ENTOMOLOGICAL SOCIETY OF AMERICA
EASTERN BRANCH

ENTOMOLOGY:
CONTINUING A HERITAGE OF DISCOVERY

77th ANNUAL MEETING

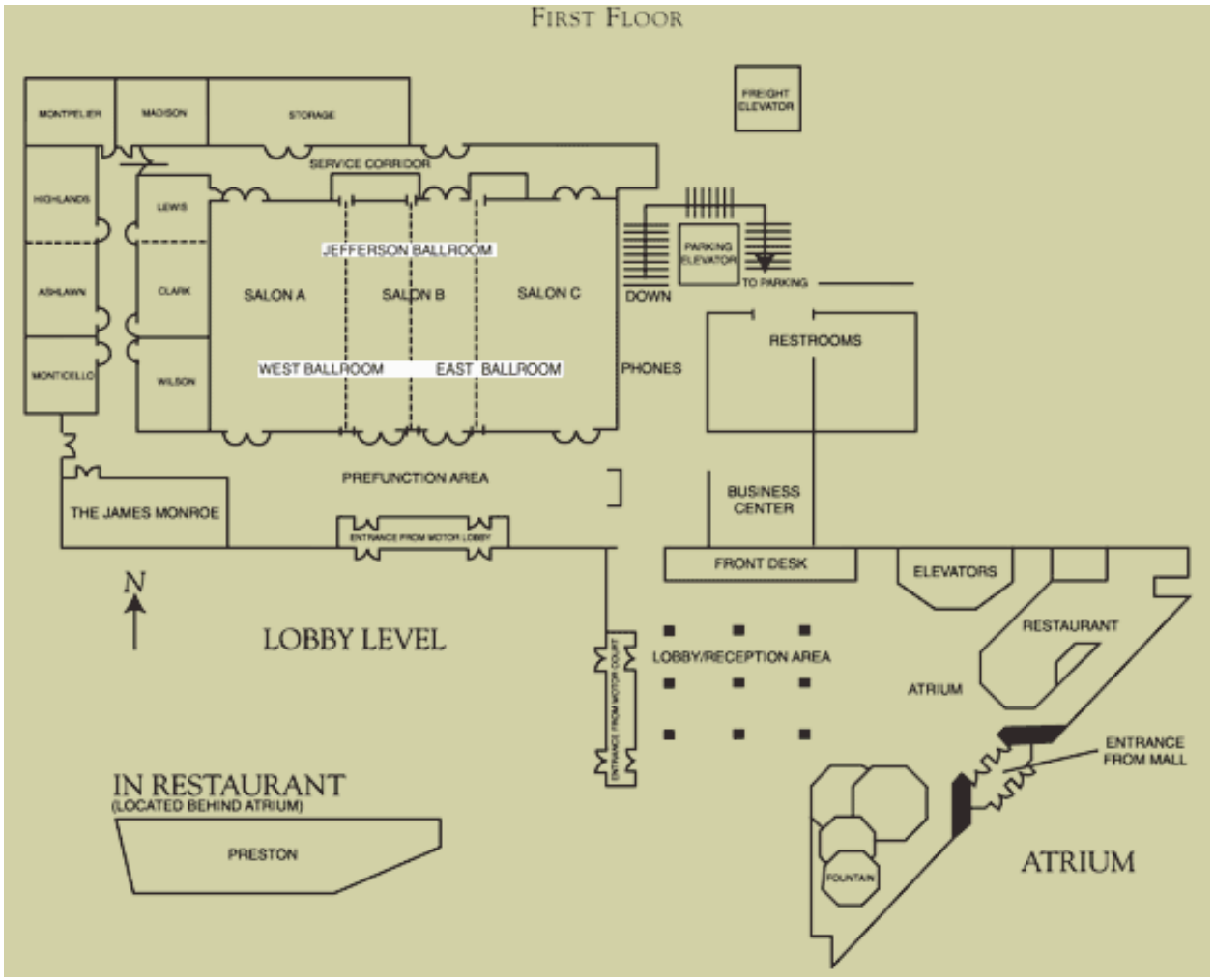
March 12-14, 2006

Charlottesville Omni Hotel
Charlottesville, Virginia

The Program Encapsulated

	SUNDAY		
Afternoon	Registration	1:00-5:00	Prefunction Area=PFA
	Local Arrangements	12:00-6:00	Monticello
	Executive Committee Meeting	2:00-5:00	Montpelier
	It's a Bug's World – Outreach	1:00-5:00	Atrium/PFA
	Posters and Displays	1:00-5:00	Salon C/PFA
	Student Oral Presentation Competition	1:30-5:06	Salon B
Evening	Reception and President's Welcome	6:00-7:30	Salon BC
	IDEP Workshop	7:30-9:00	James Monroe
	Student Networking Social	7:30-9:00	AshlawnHighlands
	Strategic Planning Meeting	7:30-9:00	LewisClark
	MONDAY		
Morning	Registration	8:00-5:00	PFA
	Local Arrangements	8:00-9:00 pm	Monticello
	Posters and Displays	8:00-5:00	Salon C/PFA
	Biological Control Symposium	8:15-12:00	Salon B
	IDEP Symposium	8:00-12:00	AshlawnHighlands
	NE Regional Field Crops Conference	8:00-11:30	LewisClark
	Industry Symposium	8:00-12:00	James Monroe
Afternoon	Student Symposium	1:00-4:35	James Monroe
	Ornamentals Symposium	1:00-5:00	Salon B
	Forensic Entomology Symposium	1:00-4:00	AshlawnHighlands
	Aquatic Entomology Symposium	1:00-5:00	LewisClark
Evening	Social and cash bar	5:30-6:00	PFA
	Banquet and awards	6:00-8:30	Westballroom
	Linnaean Games	9:00	AshlawnHighlands
	TUESDAY		
Morning	Registration	8:00-10:00	PFA
	Local Arrangements	8:00-12:00	Monticello
	Eastern Branch Business Meeting	7:00-7:45	Preston
	Posters and Displays	8:00-12:00	Salon C/PFA
	Insect Pathology Symposium	9:00-11:00	James Monroe
	Small Fruit Entomology Conference	8:00-11:00	LewisClark
	Informal Conference: Wireworms	8:00-11:45	AshlawnHighlands
	Submitted Papers	8:00-12:00	Salon B
	Adjourn	12:00	

Charlottesville Omni Hotel



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2006 Eastern Branch ESA Award Winners

ESA Entomological Foundation Award, Excellence in Integrated Pest Management

Michael Hoffmann

DR. MIKE HOFFMANN IS A PROFESSOR IN THE DEPARTMENT OF ENTOMOLOGY AT CORNELL UNIVERSITY. HE JOINED THE DEPARTMENT IN 1990. HIS RESEARCH AND EXTENSION PROGRAM IN VEGETABLES ENCOMPASSES MANY IPM TACTICS SUCH AS HOST PLANT RESISTANCE, BIOLOGICAL, CULTURAL AND MECHANICAL CONTROL, AND SAMPLING PROTOCOLS AND ECONOMIC THRESHOLDS. HIS PARTICULAR INTEREST IS IN BIOLOGICAL CONTROL AND HE HAS WORKED EXTENSIVELY WITH THE EGG PARASITOID, *TRICHOGRAMMA OSTRINIAE*, WHICH IS EFFECTIVE FOR CONTROL OF THE EUROPEAN CORN BORER IN SWEET CORN AND PEPPERS. HE IS ALSO INTERESTED IN NOVEL APPROACHES TO MANAGING PESTS SUCH AS THE NON-WOVEN FIBER BARRIER TACTIC HE HAS DEVELOPED THAT SHOWS PROMISE AGAINST INVERTEBRATE AND VERTEBRATE PESTS. HIS PUBLICATION *NATURAL ENEMIES OF VEGETABLE INSECT PESTS* IS USED ACROSS THE U.S. AS A REFERENCE FOR INFORMATION ON NATURAL ENEMIES AND BIOLOGICAL CONTROL.

From 1999 to 2005 Mike was Director NY State Integrated Pest Management Program. The 25 IPM staff help address pest problems in agricultural and non-agricultural settings across New York. In 2005, Mike became the Director of the Cornell University Agricultural Experiment Station and Associate Dean, College of Agriculture and Life Sciences at Cornell University.

ESA Distinguished Achievement Award in Regulatory Entomology

Jim Stimmel

Jim Stimmel has spent his entire 34-year career involved with insect survey and detection programs in the Bureau of Plant Industry, Pennsylvania Department of Agriculture. A native central Pennsylvanian and graduate of the University of Pittsburgh, he has seen first hand the rapid and significant changes in the insect fauna of the state. He learned insect survey from former PDA Entomologist and ESA EB member Al Wheeler, with whom he worked for nearly 25 years. The increased risk of exotic pest introduction brought on by rapidly expanding global trade, as well as the actual introductions of many important pests, has led to Jim's duties evolving exclusively to exotic pest survey. He has formed and chaired multi-agency state action committees on Asian longhorned beetle and emerald ash borer, and is currently involved with developing a cooperative survey plan for the wood wasp *Sirex noctilio*. Jim has been a regional authority on scale insects since participating in the First Coccidology Training Session at the University of Maryland in 1974. He recently was named Entomology Program Manager at the PA Dept. of Agriculture.

L.O. Howard Distinguished Achievement Award

Karl Maramorosch

Professor Karl Maramorosch has served the discipline of entomology with uninterrupted distinction across a span of seven decades. His hundreds of scholarly publications document the remarkable scientific journey of one of the giants and icons of entomology. He has gained true world renown in insect pathology, plant-insect vectors, insect cell culture, and virology. To have contributed to such a breadth of disciplines is notable but to have had substantial impact in each is extraordinary.

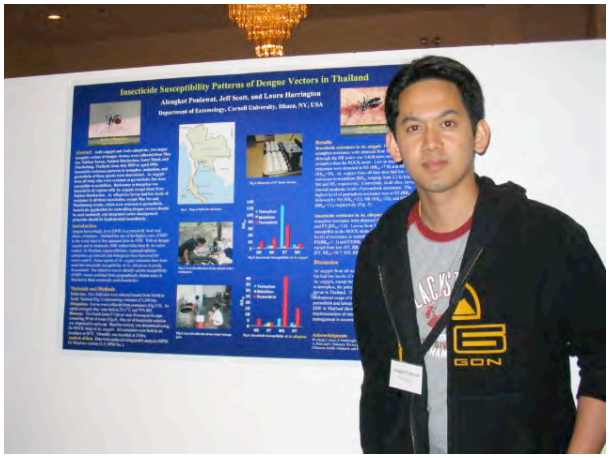
John Henry Comstock Award

Torsten Dikow

Torsten Dikow studied zoology, entomology, and botany at the University of Rostock, Rostock, Germany and the University of Natal, Pietermaritzburg, South Africa. He received his *Diploma in Biology* from the University of Rostock in January 2002. His thesis dealt with the taxonomic revision and phylogenetic analysis of the robber-fly genus *Euscelidia* (Diptera: Asilidae: Leptogastrinae). In August 2002, he started his dissertation at Cornell University and is currently working on the phylogeny, classification, and biodiversity of Asilidae with particular reference to the subfamily Leptogastrinae. Dikow is studying in the joint Cornell University-American Museum of Natural History programme in insect systematics and is currently, after finishing his course work in Ithaca and passing the exam of candidacy, working at the latter institution. Apart from the straight taxonomic and phylogenetic research Dikow is also interested in involving robber flies in quantitative biodiversity research by testing plant-based biodiversity hotspots and conducting species richness estimations based on high-quality specimen data from taxonomic revisions. He is also involved in two web-sites that feature two Diptera families, the Asilidae and Mydidae.

Asa Fitch Memorial Award

Alongkot Ponlawat



My name is Alongkot Ponlawat, currently a Ph.D. student in the Department of Entomology at Cornell University. I earned a bachelor's degree in biological science from Chulalongkorn University, with a major in medical entomology. I became interested in medical entomology and the role of insect-borne diseases and other public health problems, when I was an undergraduate student. In my home country, Thailand, vector-borne diseases are a serious problem infecting thousands of Thai people each year. As a result of my fervent interest in medical entomology, I decided to undertake "Transovarial Transmission of Chigger Mites (vectors of scrub typhus)" as my senior project.

After graduation I worked on malaria research at Armed Forces Research Institute of Medical Sciences, U.S. Army Medical Component for two years. Through my work experience, I have realized how vector-borne diseases can have a significant impact on public health. I also realized that I could not obtain the type of job I wanted in the field with out an advanced degree, so I decided to pursue a M.S. degree at Cornell University.

For my M.S. thesis at Cornell under the direction of Dr. Laura Harrington, I focused on the biology of *Aedes aegypti* and *Aedes albopictus*, the two most important vectors of dengue viruses in Thailand. The main aims of my research (which have resulted in two publications) were to: (1) compare and contrast geographic variability and host availability effects on the blood feeding patterns of *Ae. aegypti and Ae. albopictus*, and (2) determine the geographic patterns of insecticide susceptibility of these species in Thailand as it relates to dengue control.

In order to reach my career goals in becoming a medical entomologist and establishing my own laboratory and research program in a Thai university, I decided to directly pursue a PhD in medical entomology at Cornell. For my PhD I plan to investigate *Ae. aegypti* and *Anopheles* spp. mating biology and behavior as it relates to genetic control strategies.

SUNDAY MARCH 12, 2006

Afternoon

Registration	***Prefunction Area C = PFA/C***	**1:00-5:00**
Dean Polk, Rutgers University, Cream Ridge, NJ		
Local Arrangements	***Monticello***	**12:00-6:00**
Paul Semtner, Virginia Tech,		
Executive Committee Meeting	***Montpelier***	**2:00-5:00**

Public Outreach Program ***Atrium/PFA*** **1:00-5:00**

"It's a Bug's World"

Organizer: Faith Kuehn, Delaware Department of Agriculture, Dover, DE

This will be a fun and educational afternoon for Charlottesville area bug-loving children and some hesitant, some enthusiastic parents. The program is free to the public as well as to meeting registrants and their families. Displays will include Bees and Beekeeping, Butterfly Conservation, the Allwood Society of Virginia Tech, the Currie Murray Nature Center Insect Zoo of Baltimore City, MD, insect art and insect photos. Local authors will be present to sell and sign their books, including a series of honeybee books by Dewey Caron and "Aliens Among Us" by Susan Ellis.

***Bees and Beekeeping.** Dewey Caron, Univ. of Delaware, Coop. Extension
***W.B. Allwood Society of Virginia Tech**
***Hidden Wonders: Bugs in Your Back Yard.** Chris Wirth, Charlottesville Home School student
***Bugs in the System**. Susan Ellis,
Virginia Cooperative Extension. Peter Warren
***Carrie Murray Nature Center.** Baltimore City Parks & Rec, Lloyd Tydings
***Social Butterflies**. Linda Marchman

Sunday Afternoon

Student Competition Posters* ***Salon C/Prefunction Area*** **1:00-5:00**
[In person attendance at posters during reception, Sunday 6:15-7:30, Salon C/PFA]

Paul Weston, Cornell University, Ithaca, NY

***See appendix a for abstracts of talks for this session**

1. **Effects of root knot nematode and European corn borer herbivory on one another in corn.**
Siddharth Tiwari, Virginia Tech, Blacksburg, VA, Edwin E Lewis, University of California, Davis, CA and Roger R Youngman, Virginia Tech, Blacksburg, VA.

2. **Analysis of plum curculio strains using mitochondrial COI gene and wsp gene of Wolbachia in the eastern United States.**
Xing Zhang, Douglas G Pfeiffer, Virginia Tech, Blacksburg, VA and Shirley Luckhart, University of California, Davis, CA.

3. **Quantification of esterase based resistance in the tobacco-feeding form of the green peach aphid, *Myzus persicae* (Sulzer).**
Lakshmipathi Srigiriraju, Virginia Tech, Blacksburg, VA and Paul J Semtner, Southern Piedmont AREC, Virginia Tech, Blackstone, VA.

4. **Biology and Host Specificity of *Gonioctena tredecimmaculata* (Coleoptera: Chrysomelidae): A Potential Biological Control Agent for Kudzu.**
Matthew J. Frye, Judith A. Hough-Goldstein, and Clifford B. Keil, University of Delaware, Newark, DE.

5. **Temporal and spatial activity patterns among three exotic predators of hemlock woolly adelgid, *Adelges tsugae* (Hemiptera: Adelgidae).**
Robbie W Flowers, Scott M Salom, and Loke T Kok, Virginia Polytechnic, Blacksburg, VA.

6. **Lethal and sublethal effects of imidacloprid on *Laricobius nigrinus* (Coleoptera: Derodontidae) and *Sasajiscymnus tsugae* (Col: Coccinellidae), two predators of hemlock woolly adelgid (Hemiptera: Adelgidae).**
Brian Eisenback, Scott Salom, and Loke Kok, Virginia Tech, Blacksburg, VA.

7. **Release and Monitoring of *Laricobius nigrinus* (Coleoptera: Derodontidae) for Classical Biological Control of Hemlock Woolly Adelgid in the Eastern U.S.**
David L. Mausel, Scott M. Salom and Loke T. Kok, Virginia Tech, Blacksburg, VA.

8. **Pollination Biology of *Ailanthus altissima* (Mill.) Swingle (Tree-of-Heaven) and its relationship to tree health.**
Jessica S Thompson, Richard D Fell and Carlyle C Brewster, Virginia Tech, Blacksburg, VA.

Sunday Afternoon

Submitted Posters ***Salon C/PFA*** **1:00-5:00**

[In person attendance at posters during reception, Sunday 6:15-7:30, Salon C/PFA]

9. The Treehoppers (Hemiptera: Membracidae) of Delaware Water Gap National Recreation Area.
Matthew S Wallace, East Stroudsburg University, East Stroudsburg, PA.

10. Update on the Biology and Distribution of Pryeria sinica Moore (Lepidoptera: Zygaenidae) in Virginia and Maryland, a new pest of Euonymus.
Eric R. Day, Virginia Tech, Blacksburg, VA, Peter B. Schultz, Hampton Roads Agriculture Research and Education Center, Virginia Tech, Virginia Beach, VA, Richard Bean, Maryland Dept. of Agriculture, Annapolis, MD, and Adria Bordas, Virginia Coop. Exten., Fairfax, VA.

11. Aggression as an indicator of species differentiation between Reticulitermes virginicus (Banks) and R. flavipes (Kollar) in Delaware.
Greta Thorson and Susan W. King, University of Delaware, Newark, DE.

12. Peach root weevil, Myllocerus hilleri Faust (Coleoptera: Curculionidae), a new pest of tree fruit in the Northeast?
Mark W. Brown, Appalachcian Fruit Res. Sta., Kearneysville, WV, Clarissa R. Mathews, Shepherd Univ., Shepherdstown, WV, and Brent Short, Appalachian Fruit Res. Sta., Kearneysville, WV.

13. Performance of a reduced-risk IPM program for apples in West Virginia.
Henry W. Hogmire, West Virginia University, Kearneysville, WV.

14. Inverse density-dependence in hemlock woolly adelgid (Adelges tsugae) dispersal at low population density.
Scott D Costa, University of Vermont, Burlington, VT, Thomas W Baribault, Michigan State University, East Lansing, MI, and Phil LaBranche, Westfield State College, Westfield, MA.

15. Links between aquatic insect adult flight and larval assemblage structure in urban and rural headwater streams.
Robert F Smith and William O Lamp, University of Maryland, College Park, MD and Margaret A Palmer, Chesapeake Biological Laboratory, University of Maryland Center for Environmental Sciences, Solomons, MD.

16. The impact of plant origin on the production of insect biomass.
Marion E Zuefle, Douglas W Tallamy, and Vincent D'Amico, University of Delaware, Newark, DE.

Sunday Afternoon

17. Comparison of sampling methods to assess Varroa mite population level in Honey Bee Colonies.
Dewey M Caron, Elizabeth Burdick, and Kristin P Danek, University of Deleware, Newark, DE.

18. Post-copulatory mate guarding by males of Naiadacarus arboricola (Acari: Astigmata: Acaridae).
Jean C. Still and Norman J. Fashing, College of William and Mary, Williamsburg, VA.

19. The relative activity of selected compounds for control of Eastern subterranean and Formosan termites.
Suzanne Smith,Thomas E Anderson, and Charles A Staetz, FMC Corp., Princeton, NJ.

20. Toxicity of Voltage-Sensitive Chloride Channel (VSCC) Blockers Against Insects and Nematodes.
Dhana Raj Boina and Jeffrey R Bloomquist, Virginia Tech, Blacksburg, VA

Sunday Afternoon

Student Oral Presentation Competition* ***Salon B*** **1:30-5:06**

Organizer: Paul Weston, Cornell University, Ithaca, NY

***See appendix b for abstracts of talks for this session**

1:30 **Elevation of *Cicindela* (*Cylindera*) *lunalonga* Schaupp (Coleoptera: Adephaga: Cicindelidae) to Species Status Using Phylogenetic Reconstruction from Mitochondrial DNA Markers.**
M. R. Woodcock, 2405 Terry Drive, Richmond, VA, C. B. Knisley and James A. Foster, Randolph-Macon College, Ashland, VA.

1:42 **Phylogeography and population genetics of Cooley spruce gall adelgid, *Adelges cooleyi*: the genetic consequences of an insect introduction.**
Robert G. Ahern, Michael J. Raupp, and David J. Hawthorne, University of Maryland, College Park.

1:54 **Insect xylophages inhabiting red and pin oaks.**
Jianxin Zhang, James Lashomb, and Ann Gould, Rutgers Univ., New Brunswick, NJ.

2:06 **Effects of Plant Position and Entomopathogenic Nematode Application on Black Vine Weevil Larvae in a Nursery Setting.**
Ellery Vodraska, Department of Entomology, University of Maryland, College Park, MD, Rebeccah Waterworth, University of California, Riverside, Riverside, CA, and Paula Shrewsbury, University of Maryland, College Park, MD.

2:18 **The effect of predator and alternative prey density on cutworm survival, activity, and growth.**
Steven D. Frank, Paula M. Shrewsbury, and Ellery A. Vodraska, Department of Entomology, University of Maryland, College Park, MD.

2:30 **Biological Control of Mile-a-minute Weed (*Polygonum perfoliatum* L.).**
Ellen C. Lake and Judith A. Hough-Goldstein, University of Delaware, Newark, DE.

2:42 **Use of *Trichogramma ostriniae* in an integrated pest management system for European corn borer in bell pepper.**
Vonny M. Barlow, Anthony M., Bratsch, Virginia Tech University, Blacksburg VA and Thomas P. Kuhar, Virginia Tech University, Eastern Shore AREC, Painter VA.

2:54 **Measuring dispersal behavior of *Trichogramma ostriniae* (Hymenoptera: Trichogrammatidae) in potato fields.**
Anna V. Chapman, 314 Clay St. Apt 2, Blacksburg, VA and Thomas P. Kuhar, Virginia Tech University, Eastern Shore AREC, Painter, VA.

Sunday Afternoon

3:06 BREAK

3:30 **Evaluation of fall soil sampling for predicting spring infestation of secondary soil pests in corn.**
Timothy A. Jordan, Roger R. Youngman, and Curt A. Laub, Virginia Tech University, Blacksburg, VA and Thomas P. Kuhar, Virginia Tech University, Eastern Shore AREC, Painter, VA, and Siddharth Tiwari, Virginia Tech University, Blacksburg, VA.

3:42 **Exploration of European corn borer egg mass dispersion using GIS technology.**
Katie A. Ellis and Dennis D. Calvin, Pennsylvania State University, University Park, PA.

3:54 **Modeling Temperature Dependent Development of the Soybean Aphid.**
Wilma V. Aponte-Cordero, Dennis D. Calvin, and Michael C. Saunders, Pennsylvania State University, University Park, PA.

4:06 **Laboratory and Field Efficacy of Acetamiprid for Control of Asparagus Beetle in Virginia.**
Erin M. Hitchner, Virginia Tech University, Blacksburg, VA and Thomas P. Kuhar, Virginia Tech University, Eastern Shore Agricultural Research & Extension Center, Painter, VA.

4:18 **Manipulation of herbivore induced volatile emission in broad bean plants by the pea aphid, *Acyrthosiphon pisum*.**
Ezra G. Schwartzberg and James H. Tumlinson, Pennsylvania State University, University Park, PA.

4:30 **Characterization of cellulolytic enzymes from larvae of the Asian longhorned beetle (*Anoplophora glabripennis*).**
Scott Geib and Kelli Hoover, Pennsylvania State University, University Park, PA.

4:42 **Differences in hemocyte composition in gypsy moth (*Lymantria dispar*) and tobacco budworm (*Heliothis virescens*) larvae with regard to baculovirus susceptibility.**
James R. McNeil, Diana Cox-Foster, and Kelli Hoover, Pennsylvania State University, University Park, PA.

4:54 **Cytochrome P450 CYP6BB1 and CYP6P10 in the eastern salt marsh mosquito Ochlerotatus sollicitans (Diptera: Culicidae).** Shaoming Huang and Lena B. Brattsten, Rutgers University, New Brunswick, NJ.

Sunday Evening

Reception and President's Welcome ***Salon BC*** **6:00-7:30**

In person attendance at posters ***Salon C/PFA*** **6:15-7:30**

IDEP Workshop ***James Monroe*** **7:30-9:00**
"Exotic Pest Show and Tell"
Organizers: Jim Stimmel, PA Dept. of Agriculture and Eric Day, Virginia Tech

IDEP Committee Meeting ***James Monroe*** **9:00**

Student Networking Social ***AshlawnHighlands*** **7:30-9:00**
Peter Schultz, Eastern Branch President

Strategic Planning Meeting ***LewisClark*** **7:30-9:00**
"Your New ESA - Potential restructuring of our society"

Organizer: George Hamilton, Governing Board Representative

MONDAY MARCH 13, 2006

Morning

Registration	***Prefunction Area C***	**8:00-5:00**
Dean Polk, Rutgers University, Cream Ridge, NJ		
Local Arrangements	***Monticello***	**8:00-9:00 pm**
Paul Semtner, Virginia Tech, Blacksburg, VA		
Posters and Displays	***Salon C/PFA***	**8:00-5:00**

Biological Control ***Salon B*** **8:15-12:00**

"Biological Control Benchmarks*"

Organizer: Roger Fuester, USDA-ARS, Newark, DE

***See appendix c for abstracts of talks for this session**

8:15 **Introductory Remarks.** Roger Fuester, USDA-ARS Beneficial Insects Introduction Research, Newark, DE

8:20 **Cereal leaf beetle: Going, going, not really gone.** Kathleen A. Kidd. Plant Industry Division, NC Department of Agriculture and Consumer Services, Raleigh, NC.

8:45 **The alfalfa weevil, an often forgotten pest that resuscitated applied biological control in the Northeast.** William Day, USDA-ARS Beneficial Insects Introduction Research, Newark, DE

9:10 **Alfalfa Blotch Leafminer - Historical aspects and current trends.** John Plummer[1] and Robert Byers[2]. [1]Customs and Border Protection, Agriculture Division. Phila. PA, [2]Department of Entomology, Penn State University, State College, PA.

9:35 **Biological control of tarnished plant bug, past accomplishments and new directions.** Roger W. Fuester, William H. Day, and Kim Hoelmer, USDA-ARS Beneficial Insects Introduction Research, Newark, DE.

10:00 Break

10:20 **Gypchek: Development and optimization.** John D. Podgwaite[1] and Richard C. Reardon[2]. [1]USDA Forest Service, Northeastern Forest Experiment Station, Hamden, CT. [2]USDA Forest Service, Forest Health Technology Enterprise Team, Morgantown, WV.

Monday Morning

10:45 **Parasitoid polydnaviruses: unusual life strategies and potential for use in biological control.** D. Gundersen-Rindal, U.S. Dept. of Agriculture, Agricultural Research Service, Insect Biocontrol Laboratory, Beltsville, MD 20705.

11:10 **Can native plants enhance conservation bio-control?** Douglas Tallamy[1], Paula Shrewsbury[2], and Mike Raupp[2]. [1]Entomology and Wildlife Ecology, University of Delaware, Newark, DE; [2]Department of Entomology, University of Maryland. College Park, MD.

11:35 **Business**

11:55 **End of Session**

IDEP Symposium ***AshlawnHighlands*** **8:00-12:00**

"Status of Gypsy Moth in the US"

Organizers: Andy Roberts and Eric Day, Virginia Tech, Blacksburg, VA

8:00 **Welcome and introduction.** Andy Roberts, Virginia Tech, Blacksburg, VA

8:05 **Status of gypsy moth in the U.S. and the role of the Slow the Spread Program.** Donna Leonard, US Forest Service, Ashville, NC.

8:35 **Trials and tribulations of a computer-based decision algorithm in gypsy moth management.** Patrick Tobin, US Forest Service, Morgantown, WV.

9:00 ***Entomophaga maimaiga*** **and the gypsy moth: current issues.** Ann Hajek, Cornell University, Ithaca.

9:25 **Modeling gypsy moth risk; incorporating human influences.** Chris Lippet, Clark University, Worcester, MA.

9:50 **Break**

10:05 **The current status of gypsy moth treatment compounds with emphasis on mating disruption.** Ksenia Tcheslavskala, Virginia Tech, Blacksburg, VA.

Monday Morning

10:30 **County based co-op suppression programs in Virginia.** Troy Shaw, Fairfax County, VA.

10:55 **Eradication: The Tennessee Project 2001-2005.** John Ghent, US Forest Service, Asheville, NC.

11:20 **Everything you wanted to know about Asian Gypsy Moth but were afraid to ask.** Vic Mastro, USDA-APHIS, Otis, MA.

11:45 **Discussion.**

Field Crops Symposium ***LewisClark*** **8:00-11:30**

"Northeast Regional Field Crops Insect Conference"
Organizer: Ames Herbert, Virginia Tech, Suffolk, VA

8:00 **Introduction.**
Ames Herbert

8:10 **Trying to control the beet armyworm on crops in Virginia.** Thomas Kuhar, Virginia Tech, Painter, VA, Gale Drake, DuPont Crop Protection, Newark, DE

8:30 **2005 billbug outbreak in Virginia orchardgrass: a sporadic event or emerging threat?** Roger Youngman and Curt Laub, Virginia Tech, Blacksburg, VA

8:50 **Soybean aphid update for Virginia: survey, efficacy, and yield impact.** Ames Herbert and Sean Malone, Virginia Tech, Suffolk, VA

9:10 **Plant cage and field trials to evaluate efficacy of insecticides against green stink bug, *Acrosternum hilare* (Say), and *Euschistus* spp. in soybean.** Kathy Kamminga, Ames Herbert, and Sean Malone, Virginia Tech, Suffolk, VA; Thomas Kuhar, Virginia Tech, Painter, VA

9:30 **Efficacy of a new stacked corn expressing two Bt proteins.** Galen Dively and Terry Patton, University of Maryland, College Park, MD

9:50 **Poncho seed treatments on grain corn: two years with different results.** Terry Patton and Galen Dively, University of Maryland, College Park, MD

10:10 **Break**

Monday Morning

10:30 **Effect of European corn borer on corn whole-plant yield and forage quality.**
Siddharth Tiwari, Roger Youngman, Curt Laub, and Timothy Jordan, Virginia Tech, Blacksburg, VA

10:50 **Cultural and chemical practices for managing the tobacco feeding form of the green peach aphid (Hemiptera: Aphididae) on flue-cured and burley tobacco in Virginia.**
Paul Semtner, David Reed, and Lakshmipathi Srigiriraju, Virginia Tech, Blackstone, VA

11:10 **General discussion**

Industry Symposium ***James Monroe*** **8:00-12:00**

"New Tactics in Pest Management"
Organizers: Thomas Anderson, FMC Corporation, Princeton, NJ

8:00 **Introduction.** Thomas Anderson

8:00 **New Technology Insecticides and Acaricides in the Pipeline at IR-4.**
Kenneth S. Samoil, Keith W. Dorschner, and Michael P. Braverman. IR-4 Project, Rutgers University, North Brunswick, NJ.

8:30 **New Directions in Peach Arthropod Management.**
Peter Shearer and Atanas Atanassov, Rutgers University, Rutgers Agricultural Research & Extension Center, Bridgeton, NJ and Larry Hull, David Biddinger, and Greg Krawczyk, Penn State University, Biglerville, PA and Henry Hogmire, Jr., University of West Virginia, Kearneysville, WV.

9:00 **PREV-AM: A New Broad Spectrum Fungicide-Insecticide-Ovicide.**
Mark Russell, ORO AGRI, Inc. 990 Trophy Club Dr., Trophy Club, TX.

9:30 **Flonicamid: A New Concept in Plant Protection.**
Charles Staetz, FMC Corp. Research and Development Center, Princeton, NJ and Craig Heim, FMC Corp. Philadelphia, PA.

10:00 **Strategies for the Development of Pest Management Products in the Pest Control and Turf and Ornamentals Industry.**
Nate Royalty and Bruce Monke, Bayer CropScience, Research Triangle park, NC.

Monday Morning

10:30 **Applications of Green Chemistry to Discovery of Novel Pesticides.**
Britt Highland, AgraQuest, Inc., Davis, CA 95616.

11:00 **New Tactics and Enhancements for Baiting Termites with Hexaflumuron and Noviflumuron..**
Joe Eger, Dow AgroSciences, Tampa, FL, Matt Messenger, Michelle Smith, Paul Neese, Paul Borth, Dow AgroSciences, Indianapolis, IN.

11:30 **The Use of Equipment Augmented Termite Inspections for Field Evaluations of F4688 50WP.**
Allan D. Dufoe, Jim Ballard, Susan C. Jones, FMC Corp., Philadelphia, PA.

12:00 **Conclusion and Discussion.**
Thomas Anderson, moderator.

Monday Afternoon

Student Symposium ***James Monroe*** **1:00-4:35**

"Entomology Scholars: Stories of Discovery*"
Organizer: Wilma Aponte-Cordero, Pennsylvania State University, University Park, PA and Student Affairs Committee Representatives

***See appendix d for abstracts of talks for this session**

1 00 **Introduction**

1:05 **Over fifty years in entomology: what a life!** E. Alan Cameron, Professor Emeritus, Department of Entomology, Pennsylvania State University, University Park, PA

1:45 **Investigating northern hardwood insects: studies in insect ecology and forest management.** Douglas C. Allen, Professor Emeritus, Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY

2:25 **Break**

2:30 **Understanding host suitability and host tree resistance in the Asian longhorned beetle.** Scott Geib, Department of Entomology, Pennsylvania State University, University Park, PA

3:00 **Control of elongate hemlock scale on eastern hemlock: efficacy of insecticide applications and effects on natural enemies.** Robert G. Ahern and Michael J. Raupp, Department of Entomology, University of Maryland, College Park, MD

3:30 **Blood feeding patterns of *Aedes aegypti* and *Aedes albopictus* in Thailand**. Alongkot Ponlawat, Department of Entomology, Cornell University, Ithaca, NY

4:00 **Oriental fruit moth biology and the changing pest management paradigm in eastern tree fruits.** Clayton T. Myers, USDA-ARS Appalachian Fruit Research Station, Kearneysville, WV

Monday Afternoon

Ornamentals Entomology ***Salon B*** **1:00-5:00**

"New Pests, New Solutions"

Organizers: Paul Weston, Cornell University, Ithaca, NY and Daniel Gilrein, Cornell Cooperative Extension of Suffolk County, Riverhead, NY

1:00 **Introduction**

1:05 **Insects invading greenhouses: Some good news and some bad news.** John Sanderson, Cornell University, Ithaca, NY.

1:25 **The Pennsylvania piedmont: Diaspidid mecca?**
Jim Stimmel, Bureau of Plant Industry, Pennsylvania Dept. of Agric., Harrisburg, PA.

1:45 **Brown marmorated stink bug: nuisance or potential pest?** George Hamilton, Rutgers University, New Brunswick, NJ.

2:05 **Spread and economic losses of bacterial leaf scorch**. Jim Lashomb, Rutgers University, New Brunswick, NJ.

2:25 **Viburnum leaf beetle: Keeping up with a killer**. Paul Weston, Cornell Univiversity Ithaca, NY.

2:45 BREAK

3:00 **What's happening in biological control in outdoor ornamentals?** Paula Shrewsbury, University of Maryland, College Park, MD.

3:20 **Rust mite biology: What's new in sampling, monitoring, and seasonal biology?** Casey Sclar, Longwood Gardens, Kennett Square, PA.

3:40 **New insights into new and old exotic pests in Maryland: Euonymus leafnotcher and elongate hemlock scale**. Mike Raupp, University of Maryland, College Park, MD.

4:00 **New products for insect and mite management on ornamentals.** Dan Gilrein, Cornell Cooperative Extension of Suffolk County, Riverhead, NY.

4:20 **Critical needs for managing ornamental plant pests: What IR-4 is doing?** Cristi Palmer, IR-4 Project Ornamental Hort. Program Manager at Rutgers, New Brunswick, NJ.

4:40 **Discussion**

Monday Afternoon

Medical/Vector Entomology ***AshlawnHighlands*** **1:00-4:00**

"Forensic Entomology"
Organizer: Richard Fell, Virginia Tech, Blacksburg, VA

1 00 **Introduction.** Richard Fell

1:10 **CSI: Southwest Virginia (No, not really, just forensic toxicology!).** George S. Behonick, Ph.D., DABFT, Director, Forensic Toxicology, Department of Hospital Laboratories, U. Mass Memorial Medical Center & Dept. Pathology, Univ. Massachusetts Medical School, Worcester, MA.

1:55 **Drinking and dying: Effects of antemortem ingestion of ethanol on insect successional patterns and development of *Phormia regina* (Diptera: Calliphoridae).** K. Lane Tabor, Dept. Entomology, North Carolina State University, Raleigh, NC.

2:25 **Foresnsic entomotoxicology: What are the real implications? Research with barbituates and amphetamines in *Phormia regina* (Diptera: Calliphoridae).** Michelle Peace, Forensic Toxicologist, Scientific Testing Laboratories, 450 Southlake Blvd., Richomond, VA.

2:55 **Analysis of the successional patterns of insects of forensic importance.** Carlyle Brewter, Dept. Entomology, Virginia Tech, Blacksburg, VA.

3:25 **Case reviews in forensic entomology.** Mel Bishop, Dept. Entomology, University of Nebraska, Lincoln, NE.

Aquatic Entomology ***LewisClark*** **1:00-5:00**

"Discoveries Below the Water Surface: Insects in Freshwater Habitats"
Organizers: Bill Lamp and Laurie Alexander, University of Maryland, College Park, MD.

1:00 **Symposium introduction.** W. Lamp, Dept. of Entomology, University of Maryland, College Park, MD.

1:10 **Facultative parthenogenesis in mayflies.** D.H. Funk, B.W. Sweeney, and J.K. Jackson, Stroud Water Research Center, Avondale, PA.

1:30 **Assessment of mayfly population structure in headwater streams using AFLP markers.** L.C. Alexander, D. Hawthorne, and W. Lamp, University of Maryland, College Park, MD.

Monday Afternoon

1:50 **Influence of cannibalism and population size-structure on aquatic food webs.** V.H.W. Rudolf, University of Virginia, Charlottesville, VA.

2:10 **In-stream dissolved organic carbon (DOC) and the effect on macroinvertebrate community structure and function.** N. Baer, Colby-Sawyer College, New London, NH.

2:30 **Break**

2:50 **Detritus generated from harvesting transgenic corn alters patterns of insect detritivory and organic matter decay in agricultural streams.** C.M. Swan and L. Van-Tull, Department of Geography and Environmental Systems, University of Maryland, Baltimore County, Baltimore, MD, W. Lamp and G. Dively, Department of Entomology, University of Maryland, College Park, MD.

3:10 **Bionomics of container-breeding mosquitoes in southwestern Virginia.** S. Paulson, Virginia Polytechnic Institute and State University, Blacksburg, VA.

3:30 **Predictive macroinvertebrate models for Maryland streams: application and prospects.** M. Paul, Tetra Tech Inc., Owings Mills, MD, G. Moglen, Department of Civil and Environmental Engineering, University of Maryland, College Park, MD, P. Kazyak, R. Klauda, and S. Stranko, Maryland Department of Natural Resources, Annapolis, MD.

3:50 **Using benthic macroinvertebrate assemblages to relate land use to biological integrity: an example using cattle-impacted streams.** A. Braccia and J.R. Voshell, Jr., Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA.

4:10 **Aquatic macroinvertebrate sampling in North Carolina: Ongoing refinements to a nationally-recognized sampling program.** W. Crouch, North Carolina Department of Environment and Natural Resources, Division of Water Quality, Raleigh, NC.

4:30 **Symposium conclusions.** L. Alexander, Dept. of Entomology, University of Maryland, College Park, MD.

4:40 End

Monday Evening

Social gathering and cash bar ***Prefunction Area*** **5:30-6:00**

Banquet and Awards ***Westballroom*** **6:00-8:30**

ESA Recognition Award in Entomology
L.O. Howard Distinguished Achievement Award
Asa Fitch Award
John Henry Comstock Award

Banquet Speaker: Peter J. Hatch, Director of Gardens and Grounds, Monticello, The home of Thomas Jefferson

Linnaean Games ***AshlawnHighlands*** **9:00**
Doug Pfeiffer, Moderator

Tuesday March 14, 2006

Morning

Registration	***Prefunction Area C***	**8:00-10:00**
Dean Polk, Rutgers University, Cream Ridge, NJ		
Local Arrangements	***Monticello***	**8:00-12:00**
Paul Semtner, Virginia Tech, Blacksburg, VT.		
Eastern Branch Business Meeting	***Preston***	**7:00-7:45**
Posters and Displays	***Salon C/PFA***	**8:00-12:00**

Insect Pathology — ***James Monroe*** — **9:00-11:10**

Recent Advaces in Insect Pathology in the Northeast

Organizers: Ann Hajek, Cornell University, Ithaca, NY and Kelli Hoover, Penn State University, University Park, PA

9:00 **Introduction.**
Ann Hajek

9:10 **Picorna-like viruses in Honey bees: Impact of varroa mite parasitization on virus infections via suppressed bee immunity.** Diana Cox-Foster, Penn State University, University Park, PA.

9:40 **Gypsy moth virus.** Kelli Hoover, Penn State University, University Park, PA.

10:10 **Opportunisitc/virulent bacterial pathogens in drosophila.** Brian Lazzaro, Cornell University, Ithaca, NY.

10:40 **Fungal pathogens recombining with native fungal strains in the field.** Louela Castrillo, USDA ARS, Ithaca, NY.

Tuesday Morning

Small Fruit Entomology ***LewisClark*** **8:00-11:00**

"Small Fruit Entomology in the Northeast: Informal Conference"
Organizer: Doug Pfeiffer, Virginia Tech, Blacksburg, VA

Open forum

Crop Protection Entomology ***AshlawnHighlands*** **8:00-11:45**

" Informal Conference and Workshop on Wireworms"
Organizers: Joe Ingerson-Mahar, Rutgers University, New Brunswick, NJ, Joanne Whalen, University of Delaware, Newark, DE, Tom Kuhar, Virginia Tech, Painter, VA, and Juan Alvarez, University of Idaho, Moscow, ID

Tuesday Morning

Submitted Papers ***Salon B*** **8:00-11:50**

Moderator: Vonny Barlow, Virginia Tech, Eastern Shore AREC, Painter, VA

8:00 **Can insect generalists eat alien plants?** Doug Tallamy, Department of Entomology and Wildlife Ecology, University of Delaware, Newark, DE.

8:12 **Effect of Alien Grass Species on Native Insect Biomass and Diversity.** Thomas H Meek, 65 South Chapel, Apt.204, Newark and Doug Tallamy, Entomology and Wildlife Ecology, University of Delware, Newark, DE.

8:24 **Does the scale of an alien plant invasion affect native insect communities?** Erin B Reed and Douglas W Tallamy, Entomology & Wildlife Ecology, University of Delaware, Newark, DE.

8:36 **Linking Insect Biomass to the Success of Vertebrate Insectivores.** Karin T. Burghardt and Doug Tallamy, Entomology and Wildlife Ecology, University of Delaware, Newark, DE.

8:48 **Is male quality a self-referenced trait in spotted cucumber beetles, Diabrotica undecimpunctata howardii Barber?** Jared Ali and Douglas Tallamy, Entomology and Wildlife Ecology, U of D., Newark, DE.

9:00 **Variation in immunocompetence in a population of spotted cucumber beetles, Diabrotica undecimpunctata howardi.** Kiera M Blankenstein, 8211 Scholar Drive; Newark, DE and Douglas Tallamy, Entomology and Wildlife Ecology, University of Delaware, Newark, DE.

9:12 **The limited freeze resistance of monarch butterflies, Danaus plexippus, from Mexican overwintering sites.** Linda S. Fink, Tamara Himelright and Lincoln P. Brower, Department of Biology, Sweet Briar College, Sweet Briar, VA.

9:24 **The Effect of Perisulfakinin on Engorgement in the Salt Marsh Horse Fly, Tabanus nigrovittatus Macquart (Diptera: Tabanidae).** Kelley E. Downer and John G. Stoffolano, Jr., University of Massachusetts, Amherst, MA.

9:36 **Population levels and miticide resistance in Varroa destructor (Acari: Varroidae) infesting honey bee colonies (Hymenoptera: Apidae).** Keith R. Tignor, P.O. Box 1163; Richmond, VA 23218.

9:48 **Break**

10:00 **Generalist predators, relative abundance, and per capita consumption of prey: Are the numerically dominant species in an assemblage the most voracious?** Scott A Lewins, Carlo Moreno and Pedro Barbosa, University of Maryland, College Park, MD.

10:12 **The Influence of Species Richness on Biological Control by an Assemblage of Generalist Predators.** Scott A Lewins, Carlo Moreno and Pedro Barbosa, University of Maryland, College Park, MD.

Tuesday Morning

10:24 **How does the abundance of prey affect the web parameters and decision to relocate in the orb-web weaving spider Micrathena gracilis (Walckenaer) (Aranae: Araneidae)?** Steve Miller and Pedro Barbosa, University of Maryland, College Park, MD.

10:36 **Factors influencing predation of *Podisus maculiventris* (Hemiptera: Pentatomidae) on viburnum leaf beetle, *Pyrrhalta viburni* (Coleoptera: Chrysomelidae), a major landscape pest in the Northeast.** Gaylord Desurmont and Paul A. Weston, Department of Entomology, Cornell University, Ithaca, NY.

10:48 **Pre-invasive species along the frontiers of fruit IPM.** John M. Sivinski, USDA-ARS, CMAVE, 1600 SW 23 Dr, Gainesville, FL.

11:00 **Gas Exchange Rates of Grape Leaves Subsequent to Potato Leafhopper (Empoasca fabae) Feeding.** William O Lamp and Daniel Miranda, Dept of Entomology, Univ of Maryland, College Park, MD.

11:12 **Interpreting pheromone trap captures of grape root borer in Virginia vineyards.** Chris Bergh, VA Tech, AHS-AREC, 595 Laurel Grove Road, Winchester, VA.

11:24 **Reduced pheromone rates for mating disruption of Anomala orientalis Waterhouse in highbush blueberry.** Dean F Polk, Rutgers Fruit Research and Extension Center, 283 RT 539, Cream Ridge, NJ 08514, James D Barry, Dupont Crop Protection, Stine-Haskell Labs, 1090 Elkton Rd, Newark, DE 19714, and Cesar R Rodriguez, Marucci Center for Blueberry & Cranberry Research and Extension, Rutgers University, Chatsworth, NJ 08019.

11:36 **Management of oriental fruit moth in apples using different pheromone dispenser technologies in combination with in-season fruit inspection.** Arthur M Agnello and Harvey Reissig, Dept. Entomology, NYSAES, 630 W. North St., Geneva, NY.

Adjourn **12:00**

APPENDIX A

Sunday-Tuesday

Student Competition Posters

1. Effects of root knot nematode and European corn borer herbivory on one another in corn.

Siddharth Tiwari, Virginia Tech, Blacksburg, VA, Edwin E Lewis, University of California, Davis, CA and Roger R Youngman, Virginia Tech, Blacksburg, VA.

Experiments were conducted under greenhouse conditions to evaluate the reciprocal effect of two different herbivores, Meloidogyne incognita (root knot nematode), and Ostrinia nubilalis (European corn borer) on one another in potted corn plants. The first experiment investigated the effect of O. nubilalis stalk tunneling on M. incognita juvenile penetration and egg production in corn roots. This experiment involved three levels of third instar O. nubilalis larvae per plant (0, 1, and 3) at the 6-, 8-, and 10-leaf growth stages. The reciprocal experiment investigated the effect of M. incognita root penetration on O. nubilalis stalk tunneling. This experiment involved three levels of nematode inoculations (0, 3000, and 6000 M. incognita eggs and juveniles per plant) at the 6-, 8-, and 10-leaf growth stages. The level of O. nubilalis larvae per plant significantly affected the number of M. incognita juvenile penetrations in corn roots. The mean juvenile penetration numbers of 16.5 and 13.3 for plants infested with 1 and 3 larvae per plant, respectively, were significantly less than the mean juvenile penetration number of 24.4 for plants without O. nubilalis infestation. Levels of O. nubilalis larval infestation had no effect on M. incognita egg production, but plant growth stage had a highly significantly affected M. incognita egg production. In contrast, O. nubilalis tunneling was not affected by nematode inoculation level or plant growth stage.

2. Analysis of plum curculio strains using mitochondrial COI gene and wsp gene of Wolbachia in the eastern United States.

Xing Zhang, Douglas G Pfeiffer, Virginia Tech, Blacksburg, VA and Shirley Luckhart, University of California, Davis, CA.

Wolbachia can induce cytoplasmic incompatibility (CI) in many species of arthropods. Reproductive incompatibility between two strains of plum curculio may due to incompatible Wolbachia strains infection. Here, we investigated distribution patterns of Wolbachia infection associate with plum curculio strain distribution. There are two close Wolbachia strains (wCne1, wCne2, 97% identical) existing in the northern and middle of eastern North America (NY, MA, NJ, WV and VA). There is a major Wolbachia strain (wCne3) existing in the southern of eastern North America (GA, SC and FL). The FL and WV populations have a higher diversity in Wolbachia strains. Restriction Fragment Length Polymorphism (RFLP) was used for superinfection detection. Individuals of southern strain mostly show singly infected with an A-group Wolbachia strain. There are about half of individuals of northern strain doubly infected with two B-group Wolbachia. Therefore, current results suggest that Wolbachia strains

approximate distribution of PC strains: northern strain infected with two B-group Wolbachia strains, southern strain infected with one A-group Wolbachia strain and Mid-Atlantic is the convergence area. Mitochondrial COI gene was used to typing plum curculio strains as well. There are two halpotypes in COI gene. Northern strain has halpotype A and southern strain has halpotype B. The results of COI gene analysis are consistent with wsp gene analysis of wolbachia associated with PC. Therefore, COI and wsp genes analysis could be the way to differential PC strains in the future.

3. Quantification of esterase based resistance in the tobacco-feeding form of the green peach aphid, *Myzus persicae* (Sulzer).

Lakshmipathi Srigiriraju, Virginia Tech, Blacksburg, VA and Paul J Semtner, Southern Piedmont AREC, Virginia Tech, Blackstone, VA.

The tobacco-feeding form of the green peach aphid, Myzus persicae (Sulzer), is an important pest that reduces the yield of untreated tobacco by 10% to 30%. Other host-adapted forms of the aphid are pests of many vegetable, ornamental, and greenhouse crops. The green peach aphid has developed resistance to more insecticides than any other insect species. Even with the availability of new insecticide formulations, such as, neonicotinoids, organophosphates and carbamates still play an important role in controlling the aphid populations on tobacco. In the light of neonicotinoids being used on over 80% of the tobacco, these compounds can be used as effective tools for rotating insecticides, a key in integrated resistance management (IRM). Frequent monitoring of these compounds need to be checked for their effectiveness, as the tobacco aphid, and other host adapted forms have already developed considerable resistance to these insecticides, or they may no longer be available for use on tobacco in the next 2 or 3 years. Insecticide monitoring is being carried out by collecting aphid colonies from tobacco growing areas across eastern United States, especially from Virginia, North Carolina and Georgia. Selected colonies were screened for resistance to acephate, an organophosphate (Orthene) and methomyl, a carbamate insecticide (Lannate) using standard and novel methods. Standard microplate assays were used to quantify the total esterase content of individual aphids from selected colonies, as high esterase levels correspond to resistance against organophosphates and carbamates. Karyotype (number and position of the chromosomes) seen as 1 to 3 autosomal translocation, will be determined for each colony using a fluorescent in-situ hybridization technique (FISH) to locate chromosome characteristics linked with the esterase resistance. The E4 and FE4 esterase genes responsible for the increase in the esterase levels in aphids resistant to organophosphates and carbamates will be characterized and sequenced for the colonies that have show high levels of esterase.

4. Biology and Host Specificity of *Gonioctena tredecimmaculata* (Coleoptera: Chrysomelidae): A Potential Biological Control Agent for Kudzu.

Matthew J. Frye, Judith A. Hough-Goldstein, and Clifford B. Keil, University of Delaware, Newark, DE.

Gonioctena tredecimmaculata (Jacoby, 1888) (Coleoptera: Chrysomelidae) was sent to the United States for testing as a potential biological control agent of kudzu (Pueraria montana var. lobata). During the summer of 2004, observations were made on this insect's biology, and its host specificity was examined under no-choice conditions. Results suggested that G.

tredecimmaculata is oligophagous, consuming the tender young leaves of soybean (Glycine max) and hogpeant (Amphicarpea bracteata), in addition to kudzu. During the summer of 2005, host specificity tests were elaborated in order to examine potential differences in the response of G. tredecimmaculata to the growing condition of its host plants. Experiments tested plant characteristics of field- and greenhouse-grown plants to determine if variable traits alter the response and specificity of a potential biological control agent. Insect fecundity, development time, and survival were tested as well as female oviposition preference and naïve adult choice between field and greenhouse foliage. The leaf traits investigated include total carbon and nitrogen levels, toughness, water content, total phenolic and flavonoid contents, and trichome density. Results indicate that this insect does not discriminate between field- and greenhouse-grown foliage and should be rejected as a biological control agent due to its consumption of an agriculturally important plant, soybean. In addition, this work suggests that despite significant differences in plant traits, greenhouse-grown foliage may be acceptable for use in host specificity testing, since it simulates the foliage that insects encounter in the field.

5. Temporal and spatial activity patterns among three exotic predators of hemlock woolly adelgid, *Adelges tsugae* (Hemiptera: Adelgidae).

Robbie W Flowers, Scott M Salom, and Loke T Kok, Virginia Polytechnic, Blacksburg, VA.

Video studies were completed to document temporal and spatial activity patterns among two specialist predators, Laricobius nigrinus and Sasajiscymnus tsugae, and a generalist predator, Harmonia axyridis, of the invasive pest, hemlock woolly adelgid, Adelges tsugae, and to examine how these patterns are affected by additional conspecific and heterospecific predators. Single- and paired-predators assays were tested in the laboratory under simulated spring and summer conditions. Digital video recordings were captured every 15 min over 24 hr and scored as to the predominant behavior exhibited and relative location of each predator. All species exhibited continuous activity patterns punctuated by longer periods of rest. Predator activity and location did not appear to be coordinated to any particular time of day. In spring conditions, L. nigrinus had greater activity and a more even behavior distribution than that of S. tsugae or H. axyridis, which were skewed towards resting. During the summer, a more even behavioral pattern was seen for these latter two species. Paired-predator assays suggested that conspecifics of L. nigrinus and H. axyridis exert influence on one another, leading to increased dispersal movement and decreased resting, feeding and oviposition. In contrast, heterospecific combinations did not significantly affect behavior patterns. Significant spatial separation was maintained between conspecifics of L. nigrinus and H. axyridis, and in all heterospecific combinations, suggesting that avoidance behaviors may occur in these species in response to chemical or tactile (contact) cues. Overall, these studies suggest that these species are compatible, as particular temporal and spatial patterns among these species were not coordinated, and avoidance behaviors were such that significant competitive interference would be unlikely to occur in a field setting.

6. Lethal and sublethal effects of imidacloprid on *Laricobius nigrinus* (Coleoptera: Derodontidae) and *Sasajiscymnus tsugae* (Col: Coccinellidae), two predators of hemlock woolly adelgid (Hemiptera: Adelgidae).

Brian Eisenback, Scott Salom, and Loke Kok, Virginia Tech, Blacksburg, VA.

Systemic injections of imidacloprid are the most widely used technique for control of Hemlock Woolly Adelgid (Hemiptera: Adelgidae). Two predators, Laricobius nigrinus (Coleoptera: Derodontidae) and Sasajiscymnus tsugae (Col: Coccinellidae), are being mass reared and released as biological control agents of the pest. In laboratory bioassays, predator adults fed on hemlock woolly adelgid populations that were surviving on hemlock branches systemically treated with imidacloprid. Both beetle species exhibited sublethal effects such as twitching, spasms, and paralysis. Both beetle species also exhibited a dose-dependant relationship of concentration and mortality. Temperature was a significant factor, with greater predator mortality at higher temperatures. At 4∫C, L. nigrinus mortality ranged from 4-45%, and at 12∫ it was from 45-76%. S. tsugae mortality ranged from 33-48% and 25-100% at 12 and 20∫ C, respectively. There was no control mortality except S. tsugae had 25% mortality at 20∫C. Mortality increased over time at each concentration, with more rapid rates at the warmer temperatures. This project suggests that these predators can be exposed to systemic imidacloprid by feeding on adelgids surviving on treated trees. Warmer temperatures may intensify predator mortality, possibly because tree transpiration, adelgid feeding, and predator feeding rates all increase. Widespread injections of hemlock stands may inhibit predator establishment in these locations.

7. Release and Monitoring of *Laricobius nigrinus* (Coleoptera: Derodontidae) for Classical Biological Control of Hemlock Woolly Adelgid in the Eastern U.S.

David L. Mausel, Scott M. Salom and Loke T. Kok, Virginia Tech, Blacksburg, VA.

Studies are being conducted to determine optimal release procedures for establishment and sampling methodology of Laricobius nigrinus Fender (Coleoptera: Derodontidae), a predator of the hemlock woolly adelgid, Adelges tsugae Annand (Hemiptera: Adelgidae) on eastern hemlock, Tsuga canadensis (L.) Carriere, trees. Factors examined are release size, location, and time of release. CLIMEX software produced a climate match index of 0.58 ñ 0.65 between the original L. nigrinus collection area (Victoria, B.C.) and eastern release areas suggesting adequate climate matching. Lab-reared beetles were released at 22 sites from Massachusetts to Georgia and sampling methods for adult and egg/larval stages (i.e. beatsheets and branch clipping) were compared between the eastern and King County, WA (native) sites. There were 10 open releases in 2003-2004 consisting of the replicated treatments: 300 adults in fall/winter 2004, 300 in spring 2004, or 300 in fall/winter 2004 plus spring 2005 (sum = 600). There were also 12 releases in 2004-2005: 75, 150, or 1,200 adults in fall/winter 2005. In fall 2004, beatsheet sampling recovered 4 total L. nigrinus F1 adults at 2 of the first 10 release sites. In spring 2005, branch clipping recovered a total of 285 F2 Laricobius eggs/larvae from 8 of 10 sites, however at some sites these recoveries were L. rubidus LeConte. Sampling is currently underway at 2004/2005 sites. Branch clipping was significantly better in recovery of L. nigrinus and determined presence more frequently than beatsheets in native and introduced habitats.

8. Pollination Biology of *Ailanthus altissima* (Mill.) Swingle (Tree-of-Heaven) and its relationship to tree health.

Jessica S Thompson, Richard D Fell and Carlyle C Brewster, Virginia Tech, Blacksburg, VA.

To date little information has been collected on the pollination ecology of Ailanthus altissima (Mill.) Swingle (tree-of-heaven) in the U.S. The purpose of this study was to describe the insect pollinator fauna visiting healthy and unhealthy A. altissima and to study general pollinator behavior as associated with its reproductive biology. Insects on flowers were collected at different times of day on trees of different health levels. A list of taxa visiting trees within each site, damage category, and time of day was developed and the effect of damage level and time of day on pollinator species diversity was determined. The nectar composition and amount of total sugars in A. altissima and how these are related to damage level and time of day was determined. Collected sugars were analyzed using HPTLC to determine sugars and relative concentrations and Anthrone analysis for determining total amounts of sugar. Visitation patterns of insect pollinators were studied using counts and analyzed with a regression analysis. Nectar production and removal in healthy and unhealthy trees was studied using caging and compared using a Kolmogorov-Smirnov test.

APPENDIX B

Sunday Afternoon

Student Oral Presentation Competition

(1:00) **Elevation of *Cicindela* (*Cylindera*) *lunalonga* Schaupp (Coleoptera: Adephaga: Cicindelidae) to Species Status Using Phylogenetic Reconstruction from Mitochondrial DNA Markers.**

M. R. Woodcock, 2405 Terry Drive, Richmond, VA, C. B. Knisley and James A. Foster, Randolph-Macon College, Ashland, VA.

Cicindela (Cylindera) terricola Say, is one of the most widespread and variable species of Nearctic Cicindelidae with numerous attributed subspecies including C. t. lunalonga Schaupp (1884). Cicindela t. lunalonga is primarily known from a few museum specimens collected prior to 1978, and recent intensive surveys indicate only a single population extant in Lassen Co. California. The purpose of this study was to resolve the uncertain taxonomic status of C. t. lunalonga and several other subspecies of C. terricola using mitochondrial DNA analysis of cytochrome b and cytochrome oxidase subunit I. Phylogenetic reconstruction was conducted using distance and parsimony methods. All members of the terrricola group were recovered as monophyletic and embedded within outgroup species of the subgenus Cylindera, while C. lunalonga was recovered as sister to all other members of the terricola clade. The closest alignment of C. lunalonga to any C. terricola is with subspecies of the American southwest, rather than with neighboring terricola from Nevada. Cicindela lunalonga exhibited an exceptionally high 5.8-6.6% (6.36% avg.) pairwise sequence divergence for both genes against all C. terricola surveyed. In other subgeneric sets of Cicindela, pairwise sequence divergences range between 0.7-9.5%. For cytochrome oxidase subunit I alone the pairwise divergence of C. lunalonga against all C. terricola was 3.9-4.8% (4.58% avg.). Pre-established values in DNA barcoding studies hold that 3% cytochrome oxidase I pairwise divergence indicates a species level divergence. We conclude that C. lunalonga is a distinct species and given its rarity, should be considered as a candidate for Federal listing.

(1:12) **Phylogeography and population genetics of Cooley spruce gall adelgid, *Adelges cooleyi*: the genetic consequences of an insect introduction.**

Robert G. Ahern, Michael J. Raupp, and David J. Hawthorne, University of Maryland, College Park.

The Cooley spruce gall adelgid (CSGA), Adelges cooleyi, is an insect pest native to the Rocky Mountains and the western coast of the US that was introduced into the eastern US over 100 years ago. Between 2004-2004 CSGA was collected on spruce from the native range and the eastern US. Analysis of AFLPs and two mtDNA genes grouped the insects by shared similarities and the resulting phylogeny identified the northern Rocky Mountain region as the likely source

of introductions. Samples from Utah grouped with samples from Arizona and western Colorado, indicating geographically structured genetic variation in the native range. In general, introduced populations had reduced genetic variation compared with populations from the native range. The implications of our findings are discussed within the context of introduced species management.

(1:24) Insect xylophages inhabiting red and pin oaks.

Jianxin Zhang, James Lashomb, and Ann Gould, Rutgers University, New Brunswick, New Jersey.

Insect xylophages inhabiting oaks are potential vectors for transmitting bacterial Xylella fastidiosa. Xylem feeder populations in oaks were surveyed in Mercer, Middlesex, and Somerset Counties, New Jersey during 2002-2004. Yellow sticky trap cards were hung in oak tree canopies to monitor insect population dynamics. Pyrethrin fogging of tree canopies was employed in addition, to compare with insects caught by sticky card sampling. The most frequently collected insects are Hemiptera: Cicadellidae: Graphocephala versuta and G. coccinea; Membracidae: Telamona querci, T. concave, T. tiliae, Ophiderma definite, and Archasia galeata. Cicadellinae xylem feeders occurred throughout summer while Membracidae xylem feeders peaked in early summer. Higher xylem feeder populations were found in apparently healthy oak trees than in diseased trees.

(1:36) Effects of Plant Position and Entomopathogenic Nematode Application on Black Vine Weevil Larvae in a Nursery Setting.

Ellery Vodraska, Department of Entomology, University of Maryland, College Park, MD, Rebeccah Waterworth, University of California, Riverside, Riverside, CA, and Paula Shrewsbury, University of Maryland, College Park, MD.

Black vine weevil (BVW), Othiorhynchus sulcatus (Fabricius), is an economically important pest of plants in container nurseries. Traditionally BVW larval populations are controlled with the use of pesticides that can result in adverse effects on the environment and natural enemy populations. Recently, there has been pressure to explore alternative tactics that will effectively manage black vine weevil populations without the use of pesticides. This project examined the use of a habitat manipulation tactic, plant position, and an entomopathogenic nematode application as non-chemical methods to manage BVW larvae in a container nursery setting. Our study used three commonly grown herbaceous perennials, which are frequently damaged by BVW. Potted heuchera, astilbe and bergenia, were placed in either a pot above ground or pot-in-pot position. Plants were then infested with BVW adults. An application of an entomopathogenic nematode species, Heterorhabditis bacteriophora, was applied to target BVW larvae two months post initiation of plant position treatments. Damage ratings, natural enemy activity, both diurnal and nocturnal, and larval counts were conducted to examine the efficacy of pot position and entomopathogenic nematode application on BVW larval populations in the container grown perennials.

(1:48) **The effect of predator and alternative prey density on cutworm survival, activity, and growth.**

Steven D. Frank, Paula M. Shrewsbury, and Ellery A. Vodraska, Department of Entomology, University of Maryland, College Park, MD.

Conservation biological control practices seek to increase predator abundance to impose predation pressure on herbivores and prevent plant damage. However, many conservation biological control practices increase alternative food in addition to predator abundance. Moreover, research has demonstrated that predator activity or presence in a habitat can have negative indirect effects on herbivores by altering their behavior and feeding efficiency. This experiment was designed to examine the effect of varying densities of the carabid predator, Harpalus pensylvanicus, and alternative prey on the survival, activity, and growth of the black cutworm, Agrotis ipsilon. The objectives of the study were to 1) determine the effect of alternative food density on predation of cutworms by H. pensylvanicus; 2) determine the effect of predator density on predation of cutworms; 3) examine daily activity patterns of predators and cutworms to determine temporal differences; 4) determine whether cutworm activity and growth is affected by predator density. Increasing alternative prey density reduced predation of cutworms. As predicted, cutworm predation was greatest at high predator density with no alternative food. Peak cutworm activity occurs later in the night than that of H. pensylvanicus. This temporal difference may reduce the impact of H. pensylvanicus on cutworm survival. However, cutworms became less active as predator density increased. In addition, when predator density was low cutworms were heavier than when predator density was high. This research demonstrates that alternative food can reduce the impact of predators on herbivore survival. However, high predator density is still detrimental to herbivore pests.

(2:00) **Biological Control of Mile-a-minute Weed (*Polygonum perfoliatum* L.).**

Ellen C. Lake and Judith A. Hough-Goldstein, University of Delaware, Newark, DE.

Mile-a-minute weed, Polygonum perfoliatum L., is an invasive vine that originates from China. The weed took hold in an abandoned nursery in Stewartstown, Pennsylvania in the late 1930s and its current range extends from Connecticut to Virginia. Mile-a-minute germinates earlier than many native plants; retrorse thorns on its leaves and stems enable it to climb over other vegetation, form a dense canopy, and outcompete other plants in wetlands, dry meadows and upland forests. Mile-a-minute seeds prolifically and its seeds persist for at least three years in the seedbank. The search for potential biological control insects in China began in 1996 and host specificity testing commenced in 1996 in China and 1999 in the United States. The stem-boring weevil Rhinoncomimus latipes Korotyaev (Coleoptera: Curculionidae) was approved for release by the USDA in July of 2004. Weevil adults feed on mile-a-minute foliage; the larvae feed within nodes and may cause sufficient damage to reduce seed production. Weevil dispersal and impact on mile-a-minute was monitored at three sites in Pennsylvania from a release in the center of a 50m diameter array. The number of weevils, damaged nodes, and weevil egg production was monitored within the array. Weevils dispersed beyond the 25 meter monitoring points and underwent four generations in field cages between June and early October. Mile-a-

minute seed production monitoring was assessed in weevil occupied areas and controls. Preliminary experiments indicate that approximately twenty-four percent of immature mile-a-minute seed is viable and that deer play a role in seed dispersal.

(2:12) Use of *Trichogramma ostriniae* in an integrated pest management system for European corn borer in bell pepper.

Vonny M. Barlow, Anthony M., Bratsch, Virginia Tech University, Blacksburg VA and Thomas P. Kuhar, Virginia Tech University, Eastern Shore AREC, Painter VA.

Mature (colored) bell pepper is a high value crop that must ripen to full maturity, which leaves them highly vulnerable to attack from pests. Peppers can suffer 85 ñ 90 % fruit loss from attacks by the European corn borer (ECB), Ostrinia nubilalis H¸bner. In 2003 and 2004 we evaluated the use of Trichogramma ostriniae (Peng & Chen) alone, and in combination with conventional (acephate rotated with permethrin) and certified ìorganicî (spinosad) sprays to control O. nubilalis. Replicated small plot (0.0007 ha) experiments were conducted on four pepper varieties. Control plots received no applications and were spatially separated (137.2 m) from treatment plots to minimize contamination with T. ostriniae. Beginning at first fruiting, applications of insecticides and inundative releases of 30,000 to 50,000 T. ostriniae per replicate were made weekly. , In 2003, cumulative fruit damage in T. ostriniae release and conventional spray plots was similar, but was significantly lower (P = 0.002) compared with organic spray plots. No significant differences in cumulative fruit damage among treatments were observed (P = 0.085) in 2004. There was a significant difference between years (P = < 0.0001) due to decreased ECB pressures in 2004. This research shows that inundative releases of T. ostriniae are effective at controlling ECB in commercial bell pepper systems. The results also suggest that chemical applications of spinosad may be injurious to T. ostriniae adults. Trichogramma ostriniae alone can provide effective control of O. nubilalis in mature (colored) bell pepper compared to the conventional and organic spray regimes used here.

(2:24) Measuring dispersal behavior of *Trichogramma ostriniae* (Hymenoptera: Trichogrammatidae) in potato fields.

Anna V. Chapman, 314 Clay St. Apt 2, Blacksburg, VA and Thomas P. Kuhar, Virginia Tech University, Eastern Shore AREC, Painter, VA.

We investigated the effective dispersal ability of Trichogramma ostriniae Pang and Chen (Hymenoptera: Trichogrammatidae), a biological control agent of the European corn borer, Ostrinia nubilalis (Lepidoptera: Pyralidae) in commercial potatoes. The purpose of the study was to quantify dispersal of T. ostriniae after innundative releases and determine the number of release points required per acre for effective control of European corn borer in solanaceous crops. Two releases were made in separate potato fields on the Eastern Shore of Virginia in summer 2005. From central release points, dispersal was measured over 0.25, 0.5 and 1.0 acre areas. The perimeter of each area was designated with eight monitoring points bearing a yellow sticky card and O. nubilalis egg sentinels to observe adult wasps and parasitism. Results showed

that T. ostriniae dispersed quickly after emergence. Four days after emergence, uniform parasitism was observed throughout 0.5 acres with rates of 20-80% at various monitoring points. Sticky card captures of adult wasps in addition to 20-40% parasitism of egg masses were observed at monitoring points around 1 acre 4 days post emergence. Within eleven days of emergence in both fields, cumulative sticky card captures show T. ostriniae uniformly dispersed throughout 1 acre. Based on these results, a minimum of one release point per acre should be effective for uniform dispersal of T. ostriniae in solanaceous crops.

(2:36) Evaluation of fall soil sampling for predicting spring infestation of secondary soil pests in corn.

Timothy A. Jordan, Roger R. Youngman, and Curt A. Laub, Virginia Tech University, Blacksburg, VA and Thomas P. Kuhar, Virginia Tech University, Eastern Shore AREC, Painter, VA, and Siddharth Tiwari, Virginia Tech University, Blacksburg, VA.

A field study was started in fall 2005 to predict spring infestation levels of secondary soil pests, specifically white grubs (Coleoptera: Scarabaeidae) and wireworms (Coleoptera: Elateridae) in cornfields. Fifteen post-harvest soybean fields were sampled in late October and early November in several eastern Virginia counties using a randomized complete block design with 15 replicates. Current sampling procedures for secondary soil pests are done in the spring prior to planting by visually inspecting a 30-cm2 by 15-cm deep (standard method) volume of soil for annual white grubs or by using some form of baiting method for wireworms and annual white grubs. This study compared a 20.3-cm2 by 15-cm deep soil sample with the standard method. Initial results of fall 2005 sampling indicate abundant white grub densities ranging from 0.9-10.1 grubs per standard method. Of the 15 sampled fields, 12 exceeded the economic threshold of 2 grubs per standard method. The 20.3-cm2 by 15-cm deep sample method was evaluated for its potential to correlate to the standard method after a 2.25 weighting factor (the standard method samples 2.25 x more volume of soil than the 20.3-cm2 by 15-cm deep method). No significant differences were detected between the two methods after correcting for differences in sampling volume. Wireworms also were found, but numbers were generally low across all fields, averaging less than 1 wireworm per standard method. Sampling is planned for spring 2006, and again in fall 2006 and spring 2007, to evaluate how well fall sampling densities correlate with spring densities.

(2:48) Exploration of European corn borer egg mass dispersion using GIS technology.

Katie A. Ellis and Dennis D. Calvin, Pennsylvania State University, University Park, PA.

Computer mapping technologies, such as the Geographical Information System (GIS), have presented new opportunities for tracking pests and surveying damage. In this study, GIS databases and maps were used to characterize female European corn borer ovipositional preference in a heterogeneous agricultural landscape. Corn borer egg masses in thirty-one fields

of varying size and planting date were counted. Mass locations were entered into a GIS database and mapped over the 2005 growing season. Field egg mass densities were analyzed with respect to plant maturity, cornfield area, and proximity to adjacent fields. Our data suggest that early-season corn maturity affects egg mass recruitment; irrigated fields may also attract ovipositing females.

(3:20) **Modeling Temperature Dependent Development of the Soybean Aphid.**

Wilma V. Aponte-Cordero, Dennis D. Calvin, and Michael C. Saunders, Pennsylvania State University, University Park, PA.

The soybean aphid, an invasive species, is an economic pest of soybeans. Like every insect, soybean aphid development is temperature dependent. This research is focused on understanding how temperature influences the development of soybean aphids and to create developmental models. Developmental studies were conducted in environmentally controlled chambers. Soybean aphids were observed daily at 16, 21, 25, 30 and 32∫C. Careful measures were taken in order to collect accurate data. Soybean aphids were observed in modified Petri Plates, which permitted placement over a leaf bearing soybean petiole and allowed air circulation within the dish. A data logger was inserted in a Petri plate in order to collect humidity and temperature data. Results of the laboratory studies were used to estimate parameters for the modified Logan, second degree polynomial and linear models. Simulations were compared to laboratory results for goodness of fit. The modified Logan and second degree equation resulted with better fit to laboratory results in comparison to the linear model. The Logan model was found to accumulate the least (2.82 d) prediction error from birth to adult. For all individual instars and birth to adult development, the Logan model predicted the optimal temperature for soybean aphid development to be 29∫C (R2= 0.971). The second degree polynomial model predicted the nymphal stages with least error (1.08 d).

(3:32) **Laboratory and Field Efficacy of Acetamiprid for Control of Asparagus Beetle in Virginia.**

Erin M. Hitchner, Virginia Tech University, Blacksburg, VA and Thomas P. Kuhar, Virginia Tech University, Eastern Shore Agricultural Research & Extension Center, Painter, VA.

The asparagus beetle, Crioceris asparagi, is found throughout North America and is a major pest of asparagus. Larvae and adults cause damage to asparagus ferns by feeding on foliage, leaving spears unmarketable. Few insecticides have been labeled for beetle control on asparagus in the last two decades. Growers rely on carbamates and organophosphates, which are currently under review by the Food Quality Protection Act. Acetamiprid (Assail 30 SG, Cerexagri, Inc) is a neonicotinoid that was recently registered for use on a variety of leafy and fruiting vegetables. Acetamiprid has ovicidal, larvicidal and adulticidal activity against numerous pest species while having reduced impact on beneficial insects. Experiments were conducted in Virginia to determine the toxicity and field efficacy of acetamiprid on asparagus beetle. Laboratory toxicity bioassays with acetamiprid on asparagus beetle eggs and larvae showed significant mortality at concentrations as low as 0.01 mg ai/liter compared to typical field rate concentrations of 5,750

mg ai/liter. Field applications of acetamiprid significantly reduced asparagus beetle egg hatch and new asparagus beetle eggs on spears by 86 to 90% compared with the untreated control. Similar applications of acetamiprid to asparagus ferns later in the season resulted in 100% control of asparagus beetle larvae and adults. In all trials, acetamiprid had numerically and sometimes significantly greater efficacy than the carbamate standard, methomyl (Lannate LV, DuPont). We conclude that acetamiprid is effective against all stages of the asparagus beetle and has the potential to replace current insecticides that may be lost in the FQPA review process.

(3:44) **Manipulation of herbivore induced volatile emission in broad bean plants by the pea aphid, *Acyrthosiphon pisum*.**

Ezra G. Schwartzberg and James H. Tumlinson, Pennsylvania State University, University Park, PA.

The pea aphid, Acyrthosiphon pisum is able to manipulate the production of herbivore induced plant volatiles. Aphids feeding on broad bean plants do not cause a detectable change in volatile emission, however aphids inhibit terpene emission induced by beet armyworm caterpillar feeding. These terpenes include E-fl-farnesene, Caryophyllene and Limonene. Caterpillar induced green leafy volatiles were not significantly suppressed by aphid feeding with the exception of Cis-3-hexenol. This is the first evidence that aphids are able to affect caterpillar induction of plant volatiles.

(3:58) **Characterization of cellulolytic enzymes from larvae of the Asian longhorned beetle (*Anoplophora glabripennis*).**

Scott Geib and Kelli Hoover, Pennsylvania State University, University Park, PA.

The Asian longhorned beetle (ALB) (Anoplophora glabripennis), introduced to the US from China, is a highly invasive wood-boring species capable of causing billions of dollars in damage. The larvae of the beetle attack a variety of host trees, feeding first in the phloem tissue, and then moving further into the heartwood as the larvae develop. In order to feed on the nutrient poor, inner wood of the host tree, we hypothesized that the larvae have the ability to digest cellulose into glucose, as a source for carbohydrates. Enzymes that digest cellulose in some insect species have been shown to be of microbial origin, but the source of these enzymes in the ALB have not previously been identified. ALB extracts were subjected to non-denaturing polyacrylamide gel electrophoresis and activity staining with Congo Red was used to determine protein bands active towards carboxymethyl cellulose. These bands were eluted and further purified through 2-D electrophoresis. Proteins isolated through 2-D separation were excised and characterized through tryptic digestion and MALDI-TOF-MS for peptide mass fingerprinting and then this fingerprint was searched against databases for closely related proteins.

(4:10) **Differences in hemocyte composition in gypsy moth (*Lymantria dispar*) and tobacco budworm (*Heliothis virescens*) larvae with regard to baculovirus susceptibility.**

James R. McNeil, Diana Cox-Foster, and Kelli Hoover, Pennsylvania State University, University Park, PA.

Susceptibility of gypsy moth (Lymantria dispar) larvae to the baculovirus, Lymantria dispar nucleopolyhedrovirus (LdNPV) varies within an instar. A viral LD80 for newly molted larvae will only kill about 40% of larvae infected at 48-72 hours post-molt. This phenomenon is called intrastadial developmental resistance and occurs in gypsy moth whether LdNPV is administered orally or intrahemocoelically. In contrast, tobacco budworm (Heliothis virescens) and the baculovirus Autographa californica nucleopolyhedrovirus (AcNPV) exhibit a similar pattern of resistance, but only when the virus is administered orally. We hypothesize that this difference can be attributed to a systemic immune response in resistant-aged gypsy moth larvae that is not present in tobacco budworm larvae of comparable age. To test this idea, we compared the total number of hemocytes and hemocyte composition of hemolymph samples from newly molted (susceptible) and mid-instar (resistant) gypsy moth and tobacco budworm larvae. We also examined how hemocyte composition changed with viral infection. Preliminary results demonstrated important differences in the hemocyte composition of gypsy moths with respect to larval age, particularly in one cell type, the oenocytoids. This difference was not observed in tobacco budworm larvae. Because oenocytoids produce phenol oxidase, a key enzyme involved in immune responses, these results suggest a mechanism by which the immune system plays an important role in systemic developmental resistance in gypsy moth larvae and may explain why this form of resistance does not occur in tobacco budworm.

(4:22) **Cytochrome P450 CYP6BB1 and CYP6P10 in the eastern salt marsh mosquito Ochlerotatus sollicitans (Diptera: Culicidae).**

Shaoming Huang and Lena B. Brattsten, Rutgers University, New Brunswick, NJ.

Ochlerotatus sollicitans, a major medically important pest mosquito along the east coast of North America, is controlled mainly by insecticides. Field population of O. sollicitans collected in southern New Jersey showed significant higher LC50 of the organophosphate larvicide temephose both in adults and larvae compared to central New Jersey population. In order to identify the cytochrome P450s involved in this toxicity difference, a pair of degenerate primers were designed based on the two conserved regions, ETLRKYP and the heme-binding motif region PFG(A/D/E)GPR(I/N)CI, of the CYP6 family to amplify the P450s. After14 different P450 fragments were identified, RACE identified two novel P450s, CYP6BB1 and CYP6P10. Real-time quantitative PCR showed that CYP6BB1 was significantly over-expressed in the adults but not in the larvae in the southern New Jersey population. There is not significant changes of CYP6P10 expression between the two populations. CYP6BB1 seems to be involved in this toxicity difference, but this has to be confirmed by further experiment, such CYP6BB1 activities against different substrates.

APPENDIX C

Monday Morning

Biological Control Symposium

(8:20) Cereal leaf beetle: Going, going, not really gone.

Kathleen Kidd. North Carolina Department of Agriculture and Consumer Services, Raleigh, NC.

The cereal leaf beetle (CLB), *Oulema melanopus* is a chrysomelid pest of small grain crops. Native to Europe, it was first identified in Michigan in the early 1960s. The cereal leaf beetle was the target of a large biological control program and three larval parasitoids and one egg parasitoid appeared to have provided successful control. However, CLB continued to spread south and east where biocontrol efforts continued, but with slower results. After CLB became established in western North America in the early 1980s, control efforts at the federal level were renewed, and included collections of natural enemies in Europe, the renewal of parasitoid rearing and establishment of new insectaries. A review of the historical spread and biological control will be presented along with an update of current status of the cereal leaf beetle in North America.

(8:45) The alfalfa weevil, an often forgotten pest that resuscitated applied biological control in the Northeast.

William Day, USDA-ARS Beneficial Insects Introduction Research, Newark, DE

In the 1950's and 1960's, nearly all important insect pests of crops were controlled with insecticides. There had been no major biological control attempts in the northeastern U.S. since the 1930's, and very few entomologists were doing biological control research. Meanwhile, the alfalfa weevil (*Hypera postica*), which had become established in Maryland during WWII and had spread into many states by the late 1960's, was causing serious crop losses. There were over 10 million acres of alfalfa in the NE, so this was a major concern. After insecticide residues were found in milk from cows that had eaten sprayed alfalfa, research on classical biological control of this weevil was started by the USDA in the late 1950's. By 1970, after 5 species of European parasites had been established by the USDA, weevil populations were in decline in parts of several states--and by the 1980's, most untreated alfalfa fields in many states had below-threshold weevil populations. This was the first large-scale classical biological success in the NE in decades, and stimulated the startup of similar federal & state research programs, and the increased teaching of biocontrol at universities, resulting in additional successes. In recent years, in the northeastern quarter of the United States, about 12 million acres of alfalfa no longer needs insecticides to control the alfalfa weevil, with annual savings to growers (and ultimately consumers) of ca. $150 million each year. At the same time, however, increasing theoretical concerns have recently resulted in significant reductions in *releases* of beneficial insects--and in my opinion, this is a major handicap to development of classical biological controls for the future.

(9:10) Alfalfa Blotch Leafminer - Historical aspects and current trends.

John Plummer, Customs and Border Protection, Agriculture Division. Philadelphia, PA; Robert Byers, Penn State University, State College, PA.

The Alfalfa blotch leafminer (*Agromyza frontella*) (Diptera: Agromyzidae) was introduced into Massachusetts from Europe in the late 1960's. Westward range expansion now includes the Province of Manitoba, and the states of North Dakota, Minnesota, Wisconsin, and Illinois. Starting in the mid 1970's, European parasitoids were introduced through the USDA Beneficial Insects Introduction Research Unit. Successfully established European parasitoids include *Dacnusa dryas* (Hymenoptera: Braconidae) and *Chrysocharis liriomyzae* (= *C. punctifacies*) (Hymenoptera: Eulophidae). These two species, in conjunction with several native parasitoids, reduce *A. frontella* populations below suggested economic injury levels within 3-5 years of pest establishment.

(9:35) Biological control of tarnished plant bug, past accomplishments and new directions.

Roger W. Fuester, William H. Day, and Kim Hoelmer, USDA-ARS, Newark, DE.

The tarnished plant bug, *Lygus lineolaris* (Palisot), an important pest of numerous crops, is widely distributed in North America. The alfalfa plant bug, *Adelphocoris lineolatus* Goeze, a Palearctic species, infests alfalfa in the eastern U.S. and Canada. Native natural enemies attacking these pests are ineffective. Nymphal parasitoids of *L. rugulipennis* and *A. lineolatus* were imported from Europe. Candidates for control of the *Lygus* pests included two polyvoltine species, *Peristenus digoneutis* (Loan) and *P. stygicus* (Loan), and a univoltine species, *P. rubricollis* (Thomson). The latter and *P. adelphocoridis* Loan, another univoltine species, were candidates for control of *A. lineolatus*. Although earlier attempts to establish parasitoids were unsuccessful, intensive efforts in the 1980's resulted in the establishment of *P. digoneutis* in New Jersey. Successful biocontrol of *L. lineolaris* in alfalfa was achieved, and *P. digoneutis* had spread throughout much of the northeastern U.S. by 2000. Recent studies suggest that its action decreases damage by *L. lineolaris* in apples and strawberries. Unfortunately, this species has not spread south of New York City, so more southerly populations of tarnished plant bug have not been impacted by this parasitoid. To meet these needs, we propose to attempt establish *Peristenus stygicus*, the most important parasitoid of lygus bugs in the southern regions of Europe, to control populations of *L. lineolaris,* in alfalfa fields in Delaware and the Delmarva region. Both *P. rubricollis* and *P. adelphocoridis* were released against *A. lineolatus* in Delaware, but neither became established. Several years later, *P. conradi* Marsh, a thelytokous species closely resembling *P. rubricollis* (and presumed to have been released with it) was recovered at the release site.

(10:20) Gypchek: Development and optimization.

John Podgwaite, USDA Forest Service, NE Forest Experiment Station, Hamden, CT; Richard Reardon, USDA Forest Service, Forest Health Technology Enterprise Team, Morgantown, WV.

The development of the biopesticide Gypchek was initiated by the U.S. Forest Service (FS) in the 1950's in response to the growing concern over the impact of chemical pesticides on the environment.

The goal was to make available a gypsy moth-specific product that would be preferable to broad-spectrum chemical and biological insecticides for the treatment of environmentally sensitive habitats. The strategy was to conduct the basic R&D on the gypsy moth nucleopolyhedrovirus (LdNPV) that would fulfill the requirements for a pesticide product registration with the U.S. Environmental Protection Agency (EPA) and then encourage industry to further refine, produce, and market a gypsy moth virus product. The major objectives associated with this strategy were to (1) isolate a virulent LdNPV strain and ascertain its safety for other life forms, (2) select a standard laboratory strain of gypsy moth for production and potency-assays, (3) develop *in vivo* production and quality control protocols, and (4) develop a product formulation and aerial- and ground-based application protocols. In 1978, the FS registered Gypchek with EPA and since that time has worked closely with industry toward the development of a commercial Gypchek product. Both Calliope (a French company) and American Cyanamid Co. registered gypsy moth virus products with EPA but later withdrew their registrations citing high production costs and market elasticity as reasons. The FS went forward with production and the research necessary to satisfy all EPA requirements for the re-registration of Gypchek in 1999. Since then, based upon a steady yearly demand of between 5,000 and 15,000 acre-treatments, the FS has continued to manufacture and distribute Gypchek for use in wide-area government sponsored gypsy moth suppression programs.

(10:45) Parasitoid polydnaviruses: unusual life strategies and potential for use in biological control.

D. Gundersen-Rindal, USDA-ARS, Insect Biological Control Laboratory, Beltsville, MD.

Parasitoid wasps that kill insects but are harmless to humans and other vertebrate animals have been used for years as biological control agents in many insect pest management programs. Certain species of parasitoids contain a complex dsDNA polydnavirus (PDV) that is injected along with parasitoid egg(s) into host lepidopteran pests during parasitization. PDVs are probably the most important parasitoid factors in regulating and causing decline of lepidopteran pest larvae. Inside the larval host, PDVs infect various cells and tissue types, where host-specific viral genes are expressed. Expression of PDV-encoded protein gene products in the pest host alters physiology by inhibiting immune response, development, and behavior, enabling the parasitoid offspring to complete the endoparasitic life-stage. Little is known about some basic biological properties of the parasitoid polydnavirus because it is different from other DNA viruses, especially its life strategies and mode of replication. Recently, several PDV genomes have been fully sequenced and a number of genes and gene families discovered that may be involved directly or indirectly in disruption of insect pest immune systems, growth, and/or development, and may be useful in pest biocontrol.

(11:10) Can native plants enhance conservation bio-control?

Douglas Tallamy, University of Delaware, Newark, DE; Paula Shrewsbury and Mike Raupp University of Maryland. College Park, MD.

Research has shown that enemies of phytophagous arthropods suppress pest populations more often and more successfully in the presence of a diversity of alternative prey species. This relationship forms the central tenet of conservation biological control and has stimulated efforts to attract sustainable populations of alternative prey to simplified anthropogenic ecosystems. This goal may be more easily

achieved if native plants dominate the first trophic level of these ecosystems. Theory predicts that specialist herbivores will be unable to grow and reproduce on alien plant species with which they have no evolutionary history. If this is so, the overuse of alien ornamentals in millions of hectares of suburbia may have reduced the ability of native phytophagous insects to support the diverse population of natural enemies needed to control outbreaks of pest species. We will discuss tests (in progress) of the hypothesis that native insect herbivores, and thus their natural enemies, can be sustained in urban ornamental gardens when alien plants are replaced with native hosts of these herbivores. We predict that, once established, this complex of predators and parasitoids will prevent eruptive pest outbreaks without the use of pesticides.

APPENDIX D

MONDAY AFTERNOON

Entomology Scholars: Stories of Discovery

(1:05) Over Fifty Years in Entomology: What A Life!

E. Alan Cameron, Professor Emeritus, Pennsylvania State University, University Park, PA

Early childhood experiences stimulated a curiosity about and fascination with insects. Experience as a 'summer student assistant' and a Bachelor's degree in Entomology led to employment for five years with the Commonwealth Institute of Biological Control; my principal project involved providing parasitoids of Siricids to Australia and New Zealand. Graduate study at Berkeley provided a foundation for an academic career lasting over 30 years at Penn State. Some excellent graduate and post-doctoral students made significant contributions to research into behavior of gypsy moth adults and how that might (or might not!) be manipulated using disparlure, field testing new pesticides, aerial spray application technology, and environmental impact assessment, and unraveling details of pear thrips ecology and population dynamics. Some of my greatest rewards include observing the transition of scientifically naïve students to very competent professional colleagues, and making friendships that endure.

Service to professional societies is vital if our profession is to move ahead. Through various Societies, I have worked with many very interesting people and made life-long friends. The profession has allowed me to travel the world and learn from many cultures. To have an opportunity to continue to contribute in retirement, as an Editor, and to believe that some of our earlier work has made positive differences, is satisfying. Forest entomology provided marvelous opportunities for education and enjoyment in the last half of the 20th century.

(1:45) Investigating Northern Hardwood Insects: studies in insect ecology and forest management

Douglas C. Allen, Professor Emeritus, Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY

As an undergraduate in Forest Management at the University of Maine, I was required to take an introductory course in entomology. This opened my eyes to the fascinating world of insects and, eventually, I was able to combine my interests in forestry with entomology. My Masters' degree (also taken at Maine) centered on the pine leaf adelgid, at that time a serious pest of eastern white pine. This was followed by a stint at the University of Michigan where my dissertation topic addressed certain aspects of the Jack pine budworm life system. When I arrived in Syracuse, the northeast was experiencing a large-scale outbreak of saddled prominent, a notodontid that favors sugar maple, beech and birch. As a Vermonter, I felt right at home in northern hardwood forests. Though my graduate students and I have worked mostly on the bionomics and impact of sugar maple insects, over the years I

have expanded this type of research to pine systems (pine false webworm) and currently have a number of projects in the Allegheny Hardwood forest type (peach bark beetle, cerambycids and ambrosia beetles). One of the joys associated with developing research around the two most valuable northern hardwoods has been the opportunity to work closely with foresters from state, industrial, consulting and federal agencies, in addition to many forest owners

(2:30) Understanding host suitability and host tree resistance in the Asian longhorned beetle

Scott Geib, Department of Entomology, Pennsylvania State University, University Park, PA

Asian longhorned beetle (ALB) has been a known threat to the urban forests of the United States since its discovery in New York in 1996. Since then, we have collected information on the suitability of common landscape trees as hosts for Asian longhorned beetle. Using screening methods including oviposition preference, larval survival and development trials on potted trees under greenhouse conditions, we have compiled a list of host preferences, with some trees being highly preferred, others intermediate, and other not suitable for development. Our observations and findings have caused us to ask new, more basic questions about how this insect is able to feed so readily on such a nutrient poor food source, the inner wood of a tree. Also, we are interested in what unique characteristics of certain tree species make them either highly suitable for wood metabolism, or alternatively resistant to it. Summary data will be presented on the host range studies that were conducted, as well as preliminary data on more basic questions about ALB wood metabolism and tree resistance to this wood feeding insect.

(3:00) Control of elongate hemlock scale on eastern hemlock: efficacy of insecticide applications and effects on natural enemies

Robert G. Ahern and Michael J. Raupp, Department of Entomology, University of Maryland, College Park, MD

Several species of armored scale, including *Fiorinia externa* (elongate hemlock scale), *Nuculaspis tsugae*, and *Aspidiotus cryptomeriae* (cryptomeria scale) attack, disfigure, and kill *Tsuga canadensis* in the eastern United States. Damage to trees in forest and urban landscapes results in significant economic loss and threatens to eliminate unique sources of germplasm. Our objective was to evaluate practical methods of chemical control for elongate hemlock scale. In addition, we were also interested in the effect of treatments on natural enemies. During a two-year study at the National Arboretum in Washington, DC, we evaluated the efficacies of oil, imidicloprid (Merit, Imicide), acephate (Acecap), an undisclosed neonicotinoid using the Arbor-jet system, and the growth regulator pyriproxfen (Distance). Oil, Merit, and Distance significantly reduced scale abundance relative to control levels. Parasitoid emergence showed a similar pattern to that of scale abundance, although parasitoid movement and generalist predator abundance did not differ among treatments. Our results suggest that some chemical controls are effective against elongate hemlock scale. Further, limited disruption of natural enemy communities by chemical application may promote sustainable biological control of scales during times when population levels are low or moderate.

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(3:30) Blood feeding patterns of *Aedes aegypti* and *Aedes albopictus* in Thailand

Alongkot Ponlawat, Department of Entomology, Cornell University, Ithaca, NY

Aedes aegypti and *Ae. albopictus* were collected with aspirators from Mae Sot, Nakhon Sawan, Nakhon Ratchasima, Surat Thani, and Phatthalung study sites in Thailand from July 2003 though April 2004. The sandwich-B ELISA was employed to analyze 1,021 blood-fed specimens, and 85% reacted to specific host(s). *Aedes aegypti* mainly fed on humans (99%, 658/664) in single meals, and 97%, (86/88) of multiple meals included at least one human host. A low frequency of other hosts including bovine, swine, cat, rat, and chicken were less than 1%. An even higher percentage of human feeding was detected in *Ae. albopictus*. Hosts of *Ae. albopictus* collected from two sites in southern Thailand were primarily human (100%) from both single and mixed meals. In double meals of *Ae. albopictus*, we detected that 3.8% (n=4) were from swine-human, and less than 1% (n=1) from dog-human and cat-human. Forage ratios for *Ae. aegypti* indicated that human, dog, swine, and goat were preferred hosts in order of preference. In contrast, bovine and chicken were avoided hosts for this species in Thailand.

(4:00) Oriental Fruit Moth Biology and The Changing Pest Management Paradigm in Eastern Tree Fruits

Clayton T. Myers, USDA-ARS Appalachian Fruit Research Station, Kearneysville, WV

Oriental fruit moth (OFM), *Grapholita molesta* (Busck) is a major pest of peach and apple production throughout the eastern United States. Since the 1950's, OFM has been managed in commercial orchards with a wide array of broad spectrum insecticides. Since 1998, outbreaks of OFM (and also codling moth) have re-established this pest as a major economic concern. Because of this re-emergence, it was necessary to revisit questions about basic OFM biology, in order to understand how to apply modern IPM tactics to the problems surrounding this troublesome pest, and also to develop more sustainable tactics for the future.

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