# Entomological Society of America

# Eastern Branch

81st Annual Meeting

March 7-9, 2010

Sheraton Annapolis

Annapolis MD

***Connecting Academia with Industry***

# The Program Encapsulated – 2010

**Sunday, March 7**

| | | | |
|---|---|---|---|
| **Morning** | Exec Committee | 8:00-12:00 | Selby Room |
| | Local Arrangements | 8:00-5:00 | Chester Room |
| **Afternoon** | Registration | 12:00-5:00 | Foyer |
| | It's a Bug's World | 1:00-5:00 | Wye Room |
| | Local Arrangements | 8:00-5:00 | Chester Room |
| | Poster Setup | 1:00-5:00 | Admiral's Ballroom |
| | Exhibit Setup | 1:00-5:00 | Admiral's Ballroom |
| | Student Oral Competition Part I | 2:00-5:00 | Rhode Room |
| **Evening** | President's Informal Reception | 5:30-7:00 | Admiral's Ballroom |
| | Plenary Session | 7:00-9:00 | Wye Room |

**Monday, March 8**

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|---|---|---|---|
| **Morning** | Registration | 8:00-5:00 | Foyer |
| | Local Arrangements | 8:00-5:00 | Chester Room |
| | Student Poster Competition | 8:00-5:00 | Admiral's Ballroom |
| | Submitted Posters | 8:00-5:00 | Admiral's Ballroom |
| | IDEP Symposium | 8:00-12:00 | Rhode Room |
| | Vegetable and Field Crop Symposium | 8:00-12:00 | Severn Room |
| | Student Oral Competition Part II | 8:00-10:30 | Glebe Room |
| **Afternoon:** | Industry Symposium | 1:00-5:00 | Severn Room |
| | Submitted Oral Presentations | 1:00-4:30 | Glebe Room |
| | Student Symposium | 1:00-5:00 | Rhode Room |

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|---|---|---|---|
| **Evening:** | President's Reception | 5:30-7:00 | Admiral's Ballroom |
| | Banquet and Awards | 7:30-9:00 | Wye Room |
| | Linnaean Games | 9:00-11:00 | Rhode Room |

**Tuesday, March 9**

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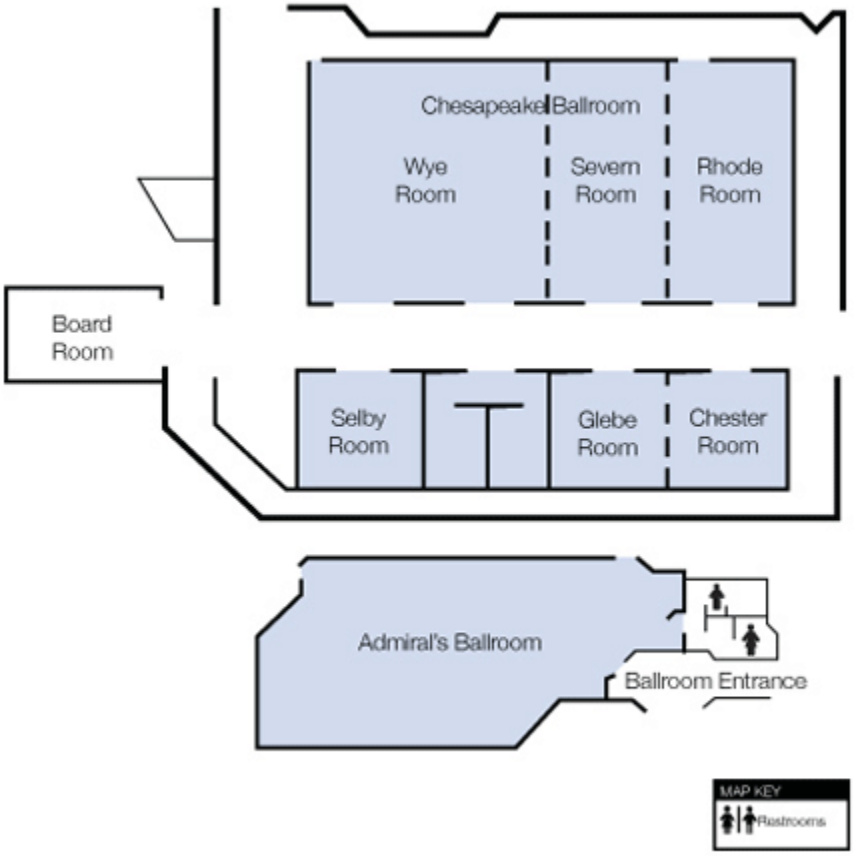
|---|---|---|---|
| **Morning:** | Final Business Meeting | 7:00-8:00 | Wye Room |
| | Registration | 8:00-12:00 | Foyer |
| | Local Arrangements | 8:00-12:00 | Chester Room |
| | IPM 2010 Symposium | 8:00-11:00 | Severn Room |
| | Urban Symposium | 8:00-12:00 | Glebe Room |
| | Submitted Oral Presentations | 8:00-9:30 | Selby Room |
| | Adjourn | 12:00 | |

# Floor Plan


Chesapeake Ballroom
Wye Room
Severn Room
Rhode Room
Board Room
Selby Room
Glebe Room
Chester Room
Admiral's Ballroom
Ballroom Entrance
MAP KEY
Restrooms

# 2010 Sponsors

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# 2010 Eastern Branch ESA Award Winners

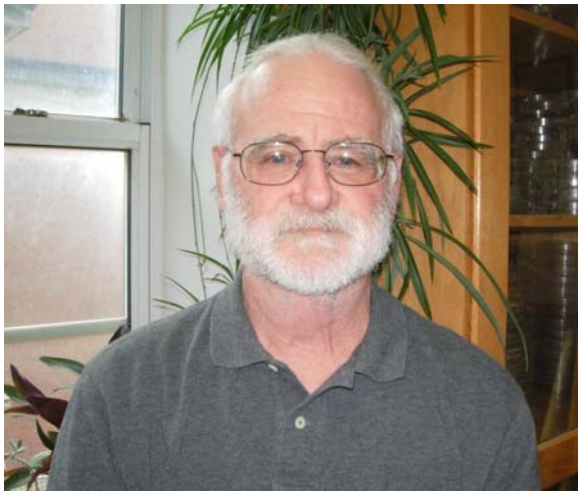
## ESA Achievement Award in Teaching

**Dr. James Liebherr** has been a member of the Department of Entomology faculty at Cornell University since 1983. His areas of expertise are systematics and biogeography.
He has degrees from University of Wisconsin (BA, 1972), Cornell University (MS, 1974), and University of California, Berkeley (PhD, 1983). During his time at Cornell, Dr. Liebherr has taught six different courses and 17 graduate students have received their Ph.D. or M.S. degrees under Dr. Liebherr's guidance as their major professor. The major courses that Dr. Liebherr has taught include Insect Biology (the general entomology course for undergraduate majors, taught 9 times), Historical Biogeography (a graduate level course co-taught with a botanical systematist, taught 7 times) and Maggots, Grubs and Cutworms: Larval Insect Biology (an upper level undergraduate course, taught 4 times).

## ESA Achievement Award in Extension

**Dr. Doug Pfeiffer** is a Professor in the Department of Entomology at Virginia Tech. and works with tree fruit, small fruit, and wine grape industries. In the Extension component of his three-way split, he has maintained a balance between traditional extension outlets and more modern and innovative approaches. He has developed and maintains a public-access web site, as well as enrollment-only project management sites. These sites allow e-mail to the entire groups or subgroups, and two-way transfer of files through drop boxes and mail. The enrolled groups can be polled for rapid assessment of grower or agent needs. But the use of electronic information transfer has not replaced traditional, face-to-face interactions with clientele. Dr. Pfeiffer participates in in-season meetings in grower orchards and vineyards, as well as more formal winter conferences supporting tree fruit and vineyard industries. Dr. Pfeiffer received his Ph.D. in 1982 from Washington State University where he studied nitrogen relations between pear psylla and pear trees under Dr. Everett Burts at the Tree Fruit Research Station in Wenatchee.

# Eastern Branch L. O. Howard Distinguished Achievement Award



**Dr. Galen P. Dively** is an emeritus professor in the Department of Entomology at the University of Maryland. He received his B.S. (1966) in biology at Juniata College and M.S. (1968) and Ph.D. (1974) in entomology from Rutgers University. He joined the department in 1972 and worked as an Extension Specialist in Agricultural IPM for 34 years. In this role, Dr. Dively served as the State IPM Coordinator for 16 years, developed sampling and decision-making guidelines to reduce pesticide use in many vegetable and field crops, and was actively involved in numerous IPM educational and demonstration activities. Many of his contributions to agricultural IPM have been adopted in other states and his work was recognized by his receipt of the University of Maryland Faculty Award in Extension in 1992 and the Eastern Branch Distinguished Achievement Award in Extension in 1993. Later in his career at Maryland, Dr. Dively has collaborated with the pesticide industry to provide laboratory bioassay services for baseline susceptibility studies and monitoring of resistance development in Colorado potato beetle populations to new insecticides. Since this retirement in 2006, he continues to conduct research on ecological risk assessment of transgenic insecticidal crops, sublethal effects of pesticides on honey bee colony health, efficacy evaluation of organic insecticides, and studies addressing information gaps in the biology and management of emerging pest species. He is best known across the society for his research on the effects of Bt corn on non-target beneficial arthropods and has served on several scientific panels addressing this issue. During his career, Dr. Dively trained 31 graduate students receiving either Ph.D. or M.S. degrees, and published with his students and colleagues 52 referred papers, 10 book-chapters, 46 extension publications, and over 200 technical papers. He enjoys fishing and sailing on the Chesapeake Bay.

## Herb Streu Meritorious Service Award


Since October 2001, **Faith B. Kuehn** has served as Plant Industries Administrator for the Delaware Department of Agriculture. Specific program responsibilities include nursery inspection and certification, apiary licensing and inspection, surveys for noxious weeds and invasive species, and permitting for the transport of plant pests and genetically-modified plants. In 2006, she began a project to catalog native bees in Delaware's vegetable production areas, and work with farmers to establish bee conservation practices on their farms. Faith represents Delaware on the National Plant Board.

In 1984, she received a Ph.D. in Entomology from the University of Arizona. Before coming to the Delaware Department of Agriculture, Faith worked as Museum Director for the Insectarium in Philadelphia; in Research, Development, Marketing, and Technical Support positions within E.I. DuPont de Nemours & Co.'s Crop Protection Division; and as a small business owner.

Faith joined the ESA in 1978 as a graduate student, and has served the society at both the branch and national levels. For the Annual Meetings, she has organized Program and other Symposia on cultural entomology and insect conservation. For the Eastern Branch, she has served as Outreach Chair since 2003, each year organizing "It's a Bug's World", the public outreach program held during the Annual Meeting. She has served as Program Co-Chair and organized symposia for the Eastern Branch. Faith is also a member of the Pennsylvania Entomological Society and the American Entomological Society, serving the latter as Treasurer for 4 years.

One of Faith's consuming interests is exploring connections between art and the science of insect life. This involves investigating art that reflects the structure, function and cultural connections of insects, with a special emphasis on insect jewelry.

## John Henry Comstock Award


**Dr. Gaylord A. Desurmont** is a postdoctorate researcher at Cornell University. He received an undergraduate degree in Sciences and Biology in Douai (France), and a M.S. degree in Agronomy and Agricultural Techniques in Dijon (France) before moving to the U.S. to complete graduate studies in Entomology at Cornell University, where he received a M.S. degree in 2005 and a Ph.D. degree in 2009.

Gaylord's research focuses on an emerging invasive landscape pest in the Northeast U.S. and Canada, viburnum leaf beetle *[Pyrrhalta viburni* (Paykull)], under the guidance of Dr. Paul Weston. Viburnum leaf beetle is a leaf-feeding chrysomelid native to Eurasia causing extensive loss of native and exotic viburnums in natural areas and managed landscapes. Gaylord's research aimed at understanding the ecology of viburnum leaf beetle in its native and introduced range and exploring potential management tactics, including but not limited to the use of biological control agents. Over the course of his graduate research, he evaluated the potential of the native generalist predator *Podisus maculiventris* (Say) (Heteroptera: Pentatomidae) for augmentative biological control and of a European egg parasitoid *Aprostocetus* sp. (Hymenoptera: Eulophidae) for classical biological control. In addition, his research uncovered previously undocumented aspects of viburnum leaf beetle ecology (e.g. aggregative oviposition) and insect-plant interactions (e.g. viburnum wound response to oviposition), with potential applications to pest management. Overall, his graduate research resulted in 9 publications, including a book chapter, and over 15 presentations at scientific meetings.

Gaylord's postdoctoral work in Agrawal laboratory focuses on understanding the evolution of viburnum leaf beetle preferences and viburnum plant defenses.

## Asa Fitch Award

**Eric Bohnenblust** graduated with a B.S. in Biology from Gettysburg College. After graduation, Eric worked at the Penn State Fruit Research and Extension Center for a year under the guidance of Drs. Larry Hull and Greg Krawczyk on the Area-Wide Sex Pheromone Mating Disruption Program for codling moth and oriental fruit moth in tree fruits. Eric then pursued a master's degree in Entomology at Penn State continuing to work under Drs. Hull and Krawczyk. During his master's, Eric's work focused on mating disruption of codling moth and oriental fruit moth, including mating disruption efficacy trials, and effective monitoring of codling moth and oriental fruit moth. Currently, Eric is pursuing a doctoral degree in Entomology at Penn State in field crops under the guidance of Dr. John Tooker.

**Sunday, March 7, 2010**

**Morning**

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**Registration** **Foyer** **8:00-5:00**

Yong-Lak Park, West Virginia University

Your chance to buy a raffle ticket to support the efforts of the Entomological Foundation's supports of educational efforts. The drawing will be made at the President's Reception on Monday evening!

**Local Arrangements** **Chester Room** **8:00-5:00**

Pete Schultz, Virginia Tech

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## Afternoon

**Student Oral Presentation Competition*** **Rhode Room** **2:00-5:00**

*See appendix C for abstracts of talks for this session

Moderator**:** Timothy Tomon, West Virginia Dept. Agriculture

2:00 **Trophallaxis and prophylaxis: Social immunity in the carpenter ant *Camponotus pennsylvanicus.*** Casey Hamilton, Department of Biological Sciences, Towson University, 8000 York Rd., Towson, MD 21286; Rebeca Rosengaus, Department of Biology, Northeastern University, 360 Huntington Ave., Boston, MA 02115

2:12 **Distribution and incidence of *Nosema ceranae* in Virginia honey bee colonies**. Brenna E. Traver, Virginia Polytechnic Institute and State University, Department of Entomology, Blacksburg, VA 24061; Richard D. Fell, Virginia Polytechnic Institute and State University, Department of Entomology, Blacksburg, VA 24061

2:24 **Native bee crop pollinators in southwest Virginia and the influence of habitat on their diversity.** Nancy Adamson, Richard Fell, Donald Mullins, Entomology Dept, 216A Price Hall (0319), Blacksburg, VA 24061

2:36 **Extent of forested settings around Virginia vineyards and landscape ecology of wild grape, *Vitis* spp.** Timothy A. Jordan, Douglas G. Pfeiffer, 216A Price Hall, Department of Entomology, Virginia Tech, Blacksburg, VA 24061

2:48 **Evaluating host plant preference of harlequin bug, *Murgantia histrionica* (Hahn) (Hemiptera: Pentatomidae).** Anna K. Wallingford, 216 Price Hall, Virginia Tech, Blacksburg, VA 24060; Peter B. Schultz, 1444 Diamond Springs Rd., Hampton Roads AREC, Virginia Beach, VA 23455; Thomas P. Kuhar, 33446 Research Dr., Eastern Shore AREC, Painter, VA 23420

3:00 **Alkylpyrazines: Alarm pheromone components of the little fire ant, *Wasmannia auropunctata* (Roger) (Hymenoptera: Formicidae).** Elisa J. Troyer, 1200 Park Rd., Harrisonburg, VA 22802; David N. Showalter, 1200 Park Rd., Harrisonburg, VA 22802; Eric B. Jang, 64 Nowelo Street, Hilo, HI 96720; Matthew S. Siderhurst, Harrisonburg, VA 22802

3:12 **Field studies of *Wasmannia auropunctata* (Roger) alkylpyrazines: Towards management applications.** Nathan T. Derstine, Elisa J. Troyer, David N.

Showalter, 1200 Park Rd., Harrisonburg, VA 22802; Eric B. Jang, 64 Nowelo Street; Hilo, HI 96720; Matthew S. Siderhurst, 1200 Park Rd., Harrisonburg, VA 22802

3:24 **Determining the source of soybean aphid (*Aphis glycines*) populations in Pennsylvania.** Amanda C. Bachmann, 501 ASI, University Park, PA 16802; Andrew P. Michel, 210 Thorne, OARDC, Wooster, Ohio 44691; Shelby J. Fleischer, 501 ASI, University Park, PA 16802

3:36 **Break**

3:48 **Distribution of *Chaetodactylus krombeini* in nests of *Osmia cornifrons*: Implications for population management.** Matthew I. McKinney, Yong-Lak Park, Entomology Program, Division of Plant and Soil Sciences, West Virginia Univ, Morgantown, WV 26506

4:00 **Behavioral characteristics of neonate European corn borer, *Ostrinia nubilalis* (Hubner), on Bt corn.** Janine M. Razze and Charles E. Mason, 4105 Scholar Drive, Newark, DE 19711

4:12 **Host-associated differentiation in a leafmining fly, *Phytomyza glabricola* (Diptera: Agromyzidae) on hybridizing plants.** Julie B. Hebert, David J. Hawthorne, Dept. of Entomology, 4112 Plant Science Building, College Park, MD 20742

4:24 **Impacts of pesticide combinations on honey bee (*Apis mellifera* L.) development.** Daniel R. Schmehl, James L. Frazier, Penn State University, 501 Ag. Science and Industries Building, Shortlidge Road, University Park, Pennsylvania 16802

4:36 **Applying metacommunity concepts to urban stream ecology: A preliminary evaluation of species sorting in a caddisfly (Trichoptera) assemblage at an urban headwater stream.** Robert F. Smith, William O. Lamp, Department of Entomology, 4112 Plant Sciences Building, University of Maryland, College Park, MD 20742

4:48 **Efficacy of bioinsecticides on thrips.** Heather E. Andrews, Dept. of Entomology, 209 Price Hall, Blacksburg, VA 24061; Thomas P. Kuhar, Eastern Shore AREC, 33446 Research Drive, Painter, VA 23420; Pete Schultz, Hampton Roads AREC, 1444 Diamond Springs Road, Virginia Beach, VA 23455; Ames Herbert, Tidewater AREC, 6321 Holland Road, Suffolk, VA 23437; Helene B. Doughty, Hampton Roads AREC, 1444 Diamond Springs Road, Virginia Beach,

VA 23455; Doug Pfeiffer, Department of Entomology, 205C Price Hall, Virginia Tech, Blacksburg, VA 24061

**Public Outreach Program**

**It's a Bug's World** **Wye Room** **1:00-5:00**

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

## Evening

**Presidents Informal Reception** **Admiral's Ballroom** **5:30-7:00**

(open to all attendees, including students)

**Plenary Session** Wye Room 7:00-9:00

### 2010 Plenary Speaker

Presentation title: "**The Academic Bridge to Industry...Closing the Gap"**

**Dr. Wayne Surles** was born in Fredericksburg ,Virginia , May 1946. Wayne says, "I grew up during the optimistic post WW II and tumultuous Viet Nam era of the 60's. Began graduate program at Virginia Tech. in June 1968 but Pres. Lyndon Johnson graciously invited me to participate in the Viet Nam conflict so I left for two years. I was trained in combat arms, but President Nixon ordered a troop withdrawal from Viet Nam and I serendipitously ended up serving as a Medical Technician in Nurnberg, Germany where Kathy and I married. Returned to Virginia Tech in 1970 and completed my graduate studies with a focus on biological control of weeds. Published extensively on *Rhinocyllus conicus* control of *Carduus nutans*.

When I departed Virginia Tech (February 1976) to join the British agrichem company, Fisons Corporation, in Boston, my intent was to broaden my perspective in the discipline of entomology. I committed to stay for three years but remained for 21 and participated in innumerable roles as I "climbed the industry ladder" and helped to grow the company. I survived 8 mergers, 10 acquisitions, various joint ventures and became a Director on the management team, but departed in 1997 when AgrEvo became Aventis--- now owned by Bayer. I joined W L Gore and Company for a brief stint with GORE TEX ® products; however, I discovered that physics and chemistry did not satisfy my passion to work with biology/chemistry. Thus, I returned to the agrichemical industry as a consultant. In 2004 I was offered the opportunity to participate in regulatory and I joined the state of Virginia as Program Manager in the Office of Pesticide Services (OPS). In 2008, I retired from OPS and returned to consulting.

Somewhere along the way I moved away from my technical arena of specialization and evolved to become a business administrator and communicator with a diversified technical background. My industrial experiences have been global and my on-the-job business and management training has been fortified with an array of additional educational programs at: Penn State; Wharton School of Business; American Management Association and others.

I am married to Kathryn L. Jones, father of two sons, Nathan and Matt, and a devoted supporter of Virginia Tech."

**Additional Plenary Speaker: Paul Borth**

**President of Plant-Insect Ecosystem Section (PIE)**

**"Overview of PIE Activities" – 10 minutes**

**Eastern Branch Awards**

**L. O Howard**

**Herb Streu Meritorious Service**

**Distinguished Achievement Award for Teaching**

**Distinguished Achievement Award for Extension**

## Monday March 8, 2010

### Morning

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Student Poster Competition Admiral's Ballroom 8:00-5:00

See Appendix A for abstracts of poster of this section

[Author attendance at posters required during Presidents Informal Reception]

1. **Feeding preference of spined soldier bugs (Hemiptera: Pentatomidae) on mealworms (Coleoptera: Tenebrionidae)**. Sudan Gyawaly, Entomology Program, Division of Plant and Soil Sciences, West Virginia University, Morgantown, West Virginia 26506;Yong-Lak Park, Entomology Program, Division of Plant and Soil Sciences, West Virginia University, Morgantown, West Virginia 26506

2. **Superparasitism of a sub-optimal host species by *Cotesia marginiventris* and resulting mortality.** Christina Harris, Jim Tumlinson, 106 Chemical Ecology Lab, University Park, PA 16802

3. **Phylogenetic exploration of mating systems in the temperate Leiobunine harvestmen.** Mercedes Burns, Jeffrey Shultz, 4112 Plant Sciences Bldg, University of Maryland, College Park, MD 20742

4. **Won't you be my neighbor: Community interactions between *Sirex noctilio* and the insect assemblage of a North American pine forest.** Brian M. Thompson, Daniel Gruner, 4112 Plant Sciences Bldg.; University of Maryland; College Park, Maryland 20742

5. **Associations of macroinvertebrate communities with environmental conditions of agricultural drainage ditches on Maryland's Eastern Shore.** Alan W. Leslie, William O. Lamp, 4112 Plant Science Bldg; College Park, MD 20742

6. **Does previous exposure to a host plant affect oviposition preference in *Manduca sexta*?** Caitlin E. Burkman, Mark A. Willis, 10900 Euclid Ave; DeGrace Hall, Case Western Reserve University, Cleveland, OH 44106

7. **Symbiotic bacteria present in the potato leafhopper, *Empoasca fabae***. Bridget D. DeLay, William Lamp, University of Maryland, Department of Entomology, 4112 Plant Sciences Bldg, College Park, MD 20742

8. **Peptidal control of crop function in *Drosophila melanogaster***. Leila J. Crisson, Aaron T. Haselton, Department of Biology, 1 Hawk Drive, SUNY New Paltz, New Paltz, NY 12561

9. **Temporal and acoustic attributes of the pathogen alarm response in *Zootermopsis angusticollis*.** Ben R. Russell, 50 Chester St Apt 11, Allston, MA 01803; Karen M. Warkentin, 5 Cumming Street, Boston University, Boston, MA 02115; Rebeca B. Rosengaus, 360 Huntington Avenue, 134 Mugar Life Science Building, Boston, MA 02115

10. **Wilting of cucurbit plants in seedling stage due to squash bug (Hemiptera: Coreidae) adult feeding.** Vimal K. Varghees, Vicki A. Kondo, Yong-Lak Park, Division of Plant and Soil Sciences, West Virginia University, P O Box 6108, Morgantown, West Virginia 26506

**Morning**

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**Submitted Poster Presentations** Admiral's Ballroom 8:00-5:00

See Appendix B for abstracts of poster of this section

[Author attendance at posters during Presidents Informal Reception]

11. **Activity of *Bacillus thuringiensis* against *Pryeria sinica* Moore (Lepidoptera: Zygaenidae), an invasive pest of *Euonymus*.** Robert R. Farrar, Jr., Michael B. Blackburn, USDA-ARS-IIBBL, Bldg. 011A, Rm. 214, BARC-West, Beltsville, MD 20705

12. **Brood drench with Honey B Healthy to control *Nosema ceranae*.** Jim Amrine, 24 Pinnacle Lane, Morgantown, WV 26508; Bob Noel, 108 Blackiston Ave, Cumberland, MD 21502

13. **Functional morphology of the axillary organs of *Hericia janehenleyi* Fashing (Acari: Astigmata: Algophagidae).** Norman J. Fashing, Department of Biology, College of William and Mary, Williamsburg, VA 23187-8795

14 **Species diversity of dung beetles (Scarabaeidae, Geotrupidae, and Trogidae) collected on Maryland's Eastern Shore.** Lauren Brenneman, Dana L. Price, Department of Biological Sciences, Salisbury University, 1101 Camden Avenue, Salisbury, Maryland 21801

15. **Providing individualized student focus in an on-line IPM course.** Douglas G. Pfeiffer, Department of Entomology, Virginia Tech, Blacksburg, VA 24061

16. ***Halyomorpha halys* (Stål) (Hemiptera: Pentatomidae) survival success when subjected to different diets**. Thomas Konar, George C. Hamilton, Dept. of Entomology, Rutgers University, 93 Lipman Drive, New Brunswick, NJ 08901

17. **Codling moth: Azinphos-methyl susceptibility levels In New York**. Peter J. Jentsch, Zeoli Zeoli, 3357 Route 9W, PO Box 727, Highland, NY 12528; Deborah Breth, Lake Ontario Fruit Program - Cornell Cooperative Extension, 12690 Route 31, Albion, NY 14411

18. **Cerambycidae associated with baited funnel traps in Virginia**. Eric R. Day, David R. Owens, Department of Entomology, Virginia Tech, Blacksburg, VA 24061

19. **Description of a hemlock stand potentially resistant to hemlock wooly adelgid**. Tim Freiday, James Lashomb, Dept of Entomology, Blake Hall, Rutgers University, New Brunswick, New Jersey 08901

20. **Prospects for biological control of *Halyomorpha halys* in the US: What are its natural enemies in its native Asian range?** Kim A. Hoelmer, Kathleen Tatman, USDA-ARS BIIR, 501 S. Chapel St., Newark, DE 19713; Seunghwan Lee, Dept. Agric. Biotecnol., Seoul National Univ., Seoul, Republic of Korea; Masatoshi Toyama, Entomology Research Team, National Institute of Fruit Tree Science NARO, NARO, Tsukuba, Japan; Amanda Koppel, Dept. Entomology, Virginia Tech, Blacksburg, VA 24061

21. **Detection of insects using unmanned aerial vehicles**. Yong-Lak Park, West Virginia University, Entomology Program, Division of Plant and Soil Sciences, Morgantown, WV 26506; Srikanth Gururajan, West Virginia University, Department of Aerospace and Mechanical Engineering, Morgantown, WV 26506

22. **Phytoplasma prevalence in leafhoppers found in Canadian vineyards**. Julien Saguez, Agriculture and Agri-Food Canada, Horticultural Research and Development Centre, 430 Gouin Boulevard, Saint-Jean-Sur-Richelieu, QC, CANADA J3B 3E6; Chrystel Olivier, Agriculture and Agri-Food Canada, Saskatoon Research Centre, 107 Science Place, Saskatoon, SK, CANADA S7N 0X2; Jacques Lasnier, Co-Lab R&D Division of Ag-Cord Inc, 655 Delorme, Granby, QC, CANADA J2J 2H4; Charles Vincent, Agriculture and Agri-Food Canada, Horticultural Research and Development Centre, 430 Gouin Boulevard, Saint-Jean-Sur-Richelieu, QC, CANADA J3B 3E6

23. **Sublethal effects of imidacloprid on honey bee colony health**. Galen P. Dively, Mike Embrey, Amy Miller, Brent Buccine, Terry Patton, 4112 Plant Sciences Bldg, University of Maryland, College Park, Maryland 20742

24. **Polyandry and fecundity in the emerald ash borer.** Claire E. Rutledge, Department of Entomology, The Connecticut Agricultural Experiment Station, 123 Huntington St, New Haven, CT 06504; Melody A. Keena, USDA Forest Service, Northern Research Station, 51 Mill Pond Road, Hamden, CT 06514

25. **Current status of billbug pest management in northern Virginia orchardgrass**. William R. Kuhn, R.R. Youngman, C. Laub, K.P. Love, T.A. Mize, S. Wu, Department of Entomology, Virginia Tech, Blacksburg VA 24061

26. **Artificial container color and size affecting mosquito oviposition site selection**. Gary Torrisi, University of Nebraska, Sarasota Springs NY

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**IDEP Symposium** Rhode Room 8:00-12:00

**"Insect Detection, Evaluation and Prediction Symposium"**

Organizers: Robert Trumbule, University of Maryland

**8:00 Introduction**

**8:10 The role of Extension in the fight against invasive species.** Mary Kay Malinoski, Regional Specialist, Entomology – IPM, University of Maryland, Home and Garden Information Center, 12005 Homewood RD, Ellicott City, MD 21042

**8:40 Recent advances in pheromone chemistry of cerambycid beetles and potential applications for invasive species**. L. M. Hanks, Dept. of Entomology, University of Illinois at Urbana-Champaign; J. G. Millar, Dept. of Entomology, University of California at Riverside; J. D. Barbour, Southwest Idaho Research & Extension Center, Parma

**9:10 Invasion of viburnum leaf beetle: Understanding susceptibility to infestation of native and exotic viburnums**. Gaylord A. Desurmont, Anurag Agrawal, Ecology and Evolutionary Biology Department, Cornell University, Ithaca, NY

**9:40 Break**

**10:00 Using native wasps to survey for emerald ash borer: Utilizing your local wasp resource, mobile colony comparison trials and wasp husbandry**. Philip D. Careless, Steve A. Paiero, Stephen A. Marshall, Bruce D. Gill, Insect Systematics Lab, University of Guelph, Guelph, Ontario N1G 2W1 Canada, and Canadian Food Inspection Agency, 960 Carling Avenue, Ottawa, Ontario K1A 0C6 Canada

**10:30 Parasitic Hymenoptera: Invasive species and biocontrol**. Michael Gates, Systematic Entomology Laboratory, USDA, ARS, PSI, Smithsonian Institution, NMNH, NHB 168, 10th & Constitution Avenue, Washington DC 20013-7012

**11:00 Discussion**

**11:30 Adjourn**

**Vegetable and Field Crop Symposium** Severn Room 8:00-12:00

"**Northeast Vegetable and Field Crop Symposium**"

Organizers: Joanne Whalen, University of Delaware. Gerald Brust, University of Maryland, and D. Ames Herbert, Virginia Tech

8:00 Introduction: Joanne Whalen, University of Delaware

8:05 **What happened with soybean insects in Virginia in 2009**? - D. Ames Herbert and Sean Malone, Virginia Tech

8:25 **Update on *Dectes* stem borer in soybeans** – Bill Cissel and Joanne Whalen, University of Delaware

8:40 **What happened with the Western Bean Cutworm in Pennsylvania in 2009? -** John Tooker, Penn State University

8:55 **Update on insecticide efficacy trials on fruiting veggies, potatoes, and cole crops**. Tom Kuhar and Helen Doughty, Virginia Tech

9:10 **Update on insecticide efficacy trials on cucurbits and sweet corn**. Joanne Whalen and Bill Cissel, Department of Entomology, University of Delaware

9:25 **Trying to mitigate pest problems in temperate-zone grown vegetables by use of a tropical cover crop**. Cerruti R.R. Hooks, and Jermaine Hinds, University of Maryland and Koon-Hui Wang, University of Hawaii

9:45 **Aphid communities, migration, and CMV epidemiology in snap beans**. Shelby Fleischer and Fred Gildow, Penn State University; Brian Nault and Denis Shah, Cornell University

10:05 **Use patterns of neonicotinoid insecticides on cucurbit crops and their potential exposure to honey bees**. Galen Dively, Amy Miller, and Terry Patton, University of Maryland

10:25 **Efficacy and economics of integrating insecticides and biological control to manage European corn borer in sweet corn**. Jeffrey Gardner, Cornell University

10:45 **New Insecticide Update from Syngenta**. Erin Hitchner, Syngenta Crop Protection

11:00 **Update on SMARTSTAX development and use in corn, and Radiant use in vegetables**. Brian Olson, Dow AgroSciences

11:20 State Reports and General Discussion

**Student Oral Presentation Competition* Glebe Room 8:00-10:30**

*See appendix C for abstracts of talks for this session

Moderator**:** Timothy Tomon, West Virginia Dept. Agriculture

8:00 **Effect of floral-supplemented filter strips on beneficial insect community in soybeans.** Laura C. Moore, Galen P. Dively, Amy Miller, Terry Patton, Dept of Entomology, 4112 Plant Sciences Building, University of Maryland, College Park, MD 20742

8:12 **Plant defenses modulate predator-prey interactions differently depending on herbivore density**. Alexander J. Forde, University of Maryland, 4112 Plant Sciences Building, College Park, MD 20742; Nora C. Underwood, Biological Science, Florida State University, 319 Stadium Drive, Tallahassee, FL 32306

8:24 **Bean leaf beetle and bean pod mottle virus: New research findings in Virginia.** Meredith E. Cassell, Virginia Tech, Price Hall, Blacksburg, VA 24061; Sue Tolin, Virginia Tech, Department of Plant Pathology, Old Glade Road, Blacksburg, VA 24060; Thomas P. Kuhar, Virginia Tech, Eastern Shore AREC, 33662 Research Drive, Painter, VA 23420; Pete Schultz, Hampton Roads Agric. Res. and Ext. Center, 1444 Diamond Springs Road, Virginia Beach, VA 23455

8:36 **Assessing *Eucryptorrhynchus brandti* as a potential carrier for *Verticillium albo-atrum* from infected *Ailanthus altissima*.** Amy L. Snyder, Scott M. Salom, Loke T. Kok, Virginia Polytechnic Institute and State University, Department of Entomology, Blacksburg, VA 24061; Gary J. Griffin, Virginia Polytechnic Institute and State University, Department of Plant Pathology, Blacksburg, VA 24061; Donald D. Davis, The Pennsylvania State University, Department of Plant Pathology, University Park, PA 16802

8:48 **RNA viruses in the pollinator community: Their distribution, inter-species transmission and health impacts on bees.** Rajwinder Singh, Abby L. Kalkstein, Diana Cox-Foster, Edwin Rajotte, Ag Sciences & Industries Building, University Park, Pennsylvania 16802

9:00 **Impacts of reduced-risk insecticides on blueberry spanworm and bees in wild blueberry.** Krilen Ramanaidu, Dept. Environmental Sciences, Nova Scotia Agricultural College, Truro, NS, NS; Angela Gradish, School of Environmental Sciences, University of Guelph, Guelph, ON; Cynthia Scott-Dupree, School of Environmental Sciences, University of Guelph, Guelph, ON; David Percival, Dept. Environmental Sciences, Nova Scotia, Agricultural College, Truro, NS; Chris Cutler, Dept. Environmental Sciences, Nova Scotia, Agricultural College, Truro, NS; John M. Hardman, Agriculture and Agri-Food Canada, Kentville, NS, CANADA

9:12 **Cancelled Submission**

9:24 **Intercropping for biological control of European corn borer (*Ostrinia nubilalis* Hübner) in bell peppers.** Matthew W. Bickerton, 9 Bartlett St., New Brunswick, NJ 08901; George C. Hamilton, Kristian E Holmstrom, Rutgers Dept. of Entomology, 93 Lipman Dr., New Brunswick, NJ 08901

9:36 **Social immunity in the carpenter ant *Camponotus pennsylvanicus*: The role of trophallaxis in colony-wide disease resistance.** Brian T. Lejeune, 134 Mugar, Life Sciences Building, Biology Department, 360 Huntington Ave., Boston, Massachusetts 02115; Rebecca Rosengaus, 134 Mugar Life Sciences Building, Biology Deparment, 360 Huntington Ave, Boston, Massachusetts 02115

9:48 **Molecular identification of crop pollen indicates foraging pattern of native bees.** C. Sheena Sidhu, Pennsylvania State University, Department of Entomology, 501 Agricultural Sciences and Industries Bldg, University Park, PA 16802; Erin E. Wilson, University of California, San Diego, Division of Biological Sciences, Mail Code 0116, 9500 Gilman Drive, La Jolla, CA 92093; Katherine E. LaVan, University of California, San Diego, Division of Biological Sciences, Mail Code 0116, 9500 Gilman Drive, La Jolla, CA 92093; David A. Holway, University of California, San Diego, Division of Biological Sciences, Mail Code 0116, 9500 Gilman Drive, La Jolla, CA 92093

10:00 **Induction of immune responses in larvae of the carpenter ant *Camponotus pennsylvanicus*.** Christopher P. Mackintosh, 134 Mugar Life Sciences Building, Northeastern University, 360 Huntington Avenue, Boston, MA 02115; Rebecca Rosengaus, 134 Mugar Life Sciences Building, Northeastern University, 360 Huntington Avenue, Boston, MA 02115

10:24 **Adjourn**

## Afternoon

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**Industry Symposium** Severn Room 1:00-5:00

**"An Insider's View of Working in Industry"**

Organizer: **Jackie McKern, Dow AgroSciences**

1:00 **Dispelling the myths of working in industry**. Brian Olson, Dow AgroSciences, 22 Delancey Dr., Geneva, NY 14456.

1:20 **Career paths in industry**: David Mayonado, Monsanto, 6075 Westbrooke Dr., Salisbury, MD 21801

1:40 **A year in the life of an industry scientist working in field crops.** Paul A. Neese, BASF Crop Protection, 26 Davis Drive, Research Triangle Park, NC 27709 USA.2:20 Break (15 minutes)

2:00 **A year in the life of an industry lab/greenhouse scientist.** James Barry, DuPont Crop Protection, 1090 Elkton Road, Newark, DE 19713.

2:20 **A year in the life of an industry field scientist studying urban entomology.** Jackie McKern, Dow AgroSciences, 200 Marlington St., Blacksburg, VA 24060.

2:40 Break

3:00 **Contract research: On the inside now**: Tim White, CMS, INC., P.O. Box 510, Hereford, PA 18056.)

3:20 **The skills you need to get the job you want.** Erin Hitchner, Syngenta Crop Protection, 410 Swing Rd, Greensboro, NC 27409.

3:40 **Question and Answer Session** (A session with refreshments for all students – students welcome after the student symposium)

4:10 **Adjourn**

**Submitted Oral Presentations** Glebe Room 1:00-4:30

Moderator**:** Rajwinder Singh, Penn State University

1:00 **Susceptibility of laboratory and field collected corn Earworm (*Helicoverpa zea*) adults to Lannate® (methomyl) using an adult vial test and selection of a diagnostic dose to determine susceptibility** Hector E. Portillo, DuPont Crop Protection, 1090 Elkton Rd, Newark, DE 19714; Ames Herbert, Virginia Tech Tidewater Agricultural Research and Extension Center; Suffolk, VA; Sean

Malone, Virginia Tech Tidewater Agricultural Research and Extension Center, Suffolk, VA,;Thomas P. Kuhar, Virginia Tech Eastern Shore Agricultural Research and Extension Center, Painter, VA; Joe P. Saienni, DuPont Crop Protection, 1090 Elkton Rd, Newark, DE; Robert W. Williams, DuPont Crop Protection, 13226 Ashford Park Drive, Raleigh, NC, Eric L. Blinka, 76864 Rd 418, Cozad, NE 69130; B. Rogers Leonard, Louisiana State University, 212A Macon Ridge Rd., Winnsboro, LA; William Hutchins, University of Minnesota, St. Paul, MN; Eric C Burkness, University of Minnesota, St. Paul, MN

1:12 **Efficacy of blacklight sampling techniques and a survey of moths in the genus *Papaipema* (Insecta: Lepidoptera: Noctuidae).** Anthony E. McBride, 95 Stillwater Rd., Hardwick, NJ 07825; Matthew S. Wallace, East Stroudsburg University, Moore Biology Hall, Rm 209, East Stroudsburg, PA 18301; Dale F. Schweitzer, 1761 Main Street Port Norris, NJ 08349

1:24 **A comparison of two traps used to monitor brown marmorated stink bug populations.** George C. Hamilton, Dept. of Entomology, Rutgers University, 93 Lipman Drive, New Brunswick, NJ 08901

1:36 **Exploring computer and video technologies in tree fruit extension outreach.** Peter J. Jentsch, 3357 Route 9W, PO Box 727, Highland, NY 12528

1:48 **Predator digestion: Lessons from polyphagous lady beetles.** Donald C. Weber, USDA ARS, Invasive Insect Biocontrol & Behavior Lab, BARC-West Building 011A, Beltsville, MD 20705; Jonathan G Lundgren, USDA ARS, North Central Agricultural Research Lab, 2923 Medary Avenue, Brookings, SD 57006; Zsofia Szendrei, Michigan State University Dept. of Entomology 439 Natural Science Bldg, East Lansing, MI 48824; Matthew H. Greenstone, USDA ARS, Invasive Insect Biocontrol & Behavior Lab, BARC-West Building 011A, Beltsville, MD 20705

2:00 **Importance of predator arrival time on aphid control.** Mark W. Brown, Appalachian Fruit Res. Stn., 2217 Wiltshire Road, Kearneysville, WV 25443

2:12 **A laboratory study to show the response of *Galendromus occidentalis* and *Neoseiulus fallacis* to six reduced risk insecticides.** Noubar J. Bostanian, Agriculture and Agri-Food Canada, 430 Gouin Blvd, St. Jean-sur-Richelieu, Qc. J3B 3E6, Gaétan Racette, Agriculture and Agri-Food Canada, 430 Gouin Blvd, St. Jean-sur-Richelieu, QC, CANADA J3B 3E6

2:24 **Feeding behavior of three leafhopper species on grapevine**. Julien Saguez, Agriculture and Agri-Food Canada, Horticultural Research and Development Centre, 430 Gouin Boulevard; Saint-Jean-Sur-Richelieu, QC, CANADA J3B 3E6; Philippe Giordanengo, Université de Picardie Jules Verne, EA 3900 - Biologie des Plantes et Contrôle des Insectes Ravageurs, 33 Rue St Leu, Amiens,

FRANCE 80 000; Charles Vincent, Agriculture and Agri-Food Canada, Horticultural Research and Development Centre, 430 Gouin Boulevard, Saint-Jean-Sur-Richelieu, QC, CANADA J3B 3E6

2:36 **Control of grape root borer, *Vitacea polistiformis*, using pheromone-mediated mating disruption**. Douglas G. Pfeiffer, Curt A. Laub, Timothy A. Jordan, Anna K. Wallingford, Laura M. Maxey and Meredith Cassell, Dept. Entomology, Virginia Tech, Blacksburg, VA 24061

2:48 **Competitive attraction is a mating disruption mechanism in oriental beetle**. Cesar Rodriguez-Saona, Dean Polk, P.E. Marucci Center, 125A Lake Oswego Rd., Chatsworth, NJ

3:00 **Evaluation of ornamental plants as nectar sources for *Tiphia* parasitoid wasps and as host plants for pest scarab beetles.** Ana Legrand, Department of Plant Science, Univ. of Connecticut, 1376 Storrs Rd. U-4067, Storrs, CT 06269

3:12 **Efficacy of three organic insecticides alone and in combination for control of Colorado potato beetle (*Leptinotarsa decemlineata* [Say]) and eggplant flea beetle (*Epitrix fuscula* [Crotch) in eggplant.** Andrew Cavanagh and Ruth V. Hazzard, 250 Natural Resources Rd, University of Massachusetts, Amherst, MA 01003

3:24 **A new biopesticide based on the bacterium *Chromobacterium subtsugae*.** Timothy Johnson, Marrone Bio Innovations, 14 Baldtop Heights, Danville, PA 17821; Lisa Chansbusarakum, Eunice Tan, Dan Wallner, Anne Murray, Huazhang Huang, Marja Koivunen and Pamela Marrone, Marrone Bio Innovations, 2121 Second Street, Suite B-107, Davis, CA 95618

3:36 **Evaluation of entomopathogenic nematodes against masked chafer white grubs.** Shaohui Wu, 301 B Price Hall; Dept. of Entomology, Virginia Tech, Blacksburg, Virginia 24061; Roger R Youngman, 308 Price Hall, Dept. of Entomology, Virginia Tech, Blacksburg, Virginia 24061; Loke T. Kok, 216 A Price Hall, Dept. of Entomology, Virginia Tech, Blacksburg, Virginia 24061; William R. Kuhn and Curt Laub, 216 A Price Hall, Dept. of Entomology, Virginia Tech, Blacksburg, Virginia 24061

3:48 **Identification and characterization of subterranean termite antifungal genes**. Mark S Bulmer, Towson University, 8000 York Road, Biology Dept., 341 Smith Hall, Towson, MD 21252

4:00 **A contribution to our understanding of the termite family Stolotermitidae (Isoptera).** Jessica L. Ware and David Grimaldi, AMNH, Division of Invertebrate Zoology, 79th and Central Park West, New York, NY 10024

4:12 **Factors affecting induced defenses of broad bean plants in response to pea aphid feeding.** Ezra G. Schwartzberg, Chemical Ecology Lab, Department of Entomology, Center for Chemical Ecology, The Pennsylvania State University; University Park, PA 16802; James H Tumlinson, Chemical Ecology Lab, Department of Entomology, Center for Chemical Ecology, The Pennsylvania State University, University Park, PA 16802

**Student Symposium** Rhode Room 1:00-5:00

**"Pollinator Health and Biodiversity: Unlocking the Key to Society's Future'"**

Organizers: Daniel Schmehl, Pennsylvania State University

1:00 **Symposium Introduction**. Daniel R. Schmehl, SAC Chair, Pennsylvania State University

1:05 **What we don't know about pollinators....can hurt us**. Sam Droege, USGS Native Bee Inventory and Monitoring Laboratory

1:35 **Factors underlying colony losses in honeybees**. Jeff Pettis, USDA-ARS Bee Research Lab

2:05 **Landscapes, biodiversity, and crop pollination: putting native bees into context**. Dan Cariveau, Postdoctoral Research Associate, Department of Entomology, Rutgers University

2:35 **Mating disruption and monitoring of codling moth and oriental fruit moth**. Eric Bohnenblust (Asa Fitch), Graduate Student, Department of Entomology, Penn State University

3:05 **Break**

3:20 **Unraveling the causes of CCD: Role of pathogens, immunity, and stress**. Diana Cox-Foster, Professor, Department of Entomology, Penn State University

3:50 **How patriline diversity within a honey bee colony fuels the productivity of its work force**. Heather Mattila, Assistant Professor, Department of Biological Sciences, Wellesley College

4:20 **Oviposition of viburnum leaf beetle: From ecology to biological control of an emerging pest**. Gaylord Desurmont (Comstock), Postdoctoral Research Associate, Department of Entomology, Cornell University

## Evening

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| President's reception | Admiral's Ballroom | 5:30-7:00 |

Be there for the drawing of the Entomological Foundation Raffle!

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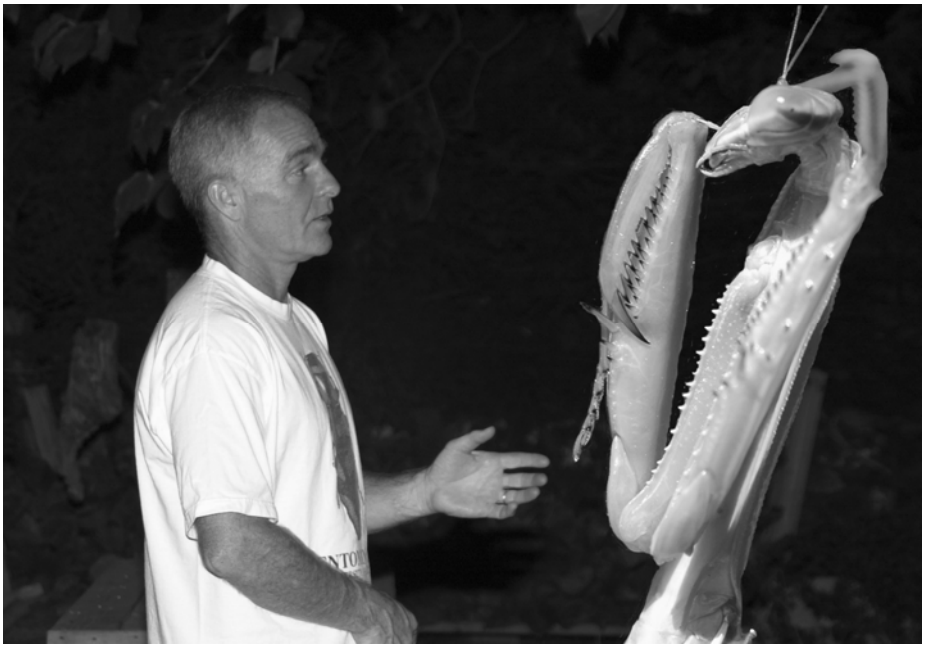
|---|---|---|
| Banquet and Awards | Wye Room | 7:30-9:00 |

**ESA Presidential Remarks**

David Hogg

University of Wisconsin

**2010 Eastern Branch ESA Banquet speaker**



Presentation title: "Local History of Annapolis Area"

**Mike Raupp** is a professor and extension specialist at the University of Maryland at College Park. He earned B.S. and M.S. degrees from Rutgers University and his Ph. D. in entomology at the University of Maryland. His extension programs provide training on the theory and practice of IPM to growers, landscape managers, master gardeners, and private citizens. Mike has taught larval taxonomy, pest management, insect pests of ornamentals, general entomology, forensic entomology, extension education, and non-majors biology. He has more than 200 publications and has made more than 750 professional and extension presentations on the ecology and management of insect and mite pests. He is a regular guest on Good Morning America and appeared on CNN, NPR, BBC, National Geographic Ultimate Explorer, and Lehrer News Hour among others. His "Bug of the Week" website, www.bugoftheweek.com, an information source on the natural history of insects, received more than 500,000 visits since its inception.

**Student Competition Awards**

**Poster Competition**

**Oral Competition**

**Linnaean Games** Severn Room 9:00-11:00

Coordinator – Douglas G. Pfeiffer

**Tuesday March 9, 2010**

**Morning**

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| **Final Business Meeting** | Wye Room | 7:00-800 |
| **Registration** | Foyer | 8:00-12:00 |
| **Local Arrangements** | Chester Room | 8:00-12:00 |
| **IPM Symposium** | Severn Room | 8:00-12:00 |

**"IPM 2010: Redefining OP-based IPM Practices using Novel Insecticides and Forecasting IPM Tools"**

Organizer: Peter Jentsch, Cornell University

8:00 **Recent developments in application technology to improve spray deposition** - Andrew Landers, Cornell University

8:30 **Development and validation of a "real-time" apple IPM website in New York** - Art Agnello, Cornell University

8:55 **The potential of electropenetrography in IPM** - J. Saguez, P. Giordanengo and C. Vincent, Horticultural Research and Development Centre Agriculture and Agri-Food Canada

9:15 **Testing web-based apple IPM protocols** - Harvey Reissig, Cornell University

9:40 **The challenge of behavioral control for apple maggot fly** - Starker Wright, USDA-ARS

10:05 **The difficult but rewarding task of developing alternative strategies to insecticides in plant protection** - Charles Vincent, Horticultural Research and Development Centre Agriculture and Agri-Food Canada

10:35 **New approaches in technology uses for fruit extension** - Peter Jentsch, Cornell University

11:00 **Adjourn**

**Urban Symposium** Glebe Room 8:00-12:00

**"Highlights in Urban Entomology in Northeastern Region"**

Organizers: Changlu Wang, Department of Entomology, Rutgers University. and Jackie McKern, Dow AgroSciences. 200 Marlington St., Blacksburg, VA 24060

8:00 **Effects of surface area, and distance between cellulose bait and soil on termite bait station discovery in *Reticulitermes malletei* Clement at field sites in Lewes, DE.** Jim Fredericks, Department of Entomology, University of Delaware

8:20 **Evolution of Sentricon termite baiting system**. Jackie McKern, Dow AgroSciences

8:40 **Susceptibility of pyrethroid resistant bed bugs eggs (*Cimex lectularius*) to different formulations of commercial insecticides**. Dini M. Miller and Tim McCoy, Department of Entomology, Virgina Tech

9:00 **The cost of multiple matings: what female bed bugs (*Cimex lectularius*) might lose in egg production**. Andrea Polanco and Dini Miller, Department of Entomology, Virginia Tech

9:20 **Selling IPM in housing**. Allison Taisey, Northeastern IPM Center, Cornell University

9:40 **Building strategic partnerships for urban IPM research, education and implementation: The Philadelphia experience**. Lyn Garling, Michelle Niedermeier, Dion Lerman, Rhonda Griffin, PA IPM Program, Penn State University, University Park, PA

10:00 **Sustainable cockroach management.** Changlu Wang, Department of Entomology, Rutgers University.

**Submitted Oral Presentations** Glebe Room 8:00-9:30

Moderator: Amy Snyder, Virginia Tech

8:00 **Management of blacklegged and lone star tick populations on Gibson Island, Maryland 1998-2009**. John F. Carroll, USDA, ARS, Invasive Insects Behavior and Biocontrol Laboratory, BARC-East, Bldg. 1040, Beltsville, Maryland 20705; J. M. Pound, USDA, ARS, Knipling-Bushland U.S. Livestock Insects Research Laboratory, 2700 Fredericksburg Road, Kerrville, Texas 78028-9184

8:12 **The efficacy of immunotherapy for house dust mite induced allergic rhinitis**. Navpreet Kaur, 66 Park Ave, #G-6; Washington, NJ 07882; Kamal Mohan, Okemos Allergy Center, Okemos, Michigan

8:24 **Development time and survivorship of *Deladenus siricidicola* (Tylenchida: Neotylenchidae) on different strains of *Amylostereum areolatum* (Russulales: Stereaceae).** Erin Morris and Ann Hajek, Department of Entomology, Cornell University, Ithaca NY

8:36 **Cucurbits, cucumber beetles, and bacterial wilt disease: A chemical ecology perspective**. Lori Shapiro, Dept of Entomology, Andy Stephenson, Dept of Biology, Consuelo De Moraes, Mark Mescher, Dept. of Entomology, Pennsylvania State Univ., State College, PA

8:48 **Assessing the potential for competitive interactions among three *Laricobius* species: Predators of hemlock woolly adelgid.** Heather Story, Scott Salom, Loke Kok, Department of Entomology, Virginia Tech, Blacksburg VA 24061

9:00 **Symbiont-mediated fungal resistance in *Zootermopsis angusticollis***. Alla Shnayderman, Northeastern University, Biology Department, Boston, MA; Kelley Schultheis, Boston, MA, Rebeca Rosengaus, Boston, MA

9:12 **Adjourn**

**Adjourn** **Conference** 12:00

## APPENDIX A

## Student Poster Competition Abstracts

### Feeding Preference of Spined Soldier Bugs (Hemiptera: Pentatomidae) on Mealworms (Coleoptera: Tenebrionidae)

Sudan Gyawaly, Entomology Program, Division of Plant and Soil Sciences, West Virginia University; Morgantown, West Virginia 26506,

The spined soldier bug, *Podisus maculiventris* (Say) (Hemiptera: Pentatomidae), is a generalist predator feeding on more than 70 insect pest species. Although the value of *P. maculiventris* as a biological control agent has been proven, no sustainable mass rearing systems have been developed yet. This study was conducted to provide key information to develop a mass rearing system for *P. maculiventris* using yellow mealworms, *Tenebrio molitor* (Coleoptera: Tenebrionidae). A series of experiments were carried out to test the feeding preference of adult *P. maculiventris* on various life stages of mealworms (i.e. small larva, large larva, pupa, and adult) and to quantify the amount of hemolymph fed by *P. maculiventris* adults. Preference test showed that *P. maculiventris* adults significantly preferred to feed on large larvae (d.f. = 3; $\chi 2$ = 11.75; P = 0.0083). One *P. maculiventris* adult could feed on 0.0135±0.0108 g of hemolymph of mealworm per day and regression analyses showed that the feeding amount of *P. maculiventris* adults was positively correlated with their body weight (d.f. = 26; F = 12.38; P = 0.0016; r2 = 0.331). The practical applications of the results related to the development of *P. maculiventris* mass rearing system will be discussed in the presentation.

### Superparasitism of a Sub-Optimal Host Species by *Cotesia marginiventris* and Resulting Mortality.

Christina Harris, 120 Chemical Ecology Lab; University Park, PA 16802

*Cotesia marginiventris* is a generalist parasitoid of Noctuid caterpillars. The beet armyworm (Spodoptera exigua) and cabbage looper (*Trichoplusia ni*) overlap in this wasp's native foraging range in the Southern U.S. We have determined that *T. ni* serves as a sub-optimal host for *C. marginiventris* relative to *S. exigua*, and that this wasp superparasitizes *T. ni*. Physiological and ecological implications are discussed.

### Phylogenetic Exploration of Mating Systems in the Temperate Leiobunine Harvestmen

Mercedes Burns, 4112 Plant Sciences Bldg; University of Maryland; College Park, MD 20742,

Species-specific variation in reproductive structures is a pervasive theme in arthropod evolution, but researchers differ on the mechanism of sexual selection that produces and maintains genitalic diversity. Here we reconstruct the phylogenetic relationships of North American leiobunine harvestmen using molecular data to determine the direction and frequency of evolutionary change in male genitalia to assess female choice and sexual conflict hypotheses. Our results show that the sacculate (nuptial gift-giving) condition is primitive within North American leiobunines and that it has been replaced by the lanceolate condition at least five times. This pattern is consistent with evolution from a male mating strategy based on female enticement to a strategy based on limited enticement and greater coercion. Thus current evidence is more amenable to a sexually antagonistic coevolution explanation than female

choice in shaping male genital structure and diversity. We hypothesize that that increased coercion is an adaptation to a shortened breeding period. Future work will determine whether propensity for coercion is inversely correlated with the length of breeding season.

**Won't you be my neighbor: Community interactions between *Sirex noctilio* and the insect assemblage of a North American Pine forest**

Brian M Thompson, 4112 Plant Sciences Bldg.; University of Maryland; College Park, Maryland 20742

Invasive species are one of the greatest threats to forests worldwide. Understanding the local processes of competition, predation and facilitation during these invasions is central to predicting the impact of invading species. The European sawfly, *Sirex noctilio*, is a recent invader to North America that, with its broad host range (>12 *Pinus* species worldwide) and an ability to attack healthy trees, is particularly threatening to North American conifers. Among the many differences between past introductions and North America is the presence of a diverse assemblage of co-evolved interacting species in North America. A pairwise field trial of *Sirex* attacked-vs-control Red pines shows that while *Sirex* is new to North America (<5 years) it elicits a strong response from members of the North American insect community. This attraction precludes interactions that could be either beneficial (facilitation) or detrimental (parasitism and predation) for *Sirex*. The dynamics of *Sirex*'s invasion will depend upon the sum and nature of the interactions *Sirex* encounters. This research establishes the level of attraction native species have for Sirex infested trees and precedes work on the type and impact of the interactions between species and groups of species.

**Associations of macroinvertebrate communities with environmental conditions of agricultural drainage ditches on Maryland's Eastern Shore**

Alan W Leslie, 4112 Plant Science Bldg; College Park, MD 20742

Agricultural ditches on the Eastern Shore of Maryland act as temporary wetlands, where nutrients may be transformed, sequestered, or released, thus impacting nutrient pollution of the Chesapeake Bay. Management practices aim to utilize the biogeochemical environment within the ditches to regulate the amounts of nutrients that are being loaded into the local watershed from these agricultural fields. By manipulating water levels, farmers promote environmental conditions that lead to denitrification by soil microbes, and the sedimentation of particle-bound phosphorus before this water can reach the local watershed. These same environmental conditions may harbor distinct communities of aquatic macroinvertebrate organisms that are able to survive in these ditches. Macroinvertebrate samples and environmental data were collected from 30 drainage ditches on Maryland's Eastern Shore to determine how different communities of aquatic macroinvertebrates correlate with the environmental conditions within ditches that also control biogeochemical cycling of nutrients.

**Does previous exposure to a host plant affect oviposition preference in *Manduca sexta*?**

Caitlin E Burkman, 10900 Euclid Ave; DeGrace Hall; Room 107; Case Western Reserve University; Cleveland, OH 44106

The Hopkins' Host-Selection Principle states that female insects are more likely to oviposit on a host plant they have had previous exposure to over another host plant species. There are

contentious findings in the literature over when such a critical exposure period can occur, but a previous study suggests that preimaginal feeding in *Manduca sexta* influenced subsequent adult preference. However, post-imaginal experience has been shown to influence other insect and moth species, but has not been studied in *M. sexta*. Therefore, this study aims to compare ovipositional preference of *M. sexta* when previously exposed to either tobacco (*Nicotiana*) or jimson weed (*Datura*) plants as early adults. Females were placed with either tobacco or jimson weed leaves overnight as a 1-day old adult. After mating, 3-day old females were flown in a wind tunnel for 5 minutes. Each moth was allowed to oviposit on freshly cut tobacco and jimson weed leaves, and most moths oriented initially to and spent more time on tobacco. However, the total number and average proportion of eggs oviposited on tobacco and jimson weed did not differ between inexperienced and jimson weed-treated moths. Instead, females pre-exposed to tobacco leaves demonstrated a preference for tobacco by laying a higher number and proportion of their eggs on these leaves. These preliminary findings suggest that *M. sexta* adults demonstrate associate learning of host plants, and future experiments aim to determine how visual, olfactory, and tactile cues influence preferences.

**Symbiontic bacteria present in the potato leafhopper, *Empoasca fabae***

Bridget D DeLay, University of Maryland; Department of Entomology; 4135 Plant Science Bldg; College Park, MD 20742

The potato leafhopper, *Empoasca fabae*, is a highly polyphagous species that is responsible for plant damage called hopperburn. Leafhopper saliva is thought to play a role in hopperburn, but little is known about this insect's salivary composition. In this study, salivary glands were dissected from leafhoppers in order to screen for bacterial symbionts. Diagnostic primers detected the presence of a known leafhopper symbiont*, Baumannia cicadellinicola*, in the salivary glands of the potato leafhopper.

**Peptidal control of crop function in *Drosophila melanogaster***

Leila J Crisson, Department of Biology; 1 Hawk Drive; SUNY New Paltz; New Paltz, NY 12561,

We will examine the effects of exogenous biologically active peptides applied to *in situ* preparations of the *Drosophila melanogaster* crop. Resulting alterations in crop contraction behavior will be recorded and characterized. The goal of this project is to further elucidate the factors that modulate crop muscle activity in insects. This will add to our current understanding of the neuropeptidal control of the insect foregut and alimentary physiology.

**Purification and Identification of a Lepidopteran “Fatty Acid Amino Acid Conjugate Hydrolase”**

Emily H Kuhns, 6 Chemical Ecology Lab; University Park, PA 16802

Several fatty-acid amide compounds (FACs) in caterpillar oral secretions enhance plant defense responses during herbivory. The most common FACs contain a fatty acid moiety either linolenic or linolenic acids that is obtained from the plant, while the amino acid moiety is almost exclusively endogenous glutamine. The levels of these FAC elicitors within the caterpillar appear to be controlled by two enzymes, one in the gut tissue membranes that synthesizes FACs and the second in the gut lumen that hydrolyzes them. Since FACs are persistent despite obvious fitness costs, it is believed that they are important to the performance and/or survival of

the caterpillar. In order to better understand the role of FACs within the caterpillar FAC hydrolase has been purified by liquid chromatography and identified by N-terminal sequencing and tandem MS/MS as an aminoacylase-1 like protein. In mammals, orthologous enzymes are involved in nitrogen recycling and detoxification pathways. However, in caterpillars the FAC hydrolase is present in the gut lumen and hydrolyzes a specific substrate that is purposely synthesized by the caterpillar, thus supporting a novel digestive role.

**Temporal and Acoustic attributes of the pathogen alarm response in *Zootermopsis angusticollis***

Ben R. Russell, 50 Chester St Apt 11; Allston, MA 01803

*Zootermopsis angusticollis*, a lower termite, uses vibrational communication to warn nestmates about the presence of lethal concentrations of conidia of the entomopathogenic fungus *Metarhizium anisopliae*. By recording and isolating the exact vibrational queues of this pathogen-alarm response, we identify and dissect the physical attributes of the substrate borne signal that induces absconding in healthy uninfected nestmates.

**Wilting of Cucurbit Plants in Seedling Stage Due to Squash Bug (Hemiptera: Coreidae) Adult Feeding**

Vimal K. Varghees, Ph.D. Student; Division of Plant and Soil Sciences; West Virginia Univeristy; P O Box 6108; Morgantown, West Virginia 26506

The Squash Bug *Anasa tristis* is a common pest of cucurbit plants including pumpkin, melon, cucumber and squash. Because seedling stage of cucurbit plants are very susceptible to squash bug feeding, growers often encounter problems with late planting, or replanting of cucurbit plants when squash bugs are present at planting time. Experiments were conducted to find the relationships between percent wilting of various cucurbit plants and squash bug density/ feeding durations (i.e. squash bug day). A set of 0, 2, 4, 7 squash bugs were introduced into each of nine varieties of seedling plants of cucumber (Veritna, Diva, Marketmore), pumpkin (Howden, Baby Palm, Tom Fox), and squash (Anton, Multipik, Burgess) plants and squash bug days required for the wilting of the plants were recorded. It was found that regardless of the plant type or variety squash bugs could cause seedling wilting in 17 ± 8.84 squash bug days. Anton and Howden varieties showed relative high resistance and Baby Palm and Burgess varieties exhibited high susceptibility. The result of this study could lead to development of recommendation for replanting or late planting of major cucurbit variety with the presence of squash bugs.

## APPENDIX B

## Submitted Poster Abstracts

**Brood Drench with Honey B Healthy to control *Nosema ceranae***

Jim Amrine, 24 Pinnacle Lane; Morgantown, WV 26508, Bob Noel, 108 Blackiston Ave; Cumberland, MD 21502

Ten colonies heavily infected with *Nosema ceranae* (Fungi: Microsporida) in late July, 2008, were treated with the method of 'Brood Drench' of 1:1 sugar syrup containing 20 ml Honey B Healthy ® per liter, at weekly intervals for three weeks. Colonies were fed at the same time using an inverted, 3 gallon open bucket) (lid perforated with 50, 0.5mm holes containing 10 ml HBH/l weekly during August and September. Spore counts of colony forager bees after 30 days were zero in the 6 treated hives that survived. Four colonies were too severely infected to be saved and died by early September. The infection of the declining colonies, with no other symptoms, was detected by R. Noel via microscopy and confirmed by J. Amrine. In September and October, robber bees (80% infected, black color, from migratory colonies nearby) continued to be collected at the entrance of the surviving colonies; robber bees were gone in spring, 2009. *Nosema ceranae* was not detected in 2009. Cost of the HBH for the drench and feeding was less than $1.00 per hive.

**Functional morphology of the axillary organs of *Hericia janehenleyi* Fashing (Acari: Astigmata: Algophagidae)**

Norman J. Fashing, Department of Biology; College of William and Mary; Williamsburg, VA 23187-8795

With the exception of a few species of the genus Algophagous that occur in the sub-antarctic, members of the astigmatid family Algophagidae are aquatic (fully submerged) or semi-aquatic (wading in liquid). One of their major characteristics is the presence of axillary organs, sclerotized bands of cuticle located on each side of the propodosoma between legs I and II. Without supportive evidence, some authors speculated that the axillary organs function as air-chambers serving for both respiration and flotation, however more recent fine structural studies implicate a probable role in osmoregulation. To date, the fine structure of the axillary organs has been described for only two species, *Algophagous pennsylvanicus* Fashing and Wiseman, a fully aquatic species in the subfamily Algophaginae that inhabits water-filled treeholes, and *Fusohericia lawrencei* Baker and Crossley, a semi-aquatic member of the subfamily Hericiinae that inhabits sap flux on tulip trees (Liriodendron tulipifera L.). The present study describes the fine structure of the axillary organs of *Hericia janehenleyi* Fashing, a member of the subfamily Hericiinae that inhabits fermenting sap flux on oak trees (*Quercus* spp.).

**Codling Moth: Azinphos-methyl susceptibility levels In New York**

Peter J Jentsch, Extension Associate; 3357 Route 9W; PO Box 727; Highland, NY 12528, Zeoli Zeoli, Technician II; 3357 Route 9W; PO Box 727; Highland, NY 12528, Deborah Breth, Extension Associate; Area Extension Educator; Lake Ontario Fruit Program - Cornell Cooperative Extension; 12690 Route 31; Albion, NY 14411

The codling moth (CM) *Cydia pomonella* (Linnaeus), a European native, is a principal insect pest of pome fruit throughout much of the world. A member of the lepidopteran family Tortricidae, it is a bivoltine moth in most of the U.S. including New York State with a partial third generation in the Pacific Northwest. Introduced to the New World during the earliest years of pome fruit production the codling moth has historically been a very difficult insect to control. It was not until the development of the synthetic insecticides, broad-spectrum materials with extended residual, contact and feeding efficacy, that economic damage imposed by this insect was, for a period, curtailed. Since 2001 western New York processing apple orchards have seen increasing numbers of damaged fruit due to internal worm infestations. In 2002

infestations contained predominately oriental fruit moth larvae, yet in 2005, a year in which 100 loads from 60 farms were ticketed from processing centers by USDA inspectors, the predominate species was and continues to be the codling moth. In this study we observed lower levels of susceptibility in all study groups compared to the previous baseline studies. Levels of reduced susceptibility were evident in western NY orchards, populations collected from most eastern NY orchards exhibited an LD90 of < 0.85 µg/µl for azinphos-methyl while western NY strains displayed an LD90 of 1.86 µg/µl for azinphos-methl, approximately 2.2 fold less susceptible than the susceptible strain. All NY strains demonstrated a higher tolerance to azinphos-methyl compared to Riedl and Barnes/Moffit studies.

**Phytoplasma prevalence in leafhoppers found in Canadian vineyards**

Julien Saguez, Agriculture and Agri-Food Canada; Horticultural Research and Development Centre; 430, Gouin Boulevard; Saint-Jean-Sur-Richelieu, QC, CANADA J3B 3E6, Chrystel Olivier, Agriculture and Agri-Food Canada; Saskatoon Research Centre ; 107 Science Place; Saskatoon, SK, CANADA S7N 0X2, Jacques Lasnier, Co-Lab R&D division of Ag-Cord inc; 655 Delorme; Granby, QC, CANADA J2J 2H4, Charles Vincent, Agriculture and Agri-Food Canada; Horticultural Research and Development Centre; 430, Gouin Boulevard; Saint-Jean-Sur-Richelieu, QC, CANADA J3B

Vectored by leafhoppers, phytoplasmas are pathogens that may cause serious losses in vineyards. During summer 2006, the presence of phytoplasmas was confirmed for the first time in Canadian vineyards. From 2006 to 2008, the prevalence of phytoplasmas in leafhoppers was assessed in Canadian vineyards. Leafhoppers were collected weekly to estimate the abundance of species in British-Columbia, Ontario and Quebec. More than 15,000 specimens were collected and 135 species were identified. Among these species, 23 are considered predominant (> 100 specimens collected over the 3 years). PCR were done on DNA extracts from leafhoppers to determine the prevalence of phytoplasmas. A large number of leafhopper species have been detected phytoplasma-positives (37 species / 135), among which *Macrosteles fascifrons* (3% of the specimens) and *Scaphoïdeus titanus* (5% of the specimens). These species are known to be respectively vector of Aster Yellow and Flavescence Dorée phytoplasmas. *Empoasca fabae* and *Erythroneura* sp. were also found as Aster Yellow phytoplasma-carriers. , Yes (Volunteer)]

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## APPENDIX C

### Student Competition, Oral Presentation Abstracts

**Trophallaxis and prophylaxis: Social immunity in the carpenter ant *Camponotus pennsylvanicus***

Casey Hamilton, Department of Biological Sciences; Towson University; 8000 York Rd.; Towson, MD 21286

Social insects have evolved a variety of defenses to counter high risks of infection and disease transmission. Group behavior can increase disease resistance among nestmates and generate

social prophylaxis. Stomodeal trophallaxis, or mutual feeding through regurgitation, may boost colony-level immunocompetence. Here we show increases in both trophallactic behavior among workers and in the antimicrobial activity of the regurgitated droplet following immunization in the carpenter ant *Camponotus pennsylvanicus*. We have identified a protein related to cathepsin D, a lysosomal protease, as a potential contributor to the antimicrobial activity. The combined behavioral and immunological responses to infection in these ants may represent an effective mechanism underlying the social facilitation of disease resistance, which could potentially produce socially mediated colony-wide prophylaxis. The externalization of an individual's immune responses via trophallaxis could be an important component of social immunity, allowing insect colonies to thrive under high pathogenic pressures.

**Distribution and Incidence of *Nosema ceranae* in Virginia Honey Bee Colonies**

Brenna E Traver, Virginia Polytechnic Institute and State University; Department of Entomology, Blacksburg, VA 24061

Honey bees are essential for the pollination of many agriculturally important crops and provide 12-15 billion dollars in annual benefits to U.S. agriculture. In recent years there has been a decline in honey bee populations worldwide. In Virginia, colony losses have averaged 30% over the past several years. The causes of many of these losses have not been determined, but previously unidentified pathogens are suspected. Recently a new species of microsporidian, *Nosema ceranae*, was discovered in the Asiatic honey bee, *Apis cerana*, and in 2006 was shown to infect *A. mellifera*. *N. ceranae*, unlike *N. apis*, is thought to be more pathogenic and has been linked to colony collapse disorder in Spain. A statewide survey of Virginia honey bee colonies using both microscopic and PCR analyses demonstrated *N. ceranae* as the dominant species present with an estimated 74% of hives infected. Four percent of hives were infected with *N. apis* but always as a co-infection with *N. ceranae*. We also report on the relationship between infection prevalence and location in Virginia, and the relationship between colony strength and infection levels.

**Native bee crop pollinators in southwest Virginia and the influence of habitat on their diversity**

Nancy Adamson, Entomology Dept; 216A Price Hall (0319); Blacksburg, VA 24061

Native bees provide the majority of crop pollination for some crops in the mid-Atlantic states. Little is known about native bee crop pollinators in Virginia, other than squash, bumble, and mason bees. This study investigates the role of native bees in southwest Virginia in pollination of apple, blueberry, caneberry, and several cucurbits (summer and winter squash, cucumber, watermelon, and melon). As part of an on-going monitoring effort managed by the U.S. Geological Survey, it also provides baseline data to understand long-term population trends. It documents honey bee and native bee visits to crop flowers, changes in bee populations through the growing season, and the potential influence of habitats and forage surrounding farms on bee diversity and abundance. Two relatively coarse spatial scale data sets, National Land Cover Data and state soils data (STATSGO), and finer scale vegetation transects are compared with bee species diversity and abundance to determine if the readily available land cover and soil data can be used to gauge bee diversity associated with crops.

**Extent of forested settings around Virginia vineyards and landscape ecology of wild grape, *Vitis* spp.**

Timothy A Jordan, 216A Price Hall; Department of Entomology; Virginia Tech; Blacksburg, VA 24061

A study was started in fall 2009 to determine the key topographic and ecological factors related to wild grape abundance and distribution in uncultivated habitats. Researchers have known for some time that the local presence of wild grape increases the complexity of managing grape berry moth in vineyards. Wild grape is abundant in and around Virginia vineyards in forested areas such as tree rows, fencerows, and forest stands that provide the structural support to which vigorous climbing vines are adapted. However, the geographical extent of wild grape habitat at local and regional scales varies much in response to environmental and anthropogenic factors such as land management and disturbance. The extent of forested area around vineyards (n=12) was evaluated at three search distances from the vineyard edge using aerial imagery and other source data that map forested areas. Forest features delineated from aerial imagery provided a better approximation of forest extent at closer search distances than other available data sets. In addition, research will be done to evaluate the relationship between landscape attributes of forested areas around vineyards and the abundance and distribution of wild grape. Stratified-random sampling and fixed area plots (8 m diameter) up to 200 m distance from a vineyard edge will be used to evaluate wild grape density, basal area of vine and support(s), and identification of grape species and fruiting potential. Predictor variables of wild grape abundance include aspect, edge exposure or orientation, time since last disturbance, distance to edge, and distance to overland drainage.

**Evaluating host plant preference of Harlequin bug, *Murgantia histrionica* (Hahn) (Hemiptera: Pentatomidae).**

Anna K Wallingford, 216 Price Hall; Virginia Tech; Blacksburg, VA 24060

Harlequin bug, *Murgantia histrionica* (Hahn) (Hemiptera: Pentatomidae), is a pest of cole crops (Brassicaceae). This study seeks to identify plant species/varieties that are preferred by this pest species in order to develop a trap crop system for its management. Field-cage and lab choice tests, conducted in 2009, found a clear preference for mustard (*Brassica juncea* 'Southern Giant Curled') over other selected Brassicacea species including rapini (*B. rapa* 'Ruvo'), rapeseed (*B. napus* 'Athena'), collard (*B. oleracea* 'Champion'), arugula (*Eruca sativa*) and a non-Brassicaceae species, snap bean (*Phaseolus vulgaris*). In addition, rapini and rapeseed were preferred over collards, arugula and bean in some tests. Additional lab choice tests showed that plant maturity may also be an important factor in plant selection as *M. histrionica* adults preferred florets over stems or leaves of broccoli, mustard and rapini plants. Preliminary olfactometer choice tests indicate that *M. histrionica* adults respond to olfactory cues of several Brassicaceae species.

**Alkylpyrazines: Alarm pheromone components of the little fire ant, *Wasmannia auropunctata* (Roger) (Hymenoptera: Formicidae)**

Elisa J. Troyer, 1200 Park Rd.; Harrisonburg, VA 22802

The previous identification of 2,5-dimethyl-3-(3-methylbutyl)pyrazine as the mandibular alarm pheromone of the little fire ant, *Wasmannia auropunctata* (Roger), has been found to be incorrect. Gas chromatography-mass spectrometry (GC-MS) of ant extracts suggested the correct structure to be the regioisomer 2,5-dimethyl-3-(2-methylbutyl)pyrazine, which was

confirmed by comparison with the synthetic pyrazine. GC-MS analysis also revealed the presence of an additional disubstituted alkyl pyrazine which was identified as 3-methyl-2-(2-methylbutyl)pyrazine. Headspace sampling of confined ants with SPME and Porapak Q followed by GC-MS analysis showed 2,5-dimethyl-3-(2-methylbutyl)pyrazine as the major volatile released by *W. auropunctata* workers while 3-methyl-2-(2-methylbutyl)pyrazine was only detected in trace amounts. In laboratory bioassays, *W. auropunctata* workers were attracted and arrested by both pyrazines, although the results were not always consistent. Synthetic pyrazines generally attracted as many *W. auropunctata* workers as were attracted to a single crushed ant. However, higher numbers of *W. auropunctata* were arrested by crushed ant treatments than by synthetic pyrazines in all bioassays but one.

**Field studies of *Wasmannia auropunctata* (Roger) Alkylpyrazines: Towards management Applications**

Nathan T. Derstine, 1200 Park Rd.; Harrisonburg, VA 22802

Field bioassays with *Wasmannia auropunctata* (Roger) show that the alarm pheromone components 2,5-dimethyl-3-(2-methylbutyl)pyrazine and 3-methyl-2-(2-methylbutyl)pyrazine both attract and arrest ants in a natural environment. Comparisons between lures containing 2,5-dimethyl-3-(2-methylbutyl)pyrazine and 3-methyl-2-(2-methylbutyl)pyrazine singly and in blends (10:1 and 100:1) based on *W. auropunctata* extracts, failed to show differences in the time required to attract a given number of ants. This indicates a lack of synergistic effects between the compounds under these test conditions. A dose response assay with 2,5-dimethyl-3-(2-methylbutyl)pyrazine showed maximal ant response to a 1 mg pheromone lure, a dose which remained attractive for 8 days under field conditions. Several of the field experiments included peanut butter baits, a lure currently used for detection. However, ant counts at peanut butter baits were not greater than at controls suggesting that peanut butter does not produce volatiles that attract ants. With the aim of developing management applications, a series of bioassays were conducted with 2,5-dimethyl-3-(2-methylbutyl)pyrazine in combination with food baits. A separate assay was conducted with Tanglefoot, a sticky catch material. In feeding bioassays, the alarm pheromone decreased consumption of peanut butter and solutions of protein and sugar. Tanglefoot squares failed to catch *W. auropunctata* with any of the lures tested. The field responses of *W. auropunctata* to alarm pheromone lures show a mixed potential for control applications. While the strong attraction and longevity of lures is promising, the inability to increase bait consumption or capture ants with Tanglefoot presents obstacles to using these alarm pheromone components for ant management.

**Determining the source of soybean aphid (*Aphis glycines*) populations in Pennsylvania**

Amanda C Bachmann, 501 ASI; University Park, PA 16802

*Aphis glycines* is an important pest of soybean as well as a competent virus vector in other legumes. In order to better understand the origin of soybean aphid in Pennsylvania, we used microsatellite markers to investigate its population structure. We looked at temporal change in allele frequency by collecting aphids from soybean at weekly intervals during the summer from an unsprayed sentinel field in central Pennsylvania. Aphids from early August in Pennsylvania were compared to those collected close to the same time from soybean in New York, Virginia, and Ohio to identify any spatial differences in allele frequency. When samples from Pennsylvania matched those in other geographic regions, we used HYSPLIT to determine if any

weather systems could have been responsible for their immigration. This information will further our understanding of aphid movement to states that do not have a strong local population.

**Distribution of *Chaetodactylus krombeini* in Nests of *Osmia cornifrons*: Implications for Population Management**

Matthew I McKinney, Entomology Program; Division of Plant and Soil Sciences; WVU; Morgantown, WV 26506

The hairy-footed mite *Chaetodactylus krombeini* Baker (Acari: Chaetodactylidae) is a cleptoparasitic mite of the Japanese horn-faced bee *Osmia cornifrons* Radoszkowski (Hymenoptera: Megachilidae). Although *C. krombeini* is a major pest in orchards due to hindrance of fruit tree pollination through reduction of *O. cornifrons* fitness, there are still large gaps in knowledge concerning its ecology and natural history. This study was conducted to develop mite control strategies by investigating *C. krombeini*'s distribution patterns within *O. cornifrons* nests. A total of 107 artificial *O. cornifrons* nests used for pollination in a blueberry orchard were examined for mite infestations, presence of pollen, and survivorship of *O. cornifrons* larva. Regression analysis showed that *C. krombeini* significantly preferred (d.f. = 1; $F = 110.63$; $P < 0.001$; $R^2 = 0.90$) the inner regions of *O. cornifrons* nests, and that *O. cornifrons* mortality rates were significantly higher (d.f. = 1 ; $F = 49.04$ ; $P < 0.001$ ; $R^2 = 0.80$) deeper inside nests. One potential reason for these trends is that *O. cornifrons* eggs destined to be females are deposited in the innermost nest cells, allowing *C. krombeini* hypopi (migratory stage of deutonymph) to disperse readily during female *O. cornifrons* spring emergence. The trends presented should direct potential control strategy development of *C. krombeini* toward the inner cells of *O. cornifrons* nests.

**Behavioral characteristics of neonate European corn borer, *Ostrinia nubilalis* (Hubner), on Bt corn**

Janine M Razze, 4105 Scholar Drive; Newark, DE 19711

European corn borer is the most damaging insect pest of corn in the US and Canada. The introduction of *Bacillus thuringiensis* (Bt) into corn has proven to be an ingenious method for delivering toxins to these pests and controlling ECB damage on corn. Bt is a naturally occurring soilborne bacterium, and it produces crystal-like proteins that selectively kill specific groups of insects when the protein is eaten. A problem with using Bt corn as a control method, as well as the use of insecticides, is that resistance to Bt will occur over time as a result of high dose usage. A possible solution to delay development of resistance is to establish refuge areas where the Bt genes are not used. A key objective of this study will be to better understand the behavioral characteristics of the neonate ECB on Bt corn hybrids. The dispersal behavior on Bt corn hybrids (Cry1Ab, Cry1F, and Pyramid) will be compared with genetically similar corn types lacking the Bt gene to determine if there are any differences in behavior. Experiments on dispersal behavior of neonate ECB will describe differences in silking behavior as well as feeding behavior between corn plant treatments. The purpose of this project is to determine how the timing of detecting Bt influences larval behavior. These results could be useful in determining the best kind of refuge to use for resistance management in Bt corn.

**Host-associated differentiation in a leafmining fly, *Phytomyza glabricola* (Diptera: Agromyzidae) on hybridizing plants**

Julie B Hebert, Dept. of Entomology; 4112 Plant Science Building; College Park, MD 20742

Phytophagous insects are extremely diverse, and one major factor contributing to this diversity involves changes in host use. Host-associated differentiation is thought to be one of the first steps in the formation of new species, and therefore diversity, in herbivorous insect lineages. Several studies have examined host-associated differentiation in a variety of herbivorous insects, but none have considered the role gene flow in the host plants can play on allowing or limiting gene flow in the insects. This study examines host-associated genetic differentiation in *Phytomyza glabricola*, a leafmining fly native to eastern North America that feeds on two hybridizing native species of holly, *Ilex glabra* and *I. coriacea*. AFLPs were used to determine rates of gene flow between populations of hollies, and to assign ancestry to individual plants. Hybridization rates were then compared across locations to genetic differentiation in the hollies to determine what role holly hybridization plays in host-associated differentiation in leafminers.

**Impacts of pesticide combinations on honey bee (*Apis mellifera* L.) development**

Daniel R. Schmehl, Penn State University; 501 Ag. Science and Industries Building; Shortlidge Road; University Park, Pennsylvania 16802

Honey bee (*Apis mellifera* L.) populations worldwide have experienced a large decline over the last several years. Colony Collapse Disorder (CCD) has been acknowledged as the primary cause for the honey bee decline in the US; however no specific cause of CCD has been identified. Pesticides are a major concern due to their widespread distribution within the hive. To date, our lab has found 118 different pesticides and pesticide metabolites in the hive, including insecticides, fungicides, herbicides, and insect growth regulators. The 4 most commonly detected pesticides – fluvalinate, coumaphos, chlorothalonil, and chlorpyrifos – were presented to in vitro reared larval honey bees through oral diet at the 95% tile dose found in pollen. In addition, the 2 most commonly detected pesticides – fluvalinate and coumaphos – were integrated into wax rearing cups in order to measure topical toxicity to developing in vitro reared larval honey bees. Our results suggest that chlorothalonil and fluvalinate, independent of one another, exhibit chronic larval oral toxicity; however when combined, they exhibit antagonism for chronic larval toxicity. In addition, a combination of the 4 most commonly detected pesticides exhibits acute oral toxicity in honey bee larvae.

**Applying metacommunity concepts to urban stream ecology: A preliminary evaluation of species sorting in a Caddisfly (Trichoptera) assemblage at an urban headwater stream**

Robert F. Smith, Department of Entomology; 4112 Plant Sciences Building; University of Maryland; College Park, MD 20742-4454

Strategies for conserving species diversity in urban landscapes usually consider how habitat fragmentation and quality affect dispersal, colonization, and survival in remaining natural habitats. The metacommunity concept addresses the same aspects of natural landscapes to describe species diversity. We believe that the metacommunity concept can guide studies of the effects of urban land-use on community diversity as well, especially for aquatic insects. We collected adult and larval Trichoptera at an urban headwater stream to compare the composition of each assemblage and determine if the “species sorting” process controls local richness of larvae. The species sorting premise describes a process where habitat quality sorts out species from the regional species pool to determine local diversity. This is opposed to local diversity resulting from differences in species’ abilities to migrate to the habitat. Working with the

assumption that larval diversity is low in urban headwater streams, we tested the null hypothesis that adult and larval assemblages were identical, which suggests that a lack of migration from neighboring streams determines local species richness. A greater number of adult species than larval species suggests that species sorting is occurring. We rejected the null and found a greater number of adult than larval species. This indicated that poor in-stream habitat quality prevented colonization for some species. However, the adult assemblage was missing many taxa typically found in headwater streams which suggested dispersal constraints were occurring as well. Multiple processes were likely acting simultaneously on subsets of the Trichoptera assemblage.

**Efficacy of bioinsecticides on thrips**

Heather E Andrews, Dept. of Entomology; 209 Price Hall; Blacksburg, VA 24061

Control of pestiferous thrips (Thysanoptera) is a critical issue facing many agricultural crops. The loss of registrations of many older broadspectrum insecticides as well as insecticide resistance in some thrips species has made control difficult. Several bioinsecticides were tested for efficacy against thrips on tomatoes, snap beans, collards and soybeans in Painter, VA in 2009. Insecticide treatments included: 1. a suspension of active spores of the entomopathogenic fungus *Metarhizium anisopliae* (Tick-Ex EC, Novozymes Biologicals; 2. a mixture of rosemary and peppermint essential oils (Ecotec AG, Brandt Consolidated Inc.); 3. spinetoram (Radiant, Dow Agrosciences); 4. a combination of Ecotec and Radiant; 5. spinosad (Entrust, Dow Agrosciences); 6. pyrethrins (PyGanic, MGK Co.); 7. azadirachtins (Aza-Direct, Gowan); 8. extract of *Chenopodium ambrosioides* (Requiem, AgraQuest); and 9. analternation of Requiem with Radiant. Thrips pest densities were low to moderate. Species complexes varied by crop and included: *Frankliniella tritici* (Fitch), *F. occidentalis* (Pergande), *F. fusca* (Hinds), *Thrips tabaci* (Lindeman), and *Sericothrips variabilis* (Beach). Insecticide efficacy also varied among crops and plant structure (leaves versus blossoms). In general, across all experiments, spinetoram alone, rosemary and peppermint oils combined with spinetoram, and spinosad provided the most consistent control of thrips, although results were not always statistically significant. Possible causes for variability among pesticide efficacy could be due to increased opportunities to evade pesticides when additional foliage and/or flowers became available in the different crops, as well as differing thrips species complexes among crops, which could lead to differing knockdown rates depending upon susceptibility to the compounds.

**Effect of floral-supplemented filter strips on beneficial insect community in soybeans**

Laura C Moore, 4112 Plant Sciences Building; University of Maryland; College Park, MD 20742

Grass filter strips are commonly deployed as crop borders in North American agricultural landscapes, often with wildflowers incorporated. Such borders filter nutrient and pesticide runoff to neighboring habitats and foster biodiversity. Additional nectar and pollen resources provided by wildflower plantings are could positively impact natural enemies of crop pests. However, the spatial consequences of such natural-enemy refuges for pest suppression in neighboring crops remain largely unexplored. We investigated the presence/absence of wildflower supplements on natural enemy abundance in buffer strips and in neighboring agricultural fields. Furthermore, we assessed pest density in crops at different distances from buffer habitats. Wildflower plantings were attractive to natural enemies, but had differing impacts on abundances of natural enemies in adjacent soybean fields. Overall effect on herbivore abundance in soybean fields was neutral.

**Plant defenses modulate predator-prey interactions differently depending on herbivore density**

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Plant defenses can affect multi-trophic species interactions by modifying the susceptibility of herbivores to natural enemies, or altering their quality as prey. With regards to herbivore suppression, plant defenses work synergistically with predators in some situations and antagonistically in others. In order to investigate interactive effects of defense and predation on herbivores, and to ascertain whether these effects are density-dependent, we conducted a factorial experiment in which stinkbug (*Podisus maculiventris*) predation and levels of chemical defense in tomato plants (*Lycopersicon esculentum*) were manipulated in mesocosms across a range of naturally observed densities of beet armyworm caterpillars (*Spodoptera exigua*). High levels of plant defense resulted in increased predation rates and stronger predator-prey interactions at some but not all herbivore densities. In general, plant defenses had stronger impacts on predation at lower herbivore densities. Overall, higher densities of herbivores were associated with weaker predator-prey interaction strengths and a greater number of prey killed per predator. Caterpillar growth rates were not affected by plant defenses during the short-term experiments, implying that effects of defense on predation were mediated by behavioral rather than developmental mechanisms. A potential mechanistic explanation for these effects is that defenses increased the likelihood of predator-prey encounters by increasing the movement rate of prey. This suggestion is supported by our finding that caterpillars tend to abandon highly defended plants more frequently. Our results demonstrate interactive effects of plant defense and predation on herbivore populations and indicate that this synergism is density dependent.

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**Bean leaf beetle and bean pod mottle virus: new research findings in Virginia**

Meredith E Cassell, Virginia Tech; Price Hall; Blacksburg, VA 24061

The bean leaf beetle (BLB), *Ceretoma trifurcata* (Förster), is native to the United States and is found primarily in the north central and southeast. It is a pest of soybean, lima bean as well as snap beans. This beetle not only damages foliage, but is also the primary vector of Bean Pod Mottle Virus (Comoviridae)(BPMV). Mild symptoms of the virus include slight chlorotic mottling of the foliage to a severe mosaic with wrinkled leaves and patches of yellow foliage. This virus can cause a severe decrease in pod production if plants are infected early in the growing season. There are two primary inoculum sources of the BPMV in Virginia, which are overwintering viruliferous beetles and perennial infected host plants. Leaf samples as well as overwintering beetles were collected in the spring and an ELISA was performed to check for the presence of virus. No host plants tested positive while 80% of the overwintered beetles were positive for the virus in the spring of 2008. However, when overwintered beetles were collected in the spring of 2009 mechanical transmission of the virus did not occur when beetles were exposed to soybean plants. BPMV has also been found in Northern VA this fall (2009) where the virus was not previously established. Leaf samples were collected from fields in Northern VA as well as on the DELMARVA Peninsula and a tissue blot immunoassay (TBIA) was conducted. Beetles were also collected and an ELISA was preformed to check for the percentage of viruliferous beetles in the fields that tested positive on TBIA.

**Assessing *Eucryptorrhynchus brandti* as a potential carrier for *Verticillium albo-atrum* from infected *Ailanthus altissima***

Amy L Snyder, Virginia Polytechnic Institute and State University, Department of Entomology; Blacksburg , VA 24061

Significant wilting and mortality of the invasive tree of heaven (TOH), Ailanthus altissima (Miller) Swingle, in Pennsylvania was first observed in 2002 and determined to be caused by an apparently host-specific strain of Verticillium albo-atrum, a vascular wilt fungus. A limited survey conducted in western Virginia in 2009 revealed two sites where TOH stands were infected with V. albo-atrum. Ongoing research suggests this pathogen may be a suitable biological control agent for the TOH. One limitation of this potential agent is its natural spread from tree to tree appears to be restricted. The purpose of our research is to determine if Eucryptorrhynchus brandti (Harold) (Coleoptera: Curculionidae), a host-specific weevil herbivore imported from China, can carry V. albo-atrum from tree to tree. Studies are proposed and results of ongoing work will be presented.

**RNA viruses in the pollinator community: Their distribution, inter-species transmission and health impacts on bees**

Rajwinder Singh, 527 Ag Sciences & Industries Building; University Park, Pennsylvania 16802,

Viral pathogens are suspected as one of the major contributors to the recent honey bee (*Apis mellifera*) decline. Since populations of other pollinators are also showing downward trends, it is vital to study the ecology and epidemiology of these RNA viruses in the whole pollinator community. Based on the sampling of wild hymenopteran pollinator populations and subsequent virus analysis using reverse transcriptase-PCR and sequencing, these viruses were found widely distributed among pollinators. Further, phylogenetic analysis indicated that these viruses are freely circulating in the pollinator community, mediated in part by pollen as the route of inter-species transmission. To study the health impacts of these viruses on native pollinators and to understand the intricate complexities of their inter-species transmission, controlled greenhouse experiments were conducted. Commercial greenhouse bumble bees (*Bombus impatiens*) and honey bees were allowed to forage together on same flowering plants. Oral feeding of the Israeli acute paralysis virus (IAPV) to one species resulted in a successful transmission to other species within a week. IAPV infection caused heavy mortality in honey bees within 48 hrs and negatively impacted the colony survival and foraging activity in bumble bees. Detection of IAPV in different tissues of bumble bees and honey bees, suggests both horizontal (via infected feces and food) and vertical (transovarial) routes of transmission of this virus. This study suggests much broader impact of RNA viruses on the pollinator community and highlights the risk of potential disease outbreaks resulting from the spread of new and possibly more virulent strains.

**Impacts of reduced-risk insecticides on blueberry spanworm and bees in wild blueberry**

Krilen Ramanaidu, Dept. Environmental Sciences; Nova Scotia ; Agricultural College; Truro, NS

Here the efficacy of several new “bio-rational” products to blueberry spanworm*, Itame argillacearia*, a key defoliator of wild blueberry, and assess their safety to the bumble bee, *Bombus impatiens*, and the alfalfa leafcutting bee, *Megachile rotundata*, which are used to pollinate wild blueberry, are evaluated. Field trials demonstrated that flubendiamide, spinetoram, spinosad, and spinosad have excellent potential for pest management. Laboratory bioassays

with blueberry spanworm indicate that the new alternatives are as potent to the pest as conventional insecticides. Bee susceptibility in the laboratory depended greatly on the active ingredient to which bees were exposed, and the bee species.

**The role of fatty acid amino acid conjugates in nutritional regulation in lepidopteran larvae**

Emily H. Kuhns, 6 Chemical Ecology Lab; University Park, PA 16802

Fatty-acid amino acid conjugates (FACs) in caterpillar oral secretions enhance plant defense responses during herbivory. The most common FACs contain a fatty acid moiety either linolenic or linolenic acids that is obtained from the plant, while the amino acid moiety is almost exclusively endogenous glutamine. The levels of these FAC elicitors within the caterpillar appear to be controlled by two enzymes, one in the gut tissue membranes that synthesizes FACs and the second in the gut lumen that hydrolyzes them. Since FACs are persistent despite obvious fitness costs, it is believed that they are important to the performance and/or survival of the caterpillar. In order to better understand the role of FACs within the caterpillar the nutritional requirement of fatty acids is being examined. When given a choice of two diets with fatty acid or without fatty acid, *Heliothis virescens* and *Helicoverpa zea* caterpillars choose to consume different proportions of fatty acids. A difference in linolenic acid requirement may explain the difference between the rates of FAC hydrolysis in these species.

**Intercropping for biological control of European corn borer (Ostrinia nubilalis Hübner) in bell peppers**

Matthew W Bickerton, 9 Bartlett st.; New Brunswick, NJ 08901

An intercropping strategy was evaluated for its effect on European corn borer [*Ostrinia nubilalis* (Hübner)] infestation in bell peppers. By planting buckwheat, dill, and cilantro in strips on the edge of the field, biological control provided by generalist predators was enhanced when compared with a non-intercropped field. Egg masses of *O. nubilalis* were deployed in intercropped and non-intercropped fields and egg mass predation by generalist predators was quantified. Among the generalist predators*, Orius insidiosus* (Say), *Coleomegilla maculata* (DeGeer), and *Chrysoperla carnea* (Stephens) demonstrated considerable levels of predation. When total predation on egg masses was compared in 2008, predation in the intercropped field was significantly higher ($p < 0.05$) than the non-intercropped field. Peppers harvested in the intercropped field in September of 2008 showed significantly less *O. nubilalis* damage than the non-intercropped field. Due to low pest occurrence in northern New Jersey in 2008, the study was repeated at an additional location in central Jersey in 2009. Selected rows from each field were inoculated with *O. nubilalis* egg masses in 2009 to evaluate infestations at low, moderate, and high densities. Selected rows were treated with foliar sprays of spinosad during the second flight of *O. nubilalis* and were compared to untreated rows. Damage was recorded in the fruit two weeks after inoculation and uninoculated rows were harvested last. Results will be shown at this meeting.

**Social immunity in the carpenter ant *Camponotus pennsylvanicus*: The role of trophallaxis in colony-wide disease resistance**

Brian T Lejeune, 134 Mugar; Life Sciences Building; Biology Department; 360 Huntington Ave; Boston, Massachusetts 02115,

*Camponotus pennsylvanicus* exploits microbial-rich environments predisposing ants for high risks of bacterial and fungal infections. Research on social insect immunocompetence indicates that these superorganisms have evolved both individual- and colony-level adaptations to resist disease. Previous experiments have shown that immunized ants increase rates of trophallaxis (mouth-to-mouth regurgitation) relative to controls and that their droplets have higher antimicrobial activity. Through in vivo experiments, we further tested whether trophallaxis plays a role in reducing disease risk. We hypothesized that naïve ants receiving trophallactic droplets from immunized nestmates should exhibit reduced susceptibility to a lethal challenge of the Gram negative bacterium *Serratia marcescens*. Although trophallaxis has historically been considered important in colony nutrition, our experiment suggests an additional role for this social interaction: through trophallactic exchanges, ants and perhaps other social insects, may achieve social prophylaxis and ultimately reduced colony-wide susceptibility.

**Molecular identification of crop pollen indicates foraging pattern of native bees**

C. Sheena Sidhu, Pennsylvania State University; Department of Entomology; 501 Agricultural Sciences and Industries Bldg; University Park, PA 16802

Using standard molecular methods in novel ecological contexts, we identified crop pollen content of *Hylaeus* (Hymenoptera: Colletidae). Given the current pollination crisis, there is an increased need for information detailing the dynamics of native plant-pollinator relationships and resulting ecosystem services. Genetic analyses of crop pollen characterizes native plant-pollinator interactions and can supplement time-intensive direct observations. A greater understanding of species interactions, particularly between native flora and fauna, will contribute to better environmental management strategies and conservation efforts.

**Induction of immune responses in larvae of the carpenter ant *Camponotus pennsylvanicus***

Christopher P Mackintosh, 134 Mugar Life Sciences Building; Northeastern University; 360 Huntington Avenue; Boston, MA 02115

Adult ants exhibit various mechanisms to resist disease including changes in behavior, secretion of potent antibiotic compounds and immunological responses. However, few studies have focused on whether the immature ant larvae are capable of generating an immune response. Through in vivo experiments, we tested whether larvae immunized with killed *Serratia marcescens* vaccines had lower susceptibility to infection following a lethal challenge with active bacteria than the corresponding controls. Our results indicate that larvae are indeed immunocompetent. The vaccinated/challenged larvae had significantly higher survival that both the control/challenged and naÃ¯ve/challenged treatments. In addition, the incidence of cannibalism by workers increased after larvae were challenged with active bacteria. Thus, we believe that workers not only perceive infected larvae in the colony, but also reduce risks of infection by ingesting sick individuals. None of the adult workers engaging in cannibalism succumbed to disease. The ability of larvae to generate an immune response, together with the worker's preferential elimination of infected larvae provides further evidence that ants use multiple adaptations to resist disease.

## APPENDIX D

## Submitted Oral Presentation Abstracts

### Factors affecting induced defenses of broad bean plants in response to pea aphid feeding

Ezra G Schwartzberg, Chemical Ecology Lab; Department of Entomology; Center for Chemical Ecology; The Pennsylvania State University; University park, PA 16802

Plants are able to defend themselves against herbivory through several means including the production of airborne volatile organic compounds (VOCs) that attract natural enemies. The pea aphid, Acyrthosiphon pisum, is able to feed on broad bean plants without inducing detectable changes in VOC emission. Additionally, pea aphids inhibit the release of VOCs normally increased in response to feeding by the beet armyworm caterpillar, Spodoptera exigua, including known attractants to the aphid parasitoid Aphidius ervi. Studies into how aphids inhibit herbivore-induced VOC signals provide insight into mechanisms by which aphids counteract induced plant defenses.

### Importance of predator arrival time on aphid control

Mark W Brown, Appalachian Fruit Res. Sta.; 2217 Wiltshire Road; Kearneysville, WV 25443

The ability of predators to control pests is dependent on when the predator arrives. By using adult *Harmonia axyridis* as a biological control of *Aphis spiraecola* on apple, I was able to demonstrate that control of aphid populations relied on arrival by the predator prior to the exponential growth phase of the aphid colony. Only with early intervention by the predator was adequate biological control attained.

### Exploring Computer and Video Technologies in Tree Fruit Extension Outreach

Peter J Jentsch, 3357 Route 9W; PO Box 727; Highland, NY 12528

Many new and novel technologies are becoming available for agricultural extension to communicate biological and agriculturally based management information to their constituents. Web hosted informational packets can be used to convey the complexities of insect biology, experimental results, and pest management approaches to Ag producers, farm managers, extension agents, and stakeholders in the agricultural community. The use of stand-alone presentations such as audio embedded PowerPoint, video productions, computer conferencing software for presentations to individuals and large groups is on the increase while greater user-friendliness is on the rise for producer and recipient. Employing these technologies should be considered by entomologists to broaden our visibility and outreach. These tools can be employed as resource information or to convey time critical informational ‘packets’. Use justification for its use as an informational resource for Ag clients to access information, can be observed by the trend seen throughout the world population. Overall use of the Internet has seen a dramatic increase throughout N. American with Internet use increasing 134% from the year 2000 to the present. Over 74% of the N. American population, or 253 million people, are presently accessing the Internet. , Yes (Volunteer)]

**A laboratory study to show the response of *Galendromus occidentalis* and *Neoseiulus fallacis* to six reduced risk insecticides**

Noubar J Bostanian, Agriculture and Agri-Food Canada; 430 Gouin Blvd; St. Jean-sur-Richelieu, Qc. J3B 3E6, Gaétan Racette, Agriculture and Agri-Food Canada; 430 Gouin Blvd; St. Jean-sur-Richelieu, Qc J3B 3E6

*Galendromus occidentalis* is the key phytoseid predator of phytophagous mites in orchards West of the Mississipi River and *Neoseilus fallacis* East of the Mississipi River. All reduced risk insecticides were applied with a thin layer chromatography sprayer adjusted at 1.5 PSI . The `Worst case Lab. exposure`` procedure was used whereby insecticides were applied to the target, its prey (*Tetranychus urticae*) and the interior substrate (leaf disc and wet cotton strand) as well as the cover and side walls of the petri dishes. Similarities and disimilarities were noted in the response of the two species of predators to the same insecticides. Imidacloprid was toxic to the adults of both species and adversely affected fecundity. Acetamiprid was moderately toxic to adults and to the fecundity of *G. occidentalis*. It was marginally toxic to adults and had little effect on fecundity of *N. fallacis*. Methoxyfenozide was totally harmless to both species. Thiacloprid was harmless to adults and had no impact on the fecundity of *G. occidentalis*, as well as adults of *N. fallacis* but affected moderately the fecundity of this second species. Spinosad and thiamethoxam had no effect on adults and the fecundity of *G. occidentalis* but showed marginal and moderate toxicity to adults of *N. fallacis*. Both compounds affected moderately the fecundity *of N. fallacis*.

Feeding behavior of three leafhopper species on grapevine.

Julien SAGUEZ, Agriculture and Agri-Food Canada; Horticultural Research and Development Centre; 430, Gouin Boulevard; SAINT-JEAN-SUR-RICHELIEU, QC, CANADA J3B 3E6, Philippe GIORDANENGO, Université de Picardie Jules Verne; EA 3900 - Biologie des Plantes et Contrôle des Insectes Ravageurs; 33, Rue St Leu; AMIENS, FRANCE 80 000, Charles VINCENT, Agriculture and Agri-Food Canada; Horticultural Research and Development Centre; 430, Gouin Boulevard; SAINT-JEAN-SUR-RICHELIEU, QC, CANADA J3B

In Canada, 135 species of leafhoppers (Cicadellidae) were identified in vineyards. Although some of them are specifically associated with grapevine, several species also feed on weeds and grasses. Among the former species, we focused our researches on three species of the most abundant genus, *Erythroneura* (*E. vitis, E. ziczac* and *E. elegantula*), that have been shown to be phytoplasma-carriers and that could be reared throughout the year on grapevine. The feeding behavior of each *Erythroneura* species was investigated using the electropenetrography technique. After 2.5 hours of starvation, the feeding behavior of leafhopper adults (n=30) was recorded during 4 hours on grapevine. Our results showed that these species mainly feed on mesophyll and xylem, but not on phloem sap. Although phytoplasmas are known to specifically invade phloem tissues, our results suggest that *Erythroneura* species may acquire phytoplasma in other tissues.

**Development time and survivorship of *Deladenus siricidicola* (Tylenchida: Neotylenchidae) on different strains of *Amylostereum areolatum* (Russulales: Stereaceae).**

Erin Morris, Cornell University,

The invasive pine woodwasp *Sirex noctilio* (Hymenoptera: Siricidae) differs from other *Sirex* woodwasps in that it can infest and kill healthy pine (*Pinus* spp.) trees. It owes this success to a unique symbiosis with a tree pathogenic fungus, *Amylostereum areolatum*, which the woodwasp injects into pine trees along with eggs during oviposition. In the Southern Hemisphere, where *S. noctilio* has been established since the 1940s, there are 10.4 million hectares of threatened pine plantations. In 2005, the pest was detected in North America, where there are 200 million ha of susceptible forests. The parasitic nematode *Deladenus siricidicola* has been used successfully for biological control of *S. noctilio*. *D. siricidicola* has a parasitic form and a fungal-feeding form, the latter of which is used for mass production. While *D. siricidicola* has been used to control *S. noctilio* in the Southern Hemisphere for decades, its imminent release in North America raises many questions. Because a different strain of *A. areolatum* is used by native woodwasps in North America, *D. siricidicola* might not parasitize non-target woodwasps; however, this has not been tested. This study focused on the hatching rate of eggs of *D. siricidicola*, as well as the time it takes nematodes to develop from egg to adult. Eggs were inoculated onto plates of either North America's native strain of *A. areolatum* or the strain of *A. areolatum* used for mass production of the nematode in Australia, to test the nematode's potential for using the native fungus.

**Assessing the potential for competitive interactions among three *Laricobius* species: Predators of hemlock woolly adelgid.**

Heather Story, Dr. Scott Salom, Dr. Loke Kok. Virginia Tech

Feeding, fecundity and survivorship rates of three *Laricobius* species, (*L. nigrinus* Fender*, L. rubidus,* LeConte, and *L. osakensis* Montgomery and Shiyaki (Proposed) predators of *Adelges tsugae,* Annand, hemlock woolly adelgid, were investigated in the laboratory and in the field using sleeve cages. In laboratory assays containing congeneric or conspecific groups of adult *Laricobius*, *L. osakensis* preyed upon greater numbers of ovisacs than *L. nigrinus* or *L. rubidus.* When all three species were together the numbers of ovisacs preyed upon were similar to an overall average of all three species, indicating they were not interfering with each other. Adult predators fed on *Laricobius* eggs without exhibiting any species preference. *Laricobius* species increased predation on *A. tsugae* ovisacs at higher ovisac densities suggesting a density-dependent functional response. No significant differences were found among groups of congeneric or conspecific *Laricobius* larvae with regard to predation of ovisacs. Adults and larvae had high survival rates throughout all experiments. Feeding, fecundity, and survivorship rates were examined between *L. nigrinus* and *L. rubidus* in two natural hemlock stands, one in southwest Virginia, the other in southeast Kentucky, during 2009. Predators were enclosed in sleeve cages with both high (>120 ovisacs) and low (<90 ovisacs) *A. tsugae* densities for 1 wk. Sleeve cage studies indicate a density-dependant functional relationship between *Laricobius* predators and *A. tsugae* density. No significant differences were found in fecundity rates at either prey density between predators. Predator survivorship rates ranged from 47% to 75% with no significant differences between species. Predators did not appear to have any negative inter- and intra-specific interactions. Similar responses were found in both conspecific and congeneric groupings. Results from both laboratory and field experiments suggests that these

species will not inhibit each other when found or released together for *A. tsugae* biological control.

### Symbiont-mediated fungal resistance in *Zootermopsis angusticollis*

Alla Shnayderman, Boston, Massachusetts, Kelley Schultheis, Boston, Massachusetts, Rebeca Rosengaus, Boston,

Termites thrive in microbe-rich environments where they may encounter pathogenic organisms. These social insects have evolved an array of adaptations to resist disease, which include: behavior, biochemical secretions, and physiological responses. We hypothesize that the symbiont hindgut community plays an important role in the enhanced disease resistance of termites against fungal pathogens. This would be a novel role for the hindgut community who are typically credited with allowing termites to digest wood and dead matter. A series of *in vitro* and *in vivo* experiments were designed to test if symbiont-mediated disease resistance exists in the dampwood termite *Zootermopsis angusticollis*. First, hindgut extracts of defaunated and faunated termites were incubated with *Metarhizium anisopliae* conidia and then plated onto potato dextrose agar (PDA). Our results show that conidia viability (measured as colony forming units [CFUs]) was significantly reduced in the faunated treatment relative to the defaunated termites. Second, to test if the mutualistic symbionts provide protection against fungal pathogens, defaunated and faunated live termites were exposed to *M. anisopliae* and their survival was recorded for two weeks. Preliminary results suggest that the presence of the hindgut symbionts renders termites less susceptible to fungal infection. Our data implicate the gut microbial community of termites in a dual role: not only to provide nutritional benefits for their host, but also to protect their host from pathogenic fungi.

## APPENDIX E

## Symposium Abstracts

### IDEP Symposium

### Invasion of viburnum leaf beetle: understanding susceptibility to infestation of native and exotic viburnums

Gaylord A. Desurmont, 211 Stewart avenue; Ithaca , NY 14850, Anurag Agrawal, Corson Mudd; Ithaca, NY 14853 [Oral Presentation , gaylord desurmont, g.desurmont@gmail.com, 6072298125

Viburnum leaf beetle (VLB) [*Pyrrhalta viburni* (Paykull)] , an invasive chrysomelid native to Eurasia, is an emerging landscape pest causing extensive loss of several Viburnum species in the Northeast U.S and Canada. Viburnum species present in North America (native or introduced as ornamentals) vary in susceptibility to VLB: resistant species are rarely fed upon and survive infestation rather well, but very susceptible species often get totally defoliated and

are killed after 2 to 4 years of infestation. Under laboratory and field conditions, we compared VLB larval performances and adult oviposition preferences on Viburnum species of different origins (North America, Europe, Asia), and measured levels of plant resistance to oviposition (i.e. production of wound tissue that displace the eggs) showed by these hosts. Our results showed that VLB larvae perform better on European hosts than on North American and Asian hosts, but that European hosts show higher levels of resistance to oviposition; Production of wound tissue was almost absent in most North American hosts, and variable in Asian hosts. Oviposition preferences were highly variable among hosts and were highly correlated with levels of defoliation observed in the field. Overall, our results suggest that North American viburnums are less defended against VLB than European and Asian hosts, and that oviposition preferences can explain differences in susceptibility observed under natural conditions among hosts equally suitable to the insect. , No (Volunteer)]

## IPM 2010 Symposium

### The difficult but rewarding task of developing alternative strategies to insecticides in plant protection

Charles Vincent, Horticultural Research and Developement Center; Agriculture and Agri-Food Canada; 430 Gouin Blvd.; Saint-Jean-sur-Richelieu, Qc J3B 3E6

In theory, Integrated Pest Management programs should rely on an array of technologies that, optimally blended, should provide adequate control with minimal environmental impact. Launched in 1996, FQPA aims at legally review the array of technological options available: the process will likely result in less pesticidal options available for agricultural use. In that context, new management tools must be developed. Using cases histories drawn from my professional experience, I will address issues encountered while developing some of these tools. The case histories will treat of border row treatments for plum curculio (*Conotrachelus nenuphar*) adults, classical biological control of the European apple sawfly (*Hoplocampa testudinea*) larvae, the development of Virosoft CP4, a CpG-based viral insecticide specific to codling moth (*Cydia pomonella*) larvae, and the development of a *Chenopodium*-based botanical targeted at soft bodied arthropods.

### The potential of electropenetrography in IPM

Julien SAGUEZ, Agriculture and Agri-Food Canada; Horticultural Research and Development Centre; 430, Gouin Boulevard; SAINT-JEAN-SUR-RICHELIEU, QC, CANADA J3B 3E6, Philippe GIORDANENGO, Université de Picardie Jules Verne; EA 3900 - Biologie des plantes et Contrôle des Insectes Ravageurs; 33, Rue St Leu; AMIENS, FRANCE 80 000, Charles VINCENT, Agriculture and Agri-Food Canada; Horticultural Research and Development Centre; 430, Gouin Boulevard; SAINT-JEAN-SUR-RICHELIEU, QC, CANADA J3B

The electropenetrography technique (EPG) was developed to study the penetration of plant tissues by the stylets of sucking insects. In EPG, an insect is included into an electrical circuit by gluing an electrode on its dorsum. Tissue penetration by the stylets and different feeding phases induce variations of plant voltage, generating typical waveforms. EPG is a useful tool to

determine the duration of various feeding parameters that can be estimated with customized software (e.g. EPG-Calc). Plant acceptance and feeding by piercing-sucking insects that occur within plant tissues are hidden processes: EPG allows to decipher the behavioral steps involved in insect feeding. Such behaviors provide information on plant-insect interactions (i.e. compatible or non-compatible) and on the nature of plant resistance (i.e. antixenosis and antibiosis). It may also provide information on pathogen transmission, such as viruses, bacteria or phytoplasma, by insects. To illustrate the usefulness of EPG in IPM, two systems will be discussed: aphids (*Myzus persicae* and *Macrosiphum euphorbiae*) feeding on potatoes and leafhoppers (various species) feeding on grapevines. Firstly, we will show that potato cultivars can influence aphid feeding behaviour and that, in turn, aphids can induce specific plant responses which could be the mainspring of phloemophagous community structuring. Secondly, we will discuss behavorial variability of cicadellid species feeding on grapevine. Combined with video observations, EPG is also a useful tool to study the transmission of phytoplasma in plant by leafhoppers.

## Vegetable and Field Crops Symposium

### Efficacy and economics of integrating insecticides and biological to control European corn borer in sweet corn

Jeffrey Gardner, 108 New Insectary; Cornell Univ.; Ithaca, NY 14853, Michael P Hoffmann, 108 New Insectary; Cornell Univ.; Ithaca, NY 14853, Sylvie A Pitcher, Dept. Entomology; Cornell Univ.; Ithaca, NY 14853, Jayson K Harper, Dept. Ag. Econ. and Rural Sociology; Pennsylvania State Univ.; University Park, PA 16802

This talk would present the finalized findings and conclusions of a study that had been previously presented in bits and pieces as the research progressed, The European corn borer, *Ostrinia nubilalis* is a key pest of sweet corn across much of the U.S. and insecticides are the primary means of control. In an effort to develop alternative control approaches for the European corn borer we investigated the efficacy and economic ramifications of integrating the egg parasitoid, *Trichogramma ostriniae* (Hymenoptera: Trichogrammatidae), into current management practices. Trials were conducted over a four year period in which small plots of sweet corn were subjected to 1) no treatment, 2) insecticide, 3) T. ostriniae + insecticide, 4) one release of T. ostriniae, and 5) three releases of *T. ostriniae*. Lifetable analyses of European corn borer mortality showed that *T. ostriniae* reduced European corn borer egg survival and that insecticides reduced European corn borer larval survival. In addition, ear damage was reduced the most when insecticide was integrated with *T. ostriniae* or when three weekly releases were used. Economic projections strongly suggest that *T. ostriniae* is economically prudent for both organic and conventional growers, with a general trend of *T.ostriniae* 3X > Integrated >> Insecticide 2X > *T. ostriniae* 1X >> Control.

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