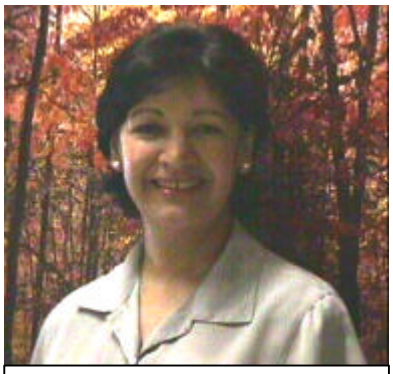
Texas A&M University Department of Entomology
Fourth Annual Graduate Student Forum



Dr. Patricia Pietrantonio
Assistant Professor
and Chair,
Graduate Student Forum

Reflections from the chair…..DIVERSIFY!!!

During my undergraduate years (1976-1982) at the University of Buenos Aires, School of Agronomy, I learned one of the most valuable lessons at the expense of many lost lives. That was the darkest period of military regime in Argentina's history. Under the "Junta" government, I obtained a fine education in agricultural science and graduated as "Ingeniera Agrónoma", one of the top students of my class. Little I did I know... Isolated by Atlantic Ocean, the Andes, the southern latitude and the fact that ALL means of communication (TV, radio, newspapers) were controlled by the government, there was only one way to think...If you dared otherwise you could end up dead – literally "desaparecido" (disappeared). In retrospect, the scariest thing is that I could not have thought otherwise. How could have I? Books and movies were also censored. Remember, our generation is "pre-internet". Those older and more intelligent, many of them academicians/professors, well rounded and privileged by having "*different*," independent thoughts were often labeled "suversivos" (subversives, opposed to the regime, renegades of society). We, the people (how incredibly naive!!!), even posted signs given by the government indicating "*Argentines: we are right and human,*" as a joke to discredit the foreign and "*infiltrated*" reports about human right abuses in our country. We were good people, how those horrifying histories could ever be true??? One way, one mind, one ideology...

Now, as I find myself living a foreign culture and language, married to an American, listening to my own and other accents, seeing infinite skin colors and national origins in this country, I feel safe. Diversity is not just a politically correct term. Diversity prevents us from blindness, single-mindedness that leads to a dangerous environment. Diversity brings resourcefulness and a variety of survival tools and ideas. Ultimately, from the political perspective, provides without a doubt the safest way of living for a nation, a state, a city, and especially a University, where the most challenging, controversial new ideas must originate for the rest of society.

In any field of science or other human activity, without diversity there is death, economic bankruptcy, and inbreeding leading to loss of vigor. As our Department was honored with the Diversity Award for the varied composition in gender, national and ethnic origin of faculty, students and staff, we should breathe confidently: this will ensure a long academic life to our Department.

On a personal level, diversifying is also fun. If you find yourself bored, wondering what you could do: DIVERSIFY. Go to a new restaurant, eat ethnic foods, travel, learn a foreign language, rent a foreign movie, drive a new route, dance a rhythm you never dared before...By the way, neurobiologists have found that these activities ("neurobics") keep the brain alive longer and your dendrites growing... (oops, I'm getting side-tracked). As a graduate student, be aware, give yourself the best chance of your life...Diversify!

Epilogue: The military regime collapsed in '82 and most of the surviving leading members are in prison; the economy was destroyed. I diversified moving to America.

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Dr. Ray Frisbie
Professor and Head

The Graduate Student Forum is another superb example of a cooperative initiative between graduate students and faculty. The Forum, a brain-child of Dr. Patricia Pietrantonio, offers students the opportunity to share their graduate research plans and results with students and faculty. "All" students are strongly encouraged to participate.

This activity offers multiple advantages. First, students should take every available chance to get up on their feet and "speak." Honing presentation skills, perhaps more than any other skill, will reap the greatest rewards. From scientific presentations, to teaching, to job interviews, to communicating with colleagues, good speakers succeed. Secondly, graduate students communicate their work across our large department. In addition to sharing information, valuable feedback from the faculty and fellow students is provided. The amount of preparatory work that goes into the Forum presentations is self-evident. The hard work pays off in the quality of presentations.

Lastly, the Forum serves as a staging ground for the Entomological Society of America (ESA) and other paper competitions. Our outstanding record of success at the ESA branch and national competitions is in no small way attributed to the Forum. This is a wonderful, scholarly event in which students and faculty should be justifiably proud. This year's Forum promises to be of the highest quality as we continue to strive for excellence in our graduate program.

Dr. Jim Woolley
Professor and
Assistant Department Head for
Graduate Studies

The graduate program in Entomology at Texas A&M University offers the M.S. and Ph.D. degrees in Entomology and Master of Agriculture degrees in Economic Entomology and Plant Protection. We enjoy one of the world's largest graduate programs in Entomology, and by any measure it is one of the world's most prestigious.

Texas A&M faculty and students led the way in the development of the Integrated Pest Management approach to controlling arthropod pests, which has become the dominant paradigm for applied entomology worldwide. In the last twenty years the biological control program in the department has emerged as a world leader, as have the research programs in insect systematics, physiology, genetics, molecular biology and toxicology.

The Biological Control Laboratory, the Insect Collection, the Center for Advanced Invertebrate Molecular Sciences, the Knowledge Engineering Laboratory and many other programs in the department offer outstanding opportunities for research and training to our graduate students. In addition, many of our students work with research and extension faculty at numerous agricultural production areas throughout Texas. Currently, our graduate students number about 55-60, evenly divided between M.S. and Ph.D. programs. At any one time, about a quarter of our graduate students are international, representing numerous countries throughout the world, with emphasis on Africa, China, India and Latin America.

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Keynote Speaker

Dr. Charles J. Scifres

Associate Vice Chancellor and Associate Dean,
Agriculture and Life Sciences and
Deputy Director, Texas Agricultural Experiment Station
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Dr. Charles J. Scifres attended Oklahoma State University where he received a B.S. degree in 1963 and a M.S. degree in 1965. He received the PhD. from the University of Nebraska in 1969.

Dr. Scifres joined the Texas Agricultural Research and Extension Center at Lubbock in 1968 as an Assistant Professor. He moved to the department of Range Science at Texas A&M University in 1969, where he was promoted to Professor in 1976. In 1982, Dr. Scifres became the first Thomas M. O'Connor Professor of Range Science. He left Texas A&M in 1987 to become Professor and Head of the Department of Agronomy at Oklahoma State University. In October of 1990, he was appointed Associate Director of the Oklahoma Agricultural Experiment Station. In 1994, Dr. Scifres became the Dean of the Dale Bumpers College of Agricultural, Food and Life Sciences at the University of Arkansas Fayetteville and Associate Vice President for Agriculture Research in the Division of Agriculture at the University of Arkansas System. He held faculty appointments in Agronomy and Animal Science. Dr. Scifres returned to Texas A&M University as Associate Vice Chancellor and Associate Dean of the College of Agriculture and Life Sciences and Deputy Director of the Texas Agricultural Experiment Station in January, 2001. He is also professor in the department of Rangeland Ecology and Management.

Dr. Scifres has received numerous awards and honors including a Faculty Distinguished Achievement Award for Research from the Association of Former Students at Texas A&M University; the first recipient of the Thomas M. O'Connor Endowed Professorship in Range Science from Texas A&M University; a Distinguished Performance Award in Team Research from the Texas A&M University Deputy Chancellor of Agriculture; an Outstanding Achievement Award from the Society of Range Management; an Outstanding Contribution to Range Management recognition from the Texas Section of the Society for Range Management; elected Fellow of the Weed Science Society of America; and was cited for distinguished service by the Oklahoma House of Representatives.

Charles and his wife, Julia, have two children (1 son and 1 daughter) and four grandchildren.

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Jason L. Mottern
Major Professor: Dr. Kevin Heinz
M.S. Candidate

Evaluating Biological Control of Fire Ants Using Phorid Flies: Effects on Competitive Interactions

Despite intensive attempts at pesticide-based eradication, the red imported fire ant, *Solenopsis invicta* Buren, continues to infest almost the entire southeastern United States. Consequently, researchers have begun to explore other options for control of this pest, including biological control. Phorid flies in the genus *Pseudacteon* are among the most promising biological control agents for use against *S. invicta*. *Pseudacteon tricuspis* Borgmeier is the only phorid fly currently available and approved for release. Consequently, *P. tricuspis* was the phorid used in this study. Though phorids parasitize only a small percentage of fire ant workers in a colony (~1-2%), they are thought to decrease the fitness of a colony by disrupting foraging behavior. This idea presumes that the presence of phorids results in a decrease in the foraging rate and hence the reproductive rate of *S. invicta*. Furthermore, attack by phorids on *S. invicta* may allow native ants to gather resources that would otherwise have been collected by *S. invicta*. This may shift the competitive balance in favor of native ants. We directly tested this idea by allowing colonies of *S. invicta* to compete for a protein resource with colonies of *Forelius pruinosus* (Roger), a native ant species. Experimental units consisted of competition arenas that included two levels of phorid pressure and phorid-free controls. The experiment was replicated under conditions of high and low protein availability. The ability of phorids to mediate competition between the two ant species was determined by quantifying the reproductive rates and foraging rates of all ant colonies.

Marc L. Fisher
Major Professor: Dr. Roger Gold
M.S. Candidate

Outbreeding via Secondary Reproductives in the Termites *Reticulitermes flavipes* (Kollar) (Isoptera: Rhinotermitidae)

Termites are one of the most serious wood-destroying pests in the United States, causing millions of dollars in damage each year. The cryptic nature of subterranean termites has posed a serious problem for researchers desiring to study their biology and ecology. This research is imperative in order to further develop effective control methods. Some of the more innovative techniques for gathering data on termites have come in the form of molecular tools, including the use of allozymes and mitochondrial DNA. In this study, intercolony and intracolony relatedness in the Eastern subterranean termite will be estimated using microsatellite and TE-AFLP molecular markers. From this data, measurements of intercolony gene flow via secondary reproductives will be evaluated. The hypothesis to be tested is that average relatedness is high among individuals within colonies and similar to the founding reproductives. Between colonies, average relatedness may vary as a result of differing colony founding styles; whether via alate flight dispersal mechanisms or via subterranean budding phenomena. Data gathered from these studies might reveal the possibility of intercolony gene exchange by way of secondary reproductives. If this hypothesis is supported, theories surrounding termite colony structure, reproductive dynamics, and gene flow must be revisited.

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

Toward Increasing Transgene Expression in *Aedes aegypti*: Promoter/Enhancer Studies in Cell Culture

Aedes aegypti is a key vector of both the Yellow Fever and Dengue Fever viruses throughout many parts of the world. Low transgene expression levels are problematic to efforts to create transgenic laboratory strains refractory to these viruses. This study explores the use of heterologous promoters and transcriptional enhancers to increase the expression of a quantifiable transgene product. Four promoters: Actin5C, alphatubulin, polyubiquitin (*Drosophila melanogaster*), and IE1 (*Autographa californica* MNPV) were cloned into a firefly luciferase reporter gene plasmid in combination with each of three enhancers: SV40 (Simian virus), Hr3 (*Bombyx mori* NPV), and *Copia* ULR (*Drosophila* transposable element). In addition, the Intermediate Early (IE1) gene product, which binds specifically to repeat elements within the Hr3 enhancer, was used as a transactivator to further increase transcription levels. *Aedes albopictus* cells were transfected in culture with both the firefly luciferase reporter construct and an internal transfection control expressing *Renilla* luciferase. Expression levels of both luciferase constructs were measured by a dual luciferase luminometer assay and a ratio of firefly to *Renilla* luciferase expression reported. Results consistently indicated that the transactivating protein bound not only to the Hr3 region, but also to the promoters in the absence of this enhancer. The results indicate that a polyubiquitin/Hr3 + transactivator combination gave the highest level of expression followed by the Actin5C/Hr3 + transactivator and the IE1/Hr3 + transactivator combinations.

Steven P. Holmes
Major Professor: Dr. Patricia Pietrantonio
Ph.D. Candidate

Functional Characterization of a Tick Receptor for Leucokinin Peptide Agonists by Expression in a CHO-K1 Cell Line

Leucokinins are invertebrate neuropeptides that exhibit myotropic and diuretic activity. Previously I cloned a cDNA from the Southern cattle tick, *Boophilus microplus*, encoding the first leucokinin-like peptide receptor known from an arthropod. An expression construct for this receptor was transfected into CHO-K1 cells, and a stably expressing cell line was selected. Functional assays of receptor-mediated increases in intracellular calcium were conducted against several leucokinin agonists. Calcium levels were determined by laser cytometry and fluorescence imaging. All leucokinin agonists tested produced dose-dependent responses in transfected cells with varying potencies.

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Alejandro Calixto
Major Professor: Dr. Marvin Harris and Dr. Allen Knutson
M.S. Candidate

Role of Fire Ants in Pecan: Interactions with Pecan Aphids, Predatory Insects and Spiders

It was recently shown that the red imported fire ant (IFA), *Solenopsis invicta*, preys on natural enemies in pecan, suggesting the ant allows an increase in pest densities. Fire ants protecting aphids for honeydew production has been also suggested to occur. These basic ideas will be addressed to consider the role of IFA on the phenologies of aphids and predators. Plots treated for reduced IFA were compared to untreated plots. The questions to be addressed are the following. Are fire ants reducing key predators and resulting in an aphid increase? Or are IFA preying on aphids, and also preying on predators? Preliminary results indicate no significant reduction of aphids and predators, densities remain the same across all treatments. Other insects were observed to significantly increase after IFA reductions, such as certain native ant species, carabids, earwigs, tiger beetles and others.

Roberto L. Gorena
Major Professor: Dr. George Teetes
Ph.D. Candidate

Phenotypic Plasticity in Virulence and Fitness of Greenbug Biotypes Grown on Sorghum

Greenbug has exhibited biotype development since the early 1960's when biotypes A and B were identified. Biotypes are designated by their ability to damage resistant crop varieties. To date, 11 biotypes have been identified, four which are important on sorghum. The mechanisms underlying biotype development are unclear and the question remains why some biotypes are virulent while others are not. Variability in characteristics such as virulence and fitness within greenbug clones could be important in biotype development. We examined the virulence and fitness of colonies of six greenbug biotypes grown on four sorghum genotypes. Seedlings were infested with approximately 30 greenbugs and grown in environmental chambers. Colonies were counted at 3 day intervals until Tx7000 was rating at a 7 or higher on a 9 point damage scale. All plants were then rated. Tx7000 incurred high levels of damage from all six biotypes, however biotype A caused significantly less damage than the other biotypes ($p < 0.05$) and had large variability in damage rating (range 4 – 9). Mean colony size 10 days post infestation for biotype A on Tx7000 did not differ significantly from the other genotypes ($p > 0.05$), due to large variability within biotype A. There was a significant biotype-genotype interaction ($p = 0.003$) in virulence for all biotypes on the other genotypes. Plasticity for fitness and virulence measures was complex for the remaining greenbug biotypes and will be discussed. Large variability within biotype clones is likely important in biotype development, with resistant plants providing the selection pressure necessary for biotype development.

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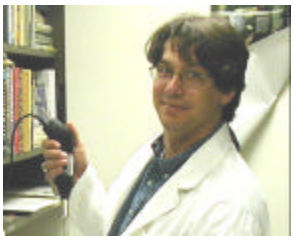

Paul D. Barron
Major Professor: Dr. Craig Coates
Ph.D. Candidate

cDNA Library Construction From the Lone Star Tick, *Amblyomma americanum*

Amblyomma americanum is known to vector pathogens that are implicated as causative agents of human diseases. The physiology and molecular biology of the tick relative to its hemophagic diet and vector/parasite interactions are poorly understood. It is hypothesized that pathogens must attain a threshold density within the tick midgut to initiate an infection so that they may become intracellularly or transcellularly located through some hypothetical molecular adherence and /or invasion mechanisms. Very little is known about the physiology and molecular biology of the tick midgut. Studying tissue-specific and blood meal activated gene expression in *A. americanum* will provide the basic research necessary to compare and contrast gene expression in uninfected ticks and those ticks harboring a pathogen. The primary goal of this study is to characterize the differential expression of genes among various life stages, feeding processes, and tissues of the lone star tick, *A. americanum*. A necessary prerequisite to such a study is the creation of cDNA libraries. Isolation of total RNA from ticks is the first step in this process. This is followed by cDNA synthesis, selection for full-length transcripts, PCR amplification and cloning. Analysis of these mRNA derived inserts proceeds through PCR screening to determine insert size, followed by DNA sequencing and analysis.

Cheryl A. Peterson
Major Professor: Dr. Larry Keeley
Ph.D. Candidate

The *in vitro* Synthesis of Vitellogenin in *Solenopsis invicta*

Since its introduction in the mid 1930's, the Red imported fire ant, *Solenopsis invicta,* has become a widespread urban, agricultural, and medical pest within the southern portion of the United States. In many insects, juvenile hormone stimulates the synthesis of a yolk precursor protein, vitellogenin, in the fat body and regulates the uptake of vitellogenin into developing oocytes. The ultimate fate of vitellogenin is to provision the egg with a source of amino acids, which is used by the developing embryo. It is suspected that juvenile hormone stimulates the synthesis of vitellogenin because topical application of juvenile hormone causes dealation and the onset of ovarian maturation in virgin queens. However, vitellogenin synthesis in the *S. invicta* fat body *in vitro* has not been previously researched. We have developed a method for isolating and incubating fat bodies *in vitro*. Vitellogenin synthesis is also age-dependent and work is being performed to determine the ages of female alates when vitellogenin is synthesized *in vitro*. Methoprene, a juvenile hormone analog, will be applied to the fat bodies of ants that fall into an age range where vitellogenin is not synthesized. If juvenile hormone stimulates vitellogenin synthesis in *S. invicta,* the presence of vitellogenin will be observed.

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Matt J. Yoder
Major Professor: Dr. John Oswald
M.S. Candidate

New Characters of Use in *Diapriid* (Hymenoptera: Diapriidae) Species Taxonomy

There are trends towards reduction or loss of morphological characters in many smaller (<2mm) species of parasitic Hymenoptera. The paucity of character states reflected by these trends is obviously problematic with respect to morphologically based species taxonomy, which is dependant on unique characters or combinations of characters to provide species diagnoses and hypotheses of phylogenetic relationships. When few useful/informative characters are available to distinguish taxa within a group, it may be necessary to carefully scrutinize previously unexplored character systems for their relative taxonomic value. Species of the genus *Entomacis* Foerster (Diapriidae: Diapriinae: Spilomicrini), relative to other members of the tribe, exhibit trends in morphological character reduction and loss. With regards to diapriid taxonomy in general the potential use of setal and sensillar characters has been under-explored. The perceived and potential use of setal and sensillar characters in *Entomacis* species taxonomy will be reviewed.

Ronald D. Weeks, Jr.
Major Professor: Dr. Brad Vinson and Dr. Ted Wilson
Ph.D. Candidate

Foraging Patterns of Polygyne Red Imported Fire Ants, *Solenopsis invicta* (Buren), From Several Nearest Neighbor Colonies

The objective of this study was to quantify the foraging patterns of polygynous red imported fire ants. Ants in several nearest neighbor colonies were mass-marked a unique color and sampled at oil-baits in a 10 x 10 m grid (61 baits). Univariate statistics were used to describe the mean, standard deviation, and skewness of marked ant captures for each colony. Distributions of marked ants were plotted as a function of distance from a colony. Spatial statistics were used to examine the spatial correlation of ant foraging from individual colonies (i.e. variograms). Inverse distance weighted measures were used to interpolate data values in unsampled locations. Contour plots of foraging areas were constructed for each colony. Univariate statistics showed that the distribution of marked ants captured was highly skewed. A graph of the number of marked ants captured by distance showed that most marked ants were collected within approximately 4 meters from a colony. Examination of each colonies experimental variogram plots indicates the range of sills in ant foraging was between 3.28 - 11.46 meters, (n = 7, mean = 6.45, mode = 4.67). Interpolation of foraging areas showed relatively distinct foraging areas for each colony. Results suggest that polygyne fire ant colonies have relatively localized foraging areas that may overlap with neighboring colonies, yet ants from different colonies do not significantly overlap on individual food sources. These results have implications for food flow studies, toxic bait delivery systems and biological control programs.

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Mei-Er Chen
Major Professor: Dr. Larry Keeley and Dr. Patricia Pietrantonio
Ph.D. Candidate

Sequence Analysis of a Vitellogenin Receptor cDNA from the Fire Ant, *Solenopsis invicta*

Vitellogenin (Vg) is a general name for a yolk protein precursor that is synthesized extraovarially and internalized via receptor-mediated endocytosis by oocytes. Genes encoding Vg receptors (VgR) for oocyte Vg endocytosis have had their sequence determined in two insect species, the mosquito, *Aedes aegypti* and the fruit fly, *Drosophila melanogaster*. Both the VgRs belong to the low-density lipoprotein receptor (LDLR) family. Sequence information from the mosquito and fruit fly VgRs was used to design degenerate primers for amplification of the VgR cDNA from reproductive female fire ant ovaries using reverse transcriptase-polymerase chain reaction (RT-PCR). The DNA sequence of the *S. invicta* PCR fragment was compared with other sequences available in the genetic database through a NCBI BLAST search to identify any VgR or LDLR cDNAs. The BLAST search result suggested that the *S. invicta* PCR fragment was most similar to the mosquito and fruit fly VgR. The full DNA sequence of the *S. invicta* putative VgR cDNA will be completed by 5' and 3' RACE (rapid amplification of cDNA ends). The complete cDNA sequence will be aligned with other vertebrate and invertebrate LDLR sequences to assess the degree of similarity and regions of homology. Further studies will determine the size and tissue specificity of *S. invicta* VgR transcript by northern blot analysis, and the cellular distribution by *in situ* hybridization.




Rodrigo Diaz
Major Professor: Dr. Julio Bernal and Dr. Allen Knutson
M.S. Candidate

Evaluations of the Impact of Red Imported Fire Ant, *Solenopsis invicta* Buren on Cotton Aphid and Noctuids in Cotton Fields

Exotic invasive species are frequently introduced in United States and several millions of dollars are invested yearly in eradication and control efforts. However, invasive species can also benefit agriculture. My research seeks to determine whether Red imported fire ants (RIFA) are important predators of lepidopteran pests of cotton and whether they lead to greater cotton aphid population densities. Populations of pests were recorded in plots with ants either present or absent. Cotton aphid populations were higher over time in the plots with ants apparently due to tending by ants. In experiments with bollworm eggs, significantly more eggs were absent after 24 hours on the plant, in plots with RIFA. Field observations confirm that RIFA are important predators of bollworm and beet armyworm eggs. Moreover, these observations suggest that while most predators feed *in situ*, RIFA remove eggs from the plant. In general, fire ants appear to promote cotton aphid population early in the season and actively predate bollworm and beet armyworm eggs in late season.

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Ahmed Mohammed
Major Professor: Dr. Craig Coates
Ph.D. Candidate

Towards Germ Line Transformation of the Potato Tuber Moth, *Phthorimaea operculella* (Zeller)

The potato is the fifth most important crop in the world. Potato production in tropical and subtropical countries suffers from damage caused by the potato tuber moth, *Phthorimaea operculella* (PTM). Development of a germ line transformation system for the potato tuber moth will improve understanding of the basic biology of this insect and may reveal molecular targets for the development of new control strategies. To establish a robust system for PTM transformation, we tested three components that are critical to genetic transformation systems for insects; promoter activity, marker gene expression, and transposable element function. We compared the transcriptional activities of 5 different promoters, hsp70, hsp82, actin5C, polyubiquitin and IE1, within PTM embryos. The IE1 promoter flanked with the enhancer element, hr5, showed a very high level of transcriptional activity compared with all other tested promoters. The hr5-IE1 promoter was used to drive the expression of the enhanced green fluorescent protein (EGFP) as a marker gene. A high proportion of the embryos injected with the hr5-IE1/EGFP plasmid fluoresced under UV-illumination. The transpositional activities of the *Hermes*, *mariner* and *piggyBac* transposable elements were tested in inter-plasmid transposition assays. The observation of *piggyBac* transposition events enabled a transformation experiment to be designed using a *piggyBac*-hr5-IE1-EGFP vector.

Marcia K. Trostle
Major Professor: Dr. Robert Wharton
Ph.D. Candidate

Do African Parasitoids Attack Asian Tephritids?

The ability of two African braconid (Hymenoptera) parasitoid species to physiologically overcome the host's immune system in tephritids (Diptera) endemic to Africa or Asia was examined. No correlation was observed between the geographic origin and the parasitoid's ability to avoid encapsulation and melanization of eggs oviposited into the host.

Texas A&M University Department of Entomology
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4th Annual Graduate Student Forum Committee Members

Dr. Patricia Pietrantonio, Chair

Dr. Julio Bernal	Dr. Craig Coates	Dr. Jim Olson
Dr. Jim Woolley	Jason Mottren	Marcia Trostle

Chair Assistant: Teresa Gold

Graduate Student Forum Award Recipients

2000	1999	1998
1-Jarrad Prasifka	1-Carlos Bogran	1-Carlos Bogran
2-Robert Kula	2-Jarrad Prasifka	2-Richard Houseman
3-Ahmed Mohammed	3-Karol Burns	3-Jim Martin
4-Ronald Weeks	4-Steve Holmes	4-Steve Holmes
5-F. Mariana Tenorio	5-Andrea Jensen	5-Henrique Serra
6-Jason Mottern	6-Matt Buffington	6-Ron Vogtsberger
7-James Martin	7-Ronald Weeks	7-Cordelia Rasa

Evaluators

Dr. Anthony Cognato
Assistant Professor
Department of Entomology

Dr. Marvin Harris
Professor
Department of Entomology

Dr. James R. Wild
Professor
Department of Biochemistry
and Biophysics

Dr. Kirk O. Winemiller
Associate Professor
Department of Wildlife and
Fisheries Sciences

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