotton in the Lower Gulf Coast of Texas"

The objective of this research was to establish economic injury levels/ treatment thresholds for stink bug species (Hemiptera: Pentatomidae) occurring in cotton grown along the Lower Texas Gulf Coast. A stink bug survey was conducted in cotton fields in this region of Texas using the drop cloth method to determine the species composition. Results indicate the cotton-associating stink bug complex in the Lower Gulf Coast Region of Texas to be different than that of elsewhere in the U.S. Preliminary data show *Euschistus quadrator* (Say) and *Nezara viridula* (L.) to be the predominant species in the southern counties sampled. *Euschistus quadrator* was found throughout blooming stage, but *N. viridula* did not appear until the last few weeks of bloom. *Euschistus servus* (Say), was the predominant stink bug present in the northern counties sampled, but there were also populations of *E. quadrator* and *N. viridula* in these counties as well.

Efforts are being made to develop a commercially-acceptable method of sampling for stink bug infestations in Texas cotton. Drop cloth, visual, and percent evidence of internal feeding sampling methods are being compared to determine which is most efficient and effective. Economic thresholds for stink bug in cotton grown in the Lower Texas Gulf Coast Region are also in the process of being determined. As part of this research, cage experiments are being conducted to ascertain whether any differences exist between *E. quadrator*, *E. servus*, and/or *N. viridula* as to the damage each species causes.

As for the control of stink bugs in the Lower Texas Gulf Coast cotton, cage test efficacy trial results indicate dicrotophos (0.5 aia), lambda-cyhalothrin (0.0325 aia) and oxamyl (0.3299 aia) all have the potential of providing excellent control of *E. quadrator.*

Maria A. Blandon
Major Professor: Dr. Patricia Pietrantonio
M.S. Candidate

"Target Validation of a Myokinin Receptor from the Tick, *Boophilus microplus*"

The Southern cattle tick, *Boophilus microplus* (Canestrini) is a vector for the *Babesia* protozoan species that cause cattle tick fever. This disease causes great economic loss for the cattle industry worldwide. An eradication program for this tick is ongoing in the U.S. at the Texas-Mexican border. Pesticide-resistant *Boophilus* ticks have been discovered in Mexico, causing serious concerns of reintroduction of this vector into the United States. Therefore, developing novel methods to control this tick is essential to prevent reinfestation.

A novel approach to control *B. microplus* is to introduce hidden tick antigens to its hosts in an attempt to use the antigen as a vaccine against the tick. One of the tick antigens to be utilized in this study is a myokinin receptor from the *B. microplus* tick that has been previously cloned. Peptides corresponding to the sequence of the extracellular loops of this receptor will be synthesized and linked to a carrier protein. A mixture of these linked peptides will be injected into Hereford cattle to induce an immunological response. Immunological tests (ELISA) will be conducted to determine antibody titers in these animals. Upon detection of appropriate antibody titers, animals will be challenged with ticks. Inoculated and control cattle will be infested daily with female ticks for three weeks. Approximately three weeks after the initial attachment the ticks will drop from the host. They will be collected, counted, weighed, and examined for physical damage. They will be incubated in ideal conditions for another three weeks to examine egg laying capacity and egg viability as well as weight after egg laying. Planned statistical analysis on this data using test and ANOVA will be performed and reported.

Ramesh R. Sagili
Major Professor: Dr. Tanya Pankiw
M.S. Candidate

"Some Effects of Plant Protease Inhibitors on Honeybees"

Insecticidal properties of protease inhibitors (PI) have been established in transgenic plants. Possible effects of these inhibitors on beneficial insects like honeybees (*Apis mellifera* L.) need to be assessed. Honeybees collect pollen to meet their protein requirement. Pollen consists of 7.5 to 35% protein and hence, it is the likely channel through which the bees might be exposed to transgenic products. In this study, Soybean trypsin inhibitor (SBTI) was fed at 3 different concentrations (0.1%, 0.5% and 1.0%) in pollen to newly-emerged bees kept in incubator at 33°C and 50% relative humidity. Controls were also maintained.

Hypopharyngeal gland protein content and gut proteolytic enzyme activity was measured after 7 days. Mortality rates and longevity were also recorded. Survival analysis was used to analyze the survival data. Significantly less amounts of protein were detected in the hypopharyngeal glands of the bees fed with inhibitor at 1.0% concentration when compared to other treatments ($P < 0.001$). Casenolytic activity (total midgut proteolytic enzyme activity) was found to be significantly low in case of bees fed with 1.0% inhibitor ($P < 0.0001$). Also bees fed with inhibitor at 1.0% concentration had significantly reduced life spans. A similar study was carried out in the field using micro nuc colonies, where the effects of PI on foraging behavior were also studied in addition to effects on HP gland protein content and midgut protease activity.

Committee Members

Dr. Patricia Pietrantonio, Chair
Dr. Keyan Zhu-Salzman
Dr. Jim Olson
Bryan Heintschel
Chair Assistant: Teresa Gold

Evaluators

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Dr. Jorge Cruz-Reyes
Assistant Professor
Department of Biochemistry and Biophysics
Program in Microbial Genetics and Genomics

Previous Award Recipients

Year	1st Place	2nd Place	3rd Place
2003	Mei-Er Chen	Andrea Julian	Jared Burks
2002	Mei-Er Chen	Christine E. Gray	Steven P. Holmes
2001 (Three way tie)	Christine E. Gray **(Three way tie)**	Steven P. Holmes **(Three way tie)**	Ronald D. Weeks **(Three way tie)**
2000	Jarrad Prasifka	Robert Kula	Ahmed Mohammed
1999	Carlos Bogran	Jarrad Prasifka	Karol Burns
1998	Carlos Bogran	Richard Houseman	Jim Martin