Entomological Society of America
Eastern Branch

Entomology: The Ubiquitous Science

84th Annual Meeting
March 16 - 19, 2013
Best Western Eden Resort
Lancaster, PA

The Program Encapsulated – 2013

Saturday, March 16

Evening	President's Informal Reception	5:00-7:00	Courtyard

Sunday, March 17

Morning	Registration	8:00-5:00	Lobby
	Executive Committee Meeting	8:00-11:00	Executive Suite
	Fruit Entomology Symposium	8:00-12:00	Grand Ballroom 3
	M.S./Undergrad. Student Oral Competition	8:00-12:00	State Room
	It's a Bug's World	10:00-3:00	Grand Ballroom 1 & 2
Afternoon	Posters, Sponsors	12:00-5:00	Regency Ballroom
	Student Poster Competition	12:00-5:00	Regency Ballroom
	Emerald Ash Borer Symposium	1:00-5:00	Grand Ballroom 3
	Ph.D. Student Oral Competition	1:00-5:00	State Room
Evening	President's Reception	5:30-6:30	Regency Ballroom
	Jobs in Entomology Workshop	6:30-8:30	State Room

Monday March 18

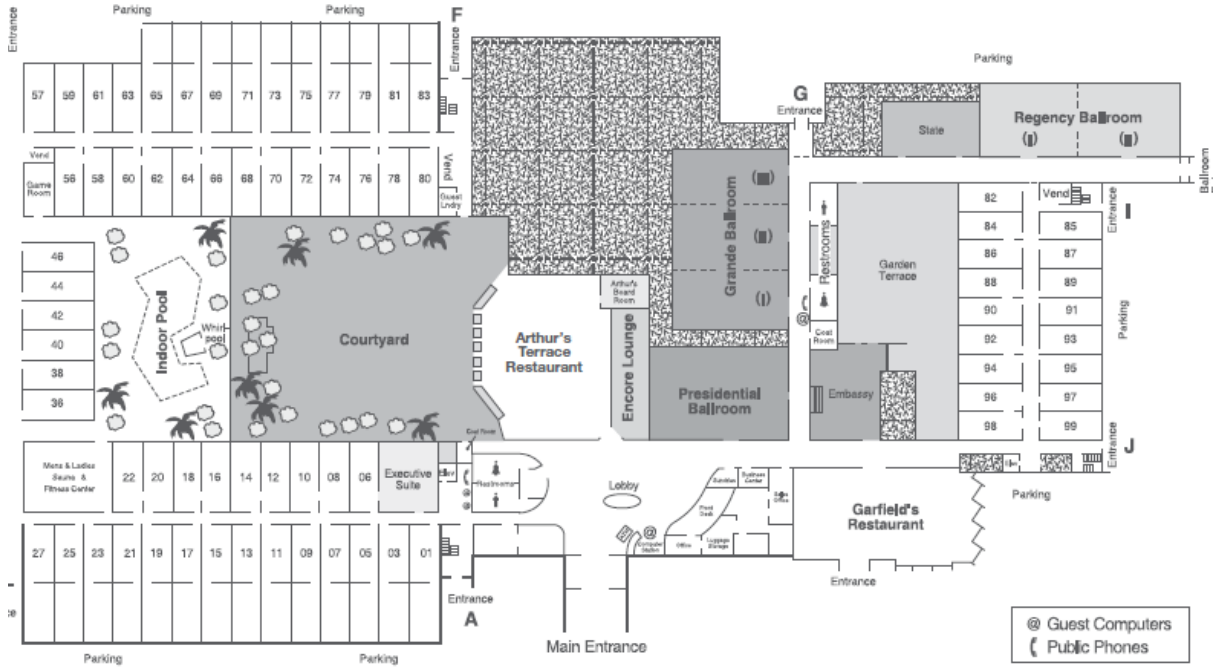
Morning	Registration	8:00-5:00	Lobby
	IDEP Symposium	8:00-12:00	State Room
	Sustainable Agriculture Symposium	8:00-12:00	Embassy Room
	Student Symposium	8:00-12:00	Regency Ballroom
Afternoon	Linnaean Games	12:00-1:30	Regency Ballroom
	Pollinator Symposium	1:30-5:30	State Room
	Agro-ecosystem Diversity Symposium	1:30-5:30	Presidential Ballroom
	Submitted Oral Presentations	2:00-5:00	Embassy Room
Evening	Social and Cash Bar	6:00-7:00	Pre-function area
	Banquet	7:00-10:00	Grand Ballroom
	ESA President Address, Branch & Student Competition Awards		
	Keynote Address - Dr. Daniel Janzen		

"What do you find in a detailed caterpillar and parasitoid inventory of a large tropical place?"

Tuesday, March 19

Morning	Final Business Meeting	7:00-8:00	Executive Suite
	Industry Symposium	8:00-12:00	State Room
	Biological Control Symposium	8:00-12:00	Embassy Room
	Adjourn	12:00	

Hotel Floor Plan



ENTOMOLOGY 2013

Science Impacting a Connected World

November 10–13, 2013 • Austin, Texas

Plan now to present your research to thousands of entomologists in Austin, Texas, the Live Music Capital of the World®!

Connect with nearly 3,000 scientists and researchers from around the world who are keenly interested in your work. Entomology 2013 offers you opportunities to share your research, gain exposure for your work, learn what's new and exciting, network with colleagues and friends, and expand your career!

And with its legendary live music venues, University of Texas Austin campus, a plethora of museums and history, the iconic state capitol, its Congress Avenue Bridge sheltering the largest urban bat colony in North America, and an abundance of outdoor activities, Austin is the place to be next November!

Stay tuned to *eNews* and to ESA's website for program information.
www.entsoc.org/entomology2013

- Plan your presentation topics
- Secure your travel funding early
- Prepare to share, learn, connect and have fun!

Mark your calendar for these important dates:

Program Symposia Deadline:	February 1
Section & Member Symposia Deadline:	March 1
Paper/Poster Submission Deadline:	June 3
Registration and Housing Opening:	June 12
Summer Planning Meeting:	July 8-12
Virtual Poster Deadline:	July 22

ENTOMOLOGICAL SOCIETY OF AMERICA

Sharing Insect Science Globally

2013 Sponsors

AMVAC

BASF CORPORATION

BAYER CROPSCIENCE

DELAWARE DEPT. of AGRICULTURE, PLANT INDUSTRIES

DOW AGROSCIENCES

DuPONT AGRICULTURAL PRODUCTS

ELSEVIER/ACCADEMIC PRESS

FMC CORPORATION

LABSERVICES

MONSANTO

MANA

NICHINO AMERICA, INC.

SUTERRA, LLC.

SYNGENTA CROP PROTECTION

TRECE, INC.

UNITED PHOSPHOROUS, INC.

Eastern Branch L. O. Howard Distinguished Achievement Award

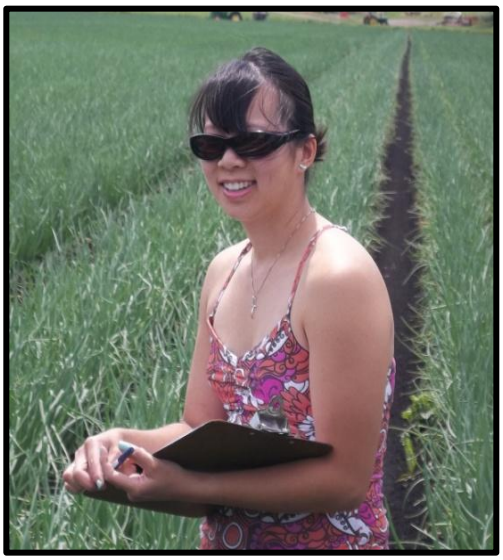
Charles Vincent

After completing a Ph. D. in Entomology at McGill University in 1983, Charles Vincent worked as an entomologist at Agriculture and Agri-Food Canada, Saint-Jean-sur-Richelieu, Qc. In 1984, he was appointed adjunct professor at the Macdonald Campus of McGill University and at the Université du Québec in Montréal in 1992. Dr. Vincent has also been an invited professor at the Université de Picardie Jules Verne (Amiens, France) since 2000. His research program focuses on the control and management of insect pests in agricultural systems using biological (including biopesticides) and physical control methods. His productivity can be summarized as follows: 163 scientific peer-reviewed papers; 3 special publications; 7 technical bulletins; 22 edited books; 5 review articles (refereed); 42 book chapters; 142 proceedings of conferences; 186 miscellaneous publications (non-refereed); 246 presentations (lay audience); 176 scientific conferences (peer audiences); 191 posters; 62 contacts with media; 78 invitations to give conferences (expenses paid); 11 book reviews; 17 research reports; 36 graduate students successfully supervised (14 Ph.D., 22 M.Sc.; 2 Ph. D. registered as of February 2012); 6 post-docs; 99 interns-mostly from Europe; 62 lectures at the college level. The high quality of his teaching reflects in the fact that most of his graduate students now work as scientists in Canada, USA, France, Switzerland, Guinea and Burkina Faso. Beyond these numbers, he had a tremendous impact in agricultural entomology, notably by developing alternative methods to insecticides, and by working relentlessly at technology transfer activities, including the publication of several books and technical bulletins. Through projects and networking, he exerted leadership at the scientific, organisational, industrial/commercial, and public scenes, and had a high impact at both national and international levels.

John Henry Comstock Award
Elina Lastro Niño

Elina Lastro Niño received her Ph.D. in Entomology from The Pennsylvania State University under the guidance of Dr. Christina Grozinger. Her dissertation research involved behavioral, physiological, and molecular characterization of factors affecting honey bee queen post-mating changes and queen-worker interactions. She is particularly interested in understanding the underlying molecular pathways regulating these changes and whether these changes are evident after the queen commences oviposition. She also studied factors that alter queen pheromone profiles and how this in turn regulates worker behavior and physiology which could affect colony status. During her postdoctoral appointment at PSU, Elina will expand on the findings of her doctoral research and will also examine socio-economic factors affecting the establishment of honey bee breeding and stock improvement programs in the US. This research is supported by the USDA-NIFA Postdoctoral Fellowship. Elina is also very involved with outreach and extension and she has received numerous fellowships, scholarships and awards.

Asa Fitch Award
Elaine Fok



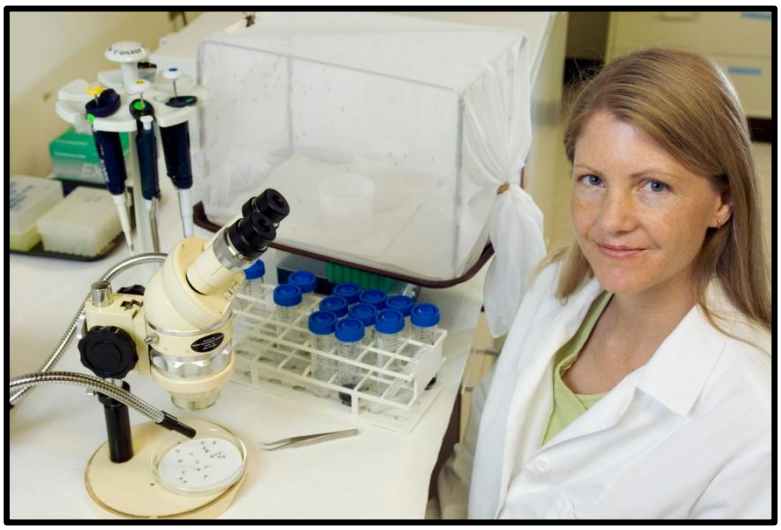
Elaine Fok grew up steeped in the cultural and culinary diversity of San Francisco Bay Area. During her senior year at the University of California, Berkeley, she began digging around in urban agriculture and food politics. She turned her attention to sustainable agriculture after graduating with a B.S. in Environmental Science and began working as field research coordinator for the Agroecology Research Group at UC Berkeley. With other self-proclaimed foodies and ecologists, she investigated conservation biological control and floral resource provisioning in California vineyards. It was among the wine grapes that she fell in love with insects and decided to pursue graduate studies in Entomology at Cornell University under Dr. Brian Nault. Her project has been investigating natural enemies of onion thrips in polyculture and monoculture production systems and their potential for biological control. As she finishes her M.S., she is excited for future opportunities to nourish others by sharing her passion for insects, agriculture, and community.

Eastern Branch ESA Nominees

For ESA Awards

The Entomological Society of America invites Branches to nominate candidates for three Society-level awards. The Eastern Branch Screening Committee for Entomological Society of America Awards has selected the following as our nominees for 2013. The three Eastern Branch nominees will be considered among candidates from other Branches and the final award recipients recognized at the Entomological Society of America's Annual Meeting in November, 2013 in Austin, Texas.

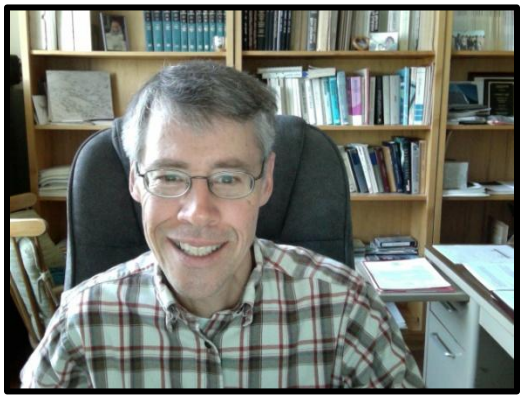
ESA Distinguished Achievement Award in Teaching
Laura Harrington (re-nominated from 2012)



Dr. Harrington's research focuses on the biology, ecology and behavior of mosquitoes that transmit human diseases. Current research projects in her laboratory address the feeding and mating behavior of mosquito vectors of dengue fever, West Nile virus, Chikungunya, malaria, human and animal-mosquito interactions and mosquito reproductive biology and behavior. Dr. Harrington studies mosquito biology in the field locally as well as abroad, with field sites in Thailand, Tanzania, and Southern Chiapas, Mexico. She is involved in cross-disciplinary projects on climate change and West Nile virus risk to human health in the United States. She offers courses in Medical and Veterinary Entomology (ENTOM 3520), a non-majors course, Plagues and People (BIO&SOC/ENTOM 2100) and she teaches the malaria module of Introduction to Global Health (NS 2060). Dr. Harrington also has offered seminars with international service in learning formats including ENTOM 4100: Malaria Interventions in Ghana, and ENTOM 4110: Health Care in Honduras. She advises and mentors a large group of undergraduate and graduate students in the areas of entomology, ecology and evolutionary biology, biomathematics, general biology, animal science, and biology and society

ESA Distinguished Achievement Award in Extension

Rod Youngman



Dr. Roger R. Youngman received his Ph. D. degree from University of California at Riverside in 1984. Following his graduation, he worked as a postdoctoral researcher with Cooperative Extension at UC Riverside and within the Dept. of Entomology at UC Riverside. He joined the Department of Entomology at Virginia Tech as an Assistant Professor in November 1988. He was promoted to full Professor in 2002. At Virginia Tech, Dr. Youngman has created a research-based integrated pest management programs in corn, alfalfa, grass hay, pasture, and turfgrass. He is the author of 51 peer-reviewed publications, 2 book chapters, and 208 refereed extension publications. He won the prestigious Alumni Award for Excellence in Extension from Virginia Tech in 2008. That award is given to only the best in Virginia Cooperative Extension. In 2004, Ron won the Gamma Sigma Delta Extension Award of Merit. He was the 2005 ESA Eastern Branch nominee for Distinguished Achievement Award in Extension. In 2009, Dr. Youngman was recognized for his outstanding service to ESA after serving as president of the Eastern branch (2008-09) and as secretary (2001-07).

Entomological Foundation Award for Excellence in IPM
(Sponsored by Syngenta Crop Protection)
Elson Shields

Dr. Elson J. Shields joined the Department of Entomology, Cornell University in 1986 as an assistant professor tasked with an extension and research appointment focused on field crops. Elson was promoted to full professor, January 2000. Prior assignments included the development and implementation of an IPM program on peppermint at Oregon State University and a dual assignment of Vegetable IPM and IPM coordinator at the University of Wisconsin-Madison. He earned his Ph.D at the University of Wisconsin-Madison while working full-time with his IPM assignments. His B.S. and M.S. are from the University of Arizona where he spent his youth exploring the desert and high-country of Arizona while avoiding all the poisonous critters who call Arizona home. Since Dr. Shields' arrival at Cornell, he has been involved in a series of diverse research projects ranging from insecticide evaluation to biological control of soil insects with native persistent entomopathogenic nematodes while supporting the IPM efforts throughout NYS. In addition, he has tackled with teams of other scientists, the challenge of studying the aerial movement of agriculturally important biota including insects, herbicide resistant weed seeds, plant pathogens and pollens with his fleet of 30+ unmanned aircraft. Currently, the Shields' laboratory efforts are focused on an area-wide biological control program with entomopathogenic nematodes directed at the alfalfa snout beetle where farmers rear and apply their own nematodes and the long-ranged movement of onion thrips infected with a plant pathogenic virus.

Saturday, March 16, 2013

President's Informal Reception	**Courtyard**	**5:00-7:00**

Sunday, March 17, 2013

Registration	**Lobby**	**8:00-5:00**
Public Outreach Program	**Grand Ballroom 1 and 2**	**10:00-3:00**

It's a Bug's World

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

Celebrate St. Patrick's Day with green beetles, green bees and a wide variety of multicolored insects. "It's a Bug's World", a program for kids, parents and teachers, is open to the public. The butterflies of Pennsylvania will be on display, along with insects of the water and forest worlds. Bugman Ryan and the York County 4-H will host a large display, along with student groups from local schools. Kids can build a bug, try watercolor with a local artist, and play the fishing game.

"It's a Bug's World" is a public service of the Entomological Society of America - Eastern Branch, and is free to meeting registrants and the public.

Fruit Entomology Symposium **Grand Ballroom 3** **8:00-12:00**

The Challenges of Invasive Pests to Fruit IPM

Moderators and Organizers: Dean Polk[1] and Tracy C. Leskey[2], [1]Rutgers, The State Univ. of New Jersey, Chatsworth, NJ, [2]USDA, Agricultural Research Service, Kearneysville, WV

8:00 Introductory Remarks

8:05 001 Seasonal patterns of crop and wild host use by SWD in NY. **Gregory Loeb**, gme1@cornell.edu, Cornell Univ., Geneva, NY

8:30 002 Steps towards the identification of host-plant volatile attractants for spotted wing drosophila. **Cesar Rodriguez-Saona**, CRodriguez@RCE.Rutgers.edu, Rutgers Univ., Chatsworth, NJ and John Abraham, Free Univ. of Bozen-Bolzano, Bolzano, Italy

8:55 003 The plot thickens: The changing drosophilid community in Virginia berries. **Meredith Shrader**, mcassell@vt.edu, Curt A. Laub and Douglas G. Pfeiffer, Virginia Tech, Blacksburg, VA

9:20 004 The impact and scope of spotted wing drosophila in NJ blueberries 2012. **Dean Polk**, polk@aesop.rutgers.edu, Rutgers Univ., Chatsworth, NJ

9:45 Break

10:00 005 Phagostimulants for improving SWD adulticides. **Richard Cowles**, Richard.Cowles@po.state.ct.us, Connecticut Agricultural Experiment Station, Windsor, CT

10:25 006 Monitoring BMSB movement into specialty crops:Recent advances and unanswered questions. **Tracy C. Leskey**, tracy.leskey@ars.usda.gov, USDA, Agricultural Research Service, Kearneysville, WV

10:50 007 Reduced-risk management options for BMSB. **Anne L. Nielsen**, nielsen@aesop.rutgers.edu, Rutgers Univ., Bridgeton, NJ

11:15 008 Synergy of attractants for season-long monitoring of BMSB. **Donald C. Weber**, Don.Weber@ars.usda.gov, USDA, Agricultural Research Service, Beltsville, MD, Ashot Khrimian, USDA - ARS, Beltsville, MD and Tracy C. Leskey, USDA, Agricultural Research Service, Kearneysville, WV

11:40 Discussion

12:00 Adjourn

Sunday Morning, March 17, 2013

M.S./Undergrad Student Oral Presentation **State Room** **8:00-12:00**

See appendix A for abstracts of talks for this session

Moderator: William Lamp, University of Maryland

8:00 009 Systematics of *Caenodelphax* Fennah (Hemiptera: Fulgoroidea: Delphacidae). **Ashley C. Kennedy**, kennedya@udel.edu and Charles Bartlett, Univ. of Delaware, Newark, DE

8:12 010 Competitor avoidance drives within-host selection in hemlock woolly adelgid (*Adelges tsugae*), a passively-dispersed herbivore. Sara Gomez[1], **Liahna Gonda-King**, lgonda-king@my.uri.edu[1], Colin M. Orians[2] and Evan L. Preisser[1], [1]Univ. of Rhode Island, Kingston, RI, [2]Tufts Univ., Medford, MA

8:24 011 Diurnal and nocturnal activities of the brown marmorated stink bug, *Halyomorpha halys*, in a Pennsylvania orchard. **Deonna C. Soergel**, dcs5112@psu.edu and Greg Krawczyk, Pennsylvania State Univ. - Fruit Research & Extension Center, Biglerville, PA

8:36 012 The impact of drought and herbivory on the invasive annual vine *Persicaria perfoliata*. **Scott Berg**, shberg@udel.edu and Judith A. Hough-Goldstein, Univ. of Delaware, Newark, DE

8:48 013 A comparison of Lepidoptera communities inhabiting restored and degraded pitch pine-scrub oak barrens in Pennsylvania. **Wendy Leuenberger**, hdgr@iup.edu[1], Scott Bearer[2], Pat McElhenny[3] and Jeffery Larkin[1], [1]Indiana Univ. of Pennsylvania, Indiana, PA, [2]The Nature Conservancy, Williamsport, PA, [3]The Nature Conservancy, Long Pond, PA

9:00 014 The life cycle of *Pineus strobi* in southwest Virginia and associated predators. **Jacqueline S. Brown**, jbrown06@vt.edu[1], Scott Salom[1], Loke T. Kok[1] and Nathan Havill[2], [1]Virginia Tech, Blacksburg, VA, [2]USDA, Forest Service, Hamden, CT

9:12 015 Dynamics of hydrophilic and hydrohobic tracing dyes in honey bee (*Apis mellifera)* hives. **Grace Kunkel**, gkunkel1@umd.edu, Univ. of Maryland, College Park, MD

9:24 016 Host plant feeding preferences of the Asiatic garden beetle. **Laura E. Eckman**, Laura.Eckman@uconn.edu and Ana Legrand, Univ. of Connecticut, Storrs, CT

9:36 017 Prey handling of toxic and non-toxic Lepidopteran prey by the Chinese mantid, *Tenodera sinensis*. **Jamie L. Rafter**, jamierafter@my.uri.edu[1], Justin Vendettuoli[1], Liahna Gonda-King[1], Anurag Agrawal[2] and Evan L. Preisser[1], [1]Univ. of Rhode Island, Kingston, RI, [2]Cornell Univ., Ithaca, NY

9:48 018 Evaluating the potential impact of *Halyomorpha halys* on grape production in the Finger Lakes. **Jeffrey R. Smith**, jesmith@udel.edu, Univ. of Delaware, Newark, DE and Gregory M. Loeb, Cornell Univ., Geneva, NY

10:00 019 Assessment of movement behavior of third instar European corn borer, *Ostrinia nubilalis*, on Bt corn. **Holly Lynn Johnson**, hollylyn83@gmail.com and Charles E. Mason, Univ. of Delaware, Newark, DE

10:12 020 Relationship between total and amino nitrogen in HWA (*Adelges tsugae*) and the health of its host tree. **Anne C. Jones**, annej@vt.edu, Donald Mullins and Scott Salom, Virginia Tech, Blacksburg, VA

Ph.D. Student Oral Presentation **State Room** **1:00-5:00**

See appendix A for abstracts of talks for this session

Moderator: William Lamp, University of Maryland

1:00 021 Does floral provisioning enhance pollination of Cucurbita and Cucumis crops by bee communities? **C. Sheena Sidhu**, cks151@psu.edu, Shelby J. Fleischer and David J. Biddinger, Pennsylvania State Univ., State College, PA

1:12 022 Distribution and biodiversity of blow flies (Diptera: Calliphoridae) throughout New Jersey. **Lauren M. Weidner**, laurenmweidner@gmail.com[1], George C. Hamilton[1] and Jeffery K. Tomberlin[2], [1]Rutgers, The State Univ. of New Jersey, New Brunswick, NJ, [2]Texas A&M Univ., College Station, TX

1:24 023 Distribution of *Chaetodactylus krombeini* (Acari: Chaetodactylidae) in nests of *Osmia cornifrons* (Hymenoptera: Megachilidae). **Matthew McKinney**, mm.entomology@gmail.com and Yong-Lak Park, West Virginia Univ., Morgantown, WV

1:36 024 Influence of landscape simplification on pollination services to strawberry. **Heather Connelly**, hlc66@cornell.edu[1], Katja Poveda[1] and Gregory M. Loeb[2], [1]Cornell Univ., Ithaca, NY, [2]Cornell Univ., Geneva, NY

1:48 025 Effect of pheromone release rate, plant volatiles and ratios of pheromone components on trap captures of the Asian longhorned beetle, *Anoplophora glabripennis* in China. **Peter S. Meng**, psm167@psu.edu[1], Melody A. Keena[2], R. Talbot Trotter[2], Yan Shanchun[3] and Kelli Hoover[1], [1]Pennsylvania State Univ., Univ. Park, PA, [2]USDA, Forest Service, Hamden, CT, [3]Northeast Forestry Univ., Harbin, China

2:00 026 Exposure to an insect-derived olfactory cue enhances plant defense responses. **Anjel M. Helms**, amh468@psu.edu, John F. Tooker, Mark C. Mescher and Consuelo M. De Moraes, Pennsylvania State Univ., Univ. Park, PA

2:12 027 The mycobiomes of sympatric native and invasive paper wasp species. **Anne Madden**, madden.anne@gmail.com and Philip Starks, Tufts Univ., Medford, MA

2:24 028 Burrowing invertebrate communities in small and large agricultural drainage ditches. **Alan Leslie**, aleslie@umd.edu and William O. Lamp, Univ. of Maryland, College Park, MD

2:36 029 Food-finding by larval grape root borer, *Vitacea polistiformis* (Lepidoptera: Sesiidae) in a soil column bioassay. **Jhalendra P. Rijal**, jrijal@vt.edu, Alson H. Smith, Jr. and J. Christopher Bergh, Virginia Polytechnic Institute and State Univ., Winchester, VA

2:48 030 Environmental and spatial factors influencing patterns in stink bug communities in soybean. **P. Dilip Venugopal**, dilip@umd.edu[1], Galen P. Dively[2], D. Ames Herbert[3] and William O. Lamp[1], [1]Univ. of Maryland, College Park, MD, [2]Univ. of Maryland, College Park Maryland, MD, [3]Virginia Polytechnic Institute and State Univ., Suffolk, VA

3:00 031 Resistance to a multi-host parasite; it's good to be rare. **Julia J Mlynarek**, jmlynare@connect.carleton.ca, Carleton Univ., Ottawa, ON, Canada

3:12 032 Assessing corn earworm infestations in Pennsylvania field corn, and the value of *Bt* for control of ear damage. **Eric Bohnenblust**, ewb14@psu.edu[1], Jim Breining[2], Shelby J. Fleischer[1], Greg Roth[2] and John F. Tooker[2], [1]Pennsylvania State Univ., State College, PA, [2]Pennsylvania State Univ., Univ. Park, PA

3:24 033 Feeding preferences of the generalist insect herbivore, *Melanoplus femurrubrum* grasshopper, on invasive and native plants. **Alina Avanesyan**, alina.avanesyan@gmail.com and Theresa Culley, Univ. of Cincinnati, Cincinnati, OH

Emerald Ash Borer Symposium **Grand Ballroom 3** **1:00-5:00**

The Thin Green Line: Updates on EAB Detection and Management on the Eastern Edge of the Infestation

Moderators and Organizers: Melissa K. Fierke[1] and Claire E. Rutledge[2], [1]State Univ. of New York, College of Environmental Science and Forestry, Syracuse, NY, [2]Connecticut Agricultural Experiment Station, New Haven, CT

1:20 034 EAB biocontrol: A decade of progress. **Juli Gould**, Juli.R.Gould@aphis.usda.gov, USDA - APHIS, Buzzards Bay, MA

1:40 035 A little wasp told me: biosurveillance and the emerald ash borer in Connecticut. **Claire E. Rutledge**, Claire.Rutledge@ct.gov, Connecticut Agricultural Experiment Station, New Haven, CT

2:00 036 Nanofabricated *Agrilus* decoys used for monitoring forest buprestids.. **Michael Domingue**, mjd29@psu.edu[1], Zoltán Imrei[2], György Csóka[3] and Thomas C. Baker[1], [1]Pennsylvania State Univ., Univ. Park, PA, [2]Hungarian Academy of Sciences, Budapest, Hungary, [3]Forest Research Institute, Mátrafüred, Hungary

2:20 037 Emerald ash borer in Maryland's cities and suburbs: How much time do we have and what will it cost?. **Michael Raupp**[1], Holly M. Martinson[1], Chris Sargent[1], Richard Bean[2], Alan J. Sawyer[3], Samuel Grimard[4] and Erik J. Bergmann[1], [1]Univ. of Maryland, College Park, MD, [2]Maryland Dept. of Agriculture, Annapolis, MD, [3]USDA APHIS PPQ CPHST Otis Laboratory, Otis ANGB, MA, [4]i2L Research, Baltimore, MD

2:40 Break

2:55 038 Emerald ash borer research and management in New York. **Melissa K. Fierke**, mkfierke@esf.edu, State Univ. of New York, College of Environmental Science and Forestry, Syracuse, NY

3:15 039 Organizing collaborative community task forces for emerald ash borer education and management. **Mark Whitmore**, mcw42@cornell.edu and Sally Whisler, Cornell Univ., Ithaca, NY

3:35 040 Emerald ash borer delimitation and management in the Northeast. **Nathan Siegert**, nwsiegert@fs.fed.us, US Forest Service, Northeastern Area State & Private Forestry, Durham, NH

3:55 Discussion

M.S./Undergrad Student Poster Presentation **Regency Ballroom** **12:00-5:00**

See appendix B for abstracts of posters for this session

[Author attendance at posters during President's Reception, Sunday Evening]

D001 Effects of photoperiod on competition between container-dwelling mosquitoes. **Daniel Radwan**, radwand@my.canisius.edu[1], Romain Dahan[1] and Katie Costanzo[2], [1]Canisius College, Buffalo, NY, [2]Univ. of Illinois, Champaign, IL

D002 Maximum lethal temperature and its potential use in predicting the distribution of the brown marmorated stink bug (*Halyomorpha halys)* in the US. **Ashley K. Lohr**, aklohr@vt.edu, Thomas P. Kuhar, Benjamin L. Aigner, John D. Aigner and Christopher R. Philips, Virginia Polytechnic Institute and State Univ., Blacksburg, VA

D003 Macroinvertebrate community response to a restored stream in Lancaster County, PA. **Alex M. Rittle**, amrittle@millersville.edu and John R. Wallace, Millersville Univ., Millersville, PA

D004 Phenotypic plasticity in life history in an invasive mosquito (*Aedes albopictus*) across photoperiod regimes. **Michael Keenan**, keenan1@canisius.edu[1], Mwengwe Ndhlovu[1], Sarah Whittington[1] and Katie Costanzo[2], [1]Canisius College, Buffalo, NY, [2]Univ. of Illinois, Champaign, IL

D005 Differences in prey handling of larval and adult monarchs, *Danaus plexippus,* by Chinese Mantids, *Tenodera sinensis*. **Justin Vendettuoli**, jvendettuoli@my.uri.edu[1], Jamie L. Rafter[1], Liahna Gonda-King[1], Anurag Agrawal[2] and Evan L. Preisser[1], [1]Univ. of Rhode Island, Kingston, RI, [2]Cornell Univ., Ithaca, NY

D006 Stink bug community in primocane- bearing raspberry planting in southwest Virginia. **Sanjay Basnet**, sanjayvt@vt.edu, Douglas G. Pfeiffer, Thomas P. Kuhar and Curt A. Laub, Virginia Polytechnic Institute and State Univ., Blacksburg, VA

D007 Does refuge availability alter the effect of predation risk on prey growth?. **Mauri Hickin**, mhickin@my.uri.edu and Evan L. Preisser, Univ. of Rhode Island, Kingston, RI

D008 Examining the influence of garden land use, management practices, and landscape context on pest and beneficial insects in urban vegetable gardens. **Alicia Miggins**, alicia.miggins@google.com[1], Megan Gregory[2], Erin Eck[1], Abigail Cohen[3], Margaret Pickoff[4] and Timothy W. Leslie[1], [1]Long Island Univ., Brooklyn, NY, [2]Cornell Univ., Ithaca, NY, [3]Rutgers Univ., New Brunswick, NJ, [4]Bates College, Lewistown, ME

D009 Assessing the effects of local and landscape factors on the abundance of *Tipula paludosa* in turfgrass habitats. **Suzanne Yocom**, suzyocom@gmail.com, Millersville Univ., Millersville, PA and Matthew Petersen, Cornell Univ., Geneva, NY

D010 Cold tolerance and cold shock response in wild type and TPI mutant fruit flies. **Nathan Kapaldo**, nok1289@sru.edu, Jack Layne and Stacy Hrizo, Slippery Rock Univ., Slippery Rock, PA

D011 Sapped of energy: The role of invasive herbivores (*Adelges tsugae* and *Fiorinia externa*) as a resource drain on hemlock (*Tsuga canadensis*) trees. **Nicole E. Soltis**, nicole.soltis@tufts.edu[1], Sara Gomez[2], Liahna Gonda-King[2] and Colin M. Orians[1], [1]Tufts Univ., Medford, MA, [2]Univ. of Rhode Island, Kingston, RI

D012 Variation in cornuti in the leaf-roller moths (Lepidoptera: Tortricidae: Tortricinae). **Salvatore S. Anzaldo**, ssa5102@psu.edu, Pennsylvania State Univ., State College, PA and J. Brown, Systematic Entomology Laboratory, PSI, Washington, DC

Ph.D. Student Poster Presentation **Regency Ballroom** **12:00-5:00**

See appendix B for abstracts of posters for this session

[Author attendance at posters during President's Reception, Sunday Evening]

D013 Evaluation of combined applications of insecticide and entomopathogenic fungi for masked chafer grub *Cyclocephala* spp. (Coleoptera: Scarabaeidae), control in turfgrass. **Sudan Gyawaly**, gyawaly17@gmail.com, Roger R. Youngman and Curt A. Laub, Virginia Polytechnic Institute and State Univ., Blacksburg, VA

D014 Temperature and floral abundance: biotic and abiotic determinants of pollinator activity in the mountain steppe of northern Mongolia. **Daniel Song**, songdan@sas.upenn.edu[1], Pierre Liancourt[1], Brenda Casper[1], Peter Petraitis[1], Bazartseren Boldgiv[2] and Laura Spence[1], [1]Univ. of Pennsylvania, Philadelphia, PA, [2]National Univ. of Mongolia, Ulaanbaatar, Mongolia

D015 Modeling temperature-dependent development and survival of *Podisus maculiventris* (Hemiptera: Pentatomidae): Implications for biological control. **Sunghoon Baek**, shbaek007@hotmail.com[1], Youngsoo Son[2] and Yong-Lak Park[1], [1]West Virginia Univ., Morgantown, WV, [2]California Dept. of Food and Agriculture, Arvin, CA

D016 Spatial distribution of brown marmorated stink bug (*Halyomorpha halys*) in peach orchards. **Noel Hahn**, nghahn@gmail.com[1], Cesar Rodriguez-Saona[2], George C. Hamilton[1] and Alex Kaufman[1], [1]Rutgers, The State Univ. of New Jersey, New Brunswick, NJ, [2]Rutgers Univ., Chatsworth, NJ

D017 Evaluation of intercropping as organic, integrated pest management in northeastern hops. **Lily Calderwood**, lcalderw@uvm.edu, Univ. of Vermont, Burlington, VT

D018 Investigating the relationship between an ornamental plant and an introduced pollinator: *Stachys byzantina* (lamb's ear) and *Anthidium manicatum* (European wool-carder bee). **Kelsey Graham**, kelsey.graham@tufts.edu[1], Steve Brown[2], Ursula S.R. Roese[3] and Philip Starks[1], [1]Tufts Univ., Medford, MA, [2]Northern Essex Community College, Haverhill, MA, [3]Univ. of New England, Biddeford, ME

Submitted Poster Presentations **Regency Ballroom** **12:00-5:00**

[Author attendance at posters during President's Reception, Sunday Evening]

D019 A survey of ant species in three habitats at Mount St. Helens National Volcanic Monument. **Jessamy Rango**, jjrango@aacc.edu, Anne Arundel Community College, Arnold, MD

D020 Mexican bean beetle (*Epilachna varivestis*) distribution and pest status in Virginia. **Louis Nottingham**, louisn@vt.edu and Thomas P. Kuhar, Virginia Tech, Blacksburg, VA

D021 Host plant preference of the brown marmorated stink bug (*Halyomorpha halys*) in northern Virginia on the farm at Sunnyside. **Taliaferro Trope**, ttrope@prescott.edu, Virginia Tech, Blacksburg, VA

D022 Grower survey on the impact of the brown marmorated stink bug: First year results. **Eric R. Day**, idlab@vt.edu, VPI&SU, Blacksburg, VA and Carrie Koplinka-Loehr, Northeastern IPM Center, Ithaca, NY

D023 The fit of Cyazypyr™ in IPM programs that include natural enemies. **Rachel A. Cameron**, rachel.a.cameron@usa.dupont.com[1], Juan M. Alvarez[1], Hector E. Portillo[1], I. Billy Annan[1], John Wiles[2], Jean-Luc Rison[3], David De Scals[4] and Jose Cardenas[5], [1]DuPont Crop Protection, Newark, DE, [2]DuPont (U.K.) Limited, Stevenage, Hertfordshire, United Kingdom, [3]DuPont de Nemours S.A.S, Nambshm, France, [4]Dupont Iberica, S.L., Murcia, Spain, [5]DuPont Iberica, S.L., Jerez de la Frontera, Spain

D024 Implications of diet for survival of potato leafhopper, *Empoasca fabae* (Homoptera: Cicadellidae) in alfalfa-based agroecosystems. **Cody Nagy**, name@ursinus.edu, Ursinus College, Collegeville, PA

D025 Predation rate of spined soldier bugs, *Podisus maculiventrus* (Hemiptera: Pentatomidae) on larval monarch butterflies, *Danaus Plexippus* (Lepidoptera: Nymphalidae). **Katlyn Lawver**, kalawver@ursinus.edu, Student, Collegeville, PA

D026 Spatial and temporal movement of brown marmorated stink bugs in urban environment. **Yong-Lak Park**, Yong-Lak.Park@mail.wvu.edu, Matthew I. McKinney and Sunghoon Baek, West Virginia Univ., Morgantown, WV

D027 Assessment of native pollinator health and diversity in urban forest fragments. **David Gardner**, dgardner@udel.edu, Univ. of Delaware, Newark, DE

D028 Effects of fertilization on spider size class distributions in an intertidal salt marsh. **Maisie Lynch**, lynch.maisie@gmail.com, Gaithersburg High School, MCPS, Gaithersburg, MD

D029 An integrated IPM program using non-chemical controls to manage parasites in honey bee colonies. **Kathleen Evans**, kciola@udel.edu, Univ. of Delaware, Newark, DE

D030 Survey of *Tiphia* parasitoids of the Japanese and oriental beetles in Massachusetts and New Hampshire. **Ana Legrand**, ana.legrand@uconn.edu, Univ. of Connecticut, Storrs, CT

D031 An experimental artificial diet for the brown marmorated stink bug, *Halyomorpha halys*. **Peter Coffey**, peterlcoffey@gmail.com, Univ. of Maryland, College Park Maryland, MD and Galen P. Dively, Univ. of Maryland, College Park, MD

D032 A novel aggregation site for silphine carrion beetles (Coleoptera : Silphidae : Silphinae). **Norman J. Fashing**, njfash@wm.edu, College of William and Mary, Williamsburg, VA and Gisela K. Fashing, G. K. Fashing, DDS, Williamsburg, VA

D033 A survey of production and pest management strategies used for gooseberry production throughout three regions of the United States. Doug Pfeiffer[1], **Linda Johnson**, berryfarmerlinda@gmail.com[1], Greg Welbaum[1] and Joshua Freeman[2], [1]Virginia Polytechnic Institute and State Univ., Blacksburg, VA, [2]Eastern Shore Agricultural Research and Extension Center, Painter, VA

Sunday Evening, March 17, 2013

President's Reception	**Regency Ballroom**	**5:30-6:30**

Sunday Evening, March 17, 2013

Jobs in Entomology Workshop **State Room** **6:30-8:30**

How and Where Can You Find a Job in Entomology?

Moderators and Organizers: George C. Hamilton, Rutgers, The State Univ. of New Jersey, New Brunswick, NJ

041 Getting a job in academia. **George C. Hamilton**, hamilton@aesop.rutgers.edu, Rutgers, The State Univ. of New Jersey, New Brunswick, NJ

042 Getting a job with the United States Department of Agriculture. **Tracy C. Leskey**, tracy.leskey@ars.usda.gov, USDA, Agricultural Research Service, Kearneysville, WV

043 Getting a job with the Environmental Protection Agency. **Clayton Myers**, myers.clayton@epa.gov, EPA, Washington, DC

044 Getting a job in private industry. **James Steffel**, jim@labservices.com, LABServices, Hamburg, PA

045 Getting a post-doc position. **Joyce Parker**, parker@AESOP.Rutgers.edu, Rutgers Univ., Chatsworth, NJ

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

New Pest Roundup, Detection and Status Update for the Eastern Branch

Moderators and Organizers: Robert B. Trumbule[1] and Eric R. Day[2], [1]Maryland Dept. of Agriculture, Annapolis, MD, [2]Virginia Polytechnic Institute and State Univ., Blacksburg, VA

8:00 Introductory Remarks

8:05 046 Current pest status of gypsy moth in the eastern US. **Karen Walker**, USDA/APHIS PPQ, Riverdale, MD

8:30 047 Flat mites of the world interactive identification key for economically important species in the family Tenuipalpidae. **J.J. Beard**[1], Ronald Ochoa[1], Gary R. Bauchan[1], M.D. Trice[2], A.J. Redford[2], Terrence Walters[2] and Charles Mitter[3], [1]USDA, Agricultural Research Service, Beltsville, MD, [2]USDA - APHIS-PPQ-CPHST, Fort Collins, CO, [3]Univ. of Maryland, College Park, MD

8:55 048 Comparative attractiveness of a single-component isomer vs. the racemic blend of a mating pheromone in *Prionus* (Coleoptera: Cerambycidae) traps. **Arthur Agnello**, ama4@cornell.edu, Cornell Univ., Geneva, NY

9:20 049 Pests recently changed to non-reportable status and new pests intercepted in the Mid-Atlantic. **James Young**, jim.d.young@aphis.usda.gov, USDA-APHIS-PPQ, Baltimore, MD

9:45 Break

10:00 050 Using AphID for identification of cosmopolitan and polyphagous aphid species.. **Gary L. Miller**, gary.miller@ars.usda.gov, USDA, Agricultural Research Service, Belstville, MD and Colin Favret, Univ. de Montréal, Montreal, QC, Canada

10:25 051 Status of hemlock woolly adelgid, *Adelges tsugae* (Annand), and biological control efforts in western Maryland. **Biff Thompson**, Maryland Dept. of Agriculture, Annapolis, MD

10:50 052 Emerald ash borer update. **Coanne O'Hern**, USDA-APHIS-PPQ, Carlisle, PA

11:15 053 New drosophilids of Virginia. **Douglas G. Pfeiffer**, dgpfeiff@vt.edu, Virginia Polytechnic Institute and State Univ., Blacksburg, VA

11:40 Group discussion and updates on new pests, please bring specimens of new insects you are finding. Microscopes will be provided

---

Sustainable Agriculture Symposium **Embassy Room** **8:00-12:00**

Growing Towards a Sustainable Future: Current Research and Insights on Sustainable Pest Management

Moderators and Organizers: Joyce E. Parker[1] and Anne L. Nielsen[2], [1]Rutgers, The State Univ. of New Jersey, Chatsworth, NJ, [2]Michigan State Univ., East Lansing, MI

8:00 Introductory Remarks

8:01 054 Sustainable vegetable production: Can we make it work?. **Anthony M. Shelton**, ams5@cornell.edu, Cornell Univ., NYSAES, Geneva, NY

8:21 055 Developing a sustainable system for managing European corn borer in bell peppers. **George C. Hamilton**, hamilton@aesop.rutgers.edu, Rutgers, The State Univ. of New Jersey, New Brunswick, NJ

8:41 056 Compensatory plant responses to pest damage: A new path for more sustainable agriculture?. **Katja Poveda**, kap235@cornell.edu, Cornell Univ., Ithaca, NY

9:01 057 Sustainable management of grape root borer in eastern vineyards: Recent advances and future needs. **Chris Bergh**, cbergh@vt.edu, Virginia Tech, Winchester, VA

9:21 058 Using non-chemical controls to manage parasites in honey bee colonies. **Deborah A. Delaney**, dadelane@udel.edu, Entomology and Wildlife Ecology, University of Delaware, DE

9:41 Break

9:56 059 Sustainable plant protection programs: Attempts to fill the gap between concepts and reality. **Charles Vincent**, Charles.Vincent@AGR.GC.CA, Agriculture and Agri-Food Canada, Saint-Jean-sur-Richelieu, QC, Canada

10:16 060 Advances in modeling phenology and migratory source of northeastern pests. **Shelby Fleischer**, sjf4@psu.edu, Pennsylvania State Univ., Univ. Park, PA

10:36 061 Conservation of entomopathogenic fungi and nematodes in sustainable cropping systems. **Mary Barbercheck**, meb34@psu.edu[1], Randa Jabbour[2] and Christina Mullen[1], [1]Pennsylvania State Univ., Univ. Park, PA, [2]Univ. of Maine, Orono, ME

10:56 062 Organic management of brown marmorated stinkbug and other pests on a diversified WV farm. **Clarissa Mathews**, cmathews@shepherd.edu, Shepherd Univ., Shepherdstown, WV

11:16 063 Trap-crop biodiversity enhances crop protection. **Joyce E. Parker**, parker@AESOP.Rutgers.edu, Rutgers, The State Univ. of New Jersey, Chatsworth, NJ

11:36 Concluding Remarks

Student Symposium **Regency Ballroom** **8:00-12:00**

Natural History and Diversity of Arthropods

Moderators and Organizers: Julia Mlynarek, Carleton Univ., Ottawa, ON, Canada

8:00 Introductory Remarks

8:05 064 Seasonal relationships of predator assemblages and onion thrips in New York agroecosystems. **Elaine J. Fok**, ejf92@cornell.edu, Cornell Univ., Geneva, NY

8:35 065 Insect Diversity and Ecosystem. **Douglas W. Tallamy**, dtallamy@udel.edu, Univ. of Delaware, Newark, DE

9:05 066 Natural history, taxonomy and climate change: Building a foundation for big questions in ecology. **Terry A. Wheeler**, terry.wheeler@mcgill.ca, McGill Univ., Ste-Anne-de-Bellevue, QC, Canada

9:35 Break

9:50 067 Multi-level analysis of honey bee queen post-mating changes and queen-worker interactions. **Elina L. Niño**, elastro@psu.edu, Pennsylvania State Univ., Univ. Park, PA

10:20 068 How molecular data have altered our understanding of bee phylogeny and evolution. **Bryan N. Danforth**, bnd1@cornell.edu, Cornell Univ., Ithaca, NY

10:50 069 Herbivory, pollination and mimicry during the preangiospermous mesozoic. **Conrad Labandeira**, labandec@si.edu, National Museum of Natural History, Washington D.C, DC

Monday Afternoon, March 18, 2013

Linnaean Games **Regency Ballroom** **12:00-1:30**

Linnaean Games

Coordinator – Douglas G. Pfeiffer

Pollinator Symposium **State Room** **1:30-5:30**

Maximizing and Sustaining Pollination Services in the 21st Century

Moderators and Organizers: Daniel Cariveau, Rutgers Univ., Somerset, NJ

1:30 Introductory Remarks

1:35 070 Host-parasite interactions in honey bees and colony declines. **Jay D. Evans**, evansj@ba.ars.usda.gov, USDA, Agricultural Research Service, Beltsville, MD

CANCELLED 2:00 071 Native and managed bees of New York apple orchards: Connecting biodiversity, pollination services, and production. **Eleanor J. Blitzer**, ejb278@cornell.edu, Mia G. Park and Bryan N. Danforth, Cornell Univ., Ithaca, NY

2:25 072 A novel mechanism causing honey bee sensitivity to sublethal concentrations of pesticides. **David J. Hawthorne**, djh@umd.edu, Univ. of Maryland, College Park, MD

2:50 073 Restoration ecology of native bee communities. **Daniel Cariveau**, dancariveau@gmail.com, Rutgers Univ., Somerset, NJ

3:15 Break

3:30 074 The development of best use practices of commercial bumble bees on crops in Delaware. **Jacquelyn Marchese**, marchese@udel.edu and Deborah A. Delaney, Entomology and Wildlife Ecology, University of Delaware, Newark, DE

3:55 075 The importance and conservation of native pollinators in Pennsylvania apple orchards. **David J. Biddinger**, djb134@psu.edu[1], Edwin Rajotte[2], Neelendra K. Joshi[1] and Mace Vaughan[3], [1]Pennsylvania State Univ., Fruit Research & Extension Center, Biglerville, PA, [2]Pennsylvania State Univ., Univ. Park, PA, [3]The Xerces Society, Portland, OR

4:20 076 Raising wild pollinators to maximize crop yields: How much pollinator-friendly habitat does one need?. **Eric Lonsdorf**, eric.lonsdorf@fandm.edu, Franklin and Marshall College, Lancaster, PA

4:45 077 Systems analysis of honey bee health: From genes to ecosystems. **Christina M. Grozinger**, cmgrozinger@psu.edu, Pennsylvania State Univ., Univ. Park, PA

Agro-ecosystem Diversity Symposium **Presidential Ballroom** **1:30-5:30**

Assessing the Value of Diversity in (Agro)ecosystems

Moderators and Organizers: John F. Tooker, Pennsylvania State Univ., Univ. Park, PA

1:30 078 Creating trophic balance in agroecosystems. **Douglas W. Tallamy**, dtallamy@udel.edu, Univ. of Delaware, Newark, DE

1:50 079 Influence of nonhost plant diversity and natural enemies on the potato leafhopper*, Empoasca fabae*, in alfalfa. **Cory Straub**, cstraub@ursinus.edu, Nathan P. Simasek, Mark R. Gapinski, Regan Dohm, Ellen O. Aikens, Sarah Muscella and Cody Nagy, Ursinus College, Collegeville, PA

2:10 080 Arthropod communities in native vs. alien urban landscapes: How do they differ?. **Paula M. Shrewsbury**, pshrewsb@umd.edu, Michael J. Raupp, David E. Jennings and Holly M. Martinson, Univ. of Maryland, College Park, MD

2:30 081 Toward a gentler orchard: Improving safety of orchard pest management for humans and beneficial arthropods. **Doug Pfeiffer**, dgpfieff@vt.edu, Virginia Polytechnic Institute and State Univ., Blacksburg, VA

2:50 Break

3:05 082 Dirty little secret: belowground diversity of entomopathogenic nematodes and conservation biological control. **Daniel S. Gruner**, dsgruner@umd.edu and Richard R. Lewis, Univ. of Maryland, College Park, MD

3:25 083 A different type of diversity: Does increased crop genotypic diversity improve control of insect pests?. **Ian M. Grettenberger**, img103@psu.edu, Pennsylvania State Univ., State College, PA and John F. Tooker, Pennsylvania State Univ., Univ. Park, PA

3:45 084 Linking control and conservation: Integrating ecosystem services into IPM decision-making. **John Losey**, jel27@cornell.edu and Antonio DiTommaso, Cornell Univ., Ithaca, NY

4:05 085 Prey-mediated effects on predators of seed-applied insecticides in no-till agroecosystems. **Maggie Douglas**, mrd276@psu.edu, Pennsylvania State Univ., State College, PA and John F. Tooker, Pennsylvania State Univ., Univ. Park, PA

Submitted Oral Presentations **Embassy Room** **2:00-5:00**

Moderators: Noel Hahn[1] and Doo-Hyung Lee[2], [1]Rutgers Univ., New Brunswick, NJ, [2]USDA, Kearneysville, WV

2:00 086 DuPont™ Exirel™, Benevia™ and Verimark™ insect control products: Optimizing insect control and yield in vegetables and potato in the northeast. **Victoria Kleczewski**, victoria.a.kleczewski@dupont.com[1], Gregory Hannig[2], Donald D. Ganske[3], Hector E. Portillo[4], I. Billy Annan[4] and Juan M. Alvarez[4], [1]DuPont Crop Protection, Westampton, NJ, [2]Dupont Crop Protection, Palmyra, NY, [3]DuPont Crop Protection, Winchester, VA, [4]DuPont Crop Protection, Newark, DE

2:12 087 Bottom up effect on top down control: the impact of plant-provided resources on the effectiveness of insect natural enemies. **Christopher R. Philips**, crp@vt.edu[1], Thomas P. Kuhar[1] and D. Ames Herbert[2], [1]Virginia Polytechnic Institute and State Univ., Blacksburg, VA, [2]Virginia Polytechnic Institute and State Univ., Suffolk, VA

2:24 088 Optimization of acylsugar mediated control of silverleaf whitefly (*Bemisia tabaci* biotype B) in tomato. **Brian M. Leckie**, bml66@cornell.edu, Darlene M. De Jong and Martha A. Mutschler, Cornell Univ., Ithaca, NY

2:36 089 Dispersal capacity and behavior of brown marmorated stink bug. **Doo-Hyung Lee**, DooHyung.Lee@ars.usda.gov, Starker E. Wright, Cameron Scorza and Tracy C. Leskey, USDA, Agricultural Research Service, Kearneysville, WV

2:48 090 What do birds eat? A trophic and taxonomic analysis of breeding bird diets in North America based on citizen scientist images. **Keara English**, keara@udel.edu, Univ. of Delaware, Newark, DE

3:00 091 Long-term IPM for western corn rootworm: Densities, damage, and dollars. **David Onstad**, david.onstad@pioneer.com, DuPont Agricultural Biotechnology, Wilmington, DE and Zaiqi Pan, DuPont Crop Protection, Newark, DE

3:12 092 The effect of urban forest quality and composition on populations of long-horned beetles (Coleoptera: Cerambycidae). **Kaitlin Handley**, khandley@udel.edu[1], Judith A. Hough-Goldstein[1], Lawrence M. Hanks[2], Jocelyn G. Millar[3] and Vincent D'Amico[4], [1]Univ. of Delaware, Newark, DE, [2]Univ. of Illinois, Urbana, IL, [3]Univ. of California, Riverside, Riverside, CA, [4]USDA, Forest Service, Newark, DE

3:24 093 Evaluating food web complexity of invaded habitats. **Melissa Richard**, mrichard@udel.edu, Univ. of Delaware, Newark, DE

3:36 094 Aggression or ovarian development as determinants of reproductive dominance in *Bombus terrestris*: Interpretation using a simulation model. **Etya Amsalem**, me.at.isra@gmail.com, Pennsylvania State Univ., State College, PA

3:48 095 The importance of gut symbionts in the development of the brown marmorated stink bug (*Halyomorpha halys*). **Christopher Taylor**, cmjtaylor3@gmail.com, Univ. of Maryland, College Park, MD

4:00 096 What do birds eat? A trophic and taxonomic analysis of breeding bird diets in North America based on literature citations. **Allison Scarbrough**, allisons@udel.edu, Univ. of Delaware, Newark, DE

4:12 097 Do soil applied neonicotinoids provide control of brown marmorated stink bug (*Halyomorpha halys*) in vegetables? **John D. Aigner**, daigner@vt.edu, Thomas P. Kuhar and Katherine L. Kamminga, Virginia Polytechnic Institute and State Univ., Blacksburg, VA

4:24 098 In comparison of Lepidoptera density between native and non-native shrub species. **Stephanie Moon**, trjs@iup.edu, Indiana Univ. of Pennsylvania, Indiana, PA

4:36 099 Does increased ear damage in *Bt* sweet corn indicate that resistance in corn earworm (*Helicoverpa zea*) is developing?. **Galen Dively**, galen@umd.edu[1], Terry Patton[2] and Mike Embrey[1], [1]Univ. of Maryland, College Park Maryland, MD, [2]Univ. of Maryland, College Park, MD

Monday Evening, March 18, 2013

Social and cash bar	**Pre-function area**	**6:00-7:00**
Banquet, Student Competition Awards, and Keynote Speaker	**Grand Ballroom**	**7:00-10:00**

ESA Presidential Remarks

Rob Wiedenmann

University of Arkansas

Branch Awards:

L.O. Howard Distinguished Achievement Award

Student Competition Awards

Asa Fitch Award Winner

Comstock Award Winner

Poster Student Competition Awards

Oral Competition Awards

Branch Nominations for National Awards

Distinguished Achievement Award for Teaching

Distinguished Achievement Award in Extension

Distinguished Award for Excellence in Integrated Pest Management

2013 Eastern Branch ESA Banquet Speaker

Dr. Daniel Janzen

Professor, Department of Biology

University of Pennsylvania

What do you find in a detailed caterpillar and parasitoid inventory of a large tropical place?

Monday Morning, March 19, 2013

Final Business Meeting	**Executive Suite**	**7:00-8:00**

Industry Symposium **State Room** **8:00-12:00**

Current Issues in Insecticide Resistance Management

Moderators and Organizers: Charles Silcox[1] and James Steffel[2], [1]AMVAC Chemical Corporation, Lincoln Univ., PA, [2]LABServices, Hamburg, PA

8:00 Introductory Remarks

8:05 100 Insecticide resistance: A global problem impacting pest management. **Mark E. Whalon**, whalon@msu.edu, Michigan State Univ., East Lansing, MI

8:30 101 Efforts to facilitate sound IRM practices in the regulatory process. **Bill Chism**, chism.bill@epa.gov and Clayton Myers, EPA, Washington, DC

8:55 102 Implementing insecticide resistance management strategies in the field: Challenges faced by the diamide IRM inter-company teams. **James Adams**, jadams@nichino.net, Nichino America, Inc, Wilmington, DE, Caydee Savinelli, Syngenta Crop Protection, Greensboro, NC, John T. Andaloro, DuPont Crop Protection, Newark, DE, Daniel W. Sherrod, DuPont Crop Protection, Memphis, TN and Ralph Bagwell, Bayer CropScience, Research Triangle Park, NC

9:20 103 Impact of pesticide resistance on IPM practices. **Andrei Alyokhin**, andrei.alyokhin@umit.maine.edu, Univ. of Maine, Orono, ME

9:45 Break

9:55 104 Value of biopesticides in resistance management strategies. **Russell Eldridge**, Russell.Eldridge@valentbiosciences.com, Valent BioSciences Corporation, Libertyville, IL and Dirk Ave, Valent BioSciences, n/a

10:20 105 Insecticide resistance in apple pests: past, present and future. **Harvey Reissig**, whr1@cornell.edu, Cornell Univ., Geneva, NY

10:45 106 Resistance of western corn rootworm to *Bt* corn: Status and relevance to Mid-Atlantic corn production. **John F. Tooker**, tooker@psu.edu, Pennsylvania State Univ., Univ. Park, PA

11:10 107 Resistance management strategies for the annual bluegrass weevil *(Listronotus maculicollis)* (Coleoptera: Curculionidae). **Steven Alm**, stevealm@uri.edu, Univ. of Rhode Island, Kingston, RI

11:35 108 Bed bugs exhibit multiple mechanisms of insecticide resistance: What are our options? **Dini Miller**, dinim@vt.edu, Virginia Polytechnic Institute and State Univ., Blacksburg, VA

12:00 Discussion

Biological Control Symposium **Embassy Room** **8:00-12:00**

Biological Control in Agricultural, Natural, and Ornamental Landscapes

Moderators and Organizers: Paula M. Shrewsbury[1] and Richard Casagrande[2], [1]Univ. of Maryland, College Park, MD, [2]Univ. of Rhode Island, Kingston, RI

8:00 Introductory Remarks

8:05 109 Plant community response two and four years following biological control of the invasive vine, *Persicaria perfoliata*. **Judith A. Hough-Goldstein**, jhough@udel.edu, Univ. of Delaware, Newark, DE, Ellen C. Lake, USDA-ARS, Fort Lauderdale, FL and Kiri J. Cutting, Univ. of Waikato, Hamilton, New Zealand

8:25 110 Preliminary assessments of native strains of persistent entomopathogenic nematodes for plum curculio management. **Arthur Agnello**, ama4@cornell.edu[1], Melissa Keller[2], Elson J. Shields[2] and Tony Testa[2], [1]Cornell Univ., Geneva, NY, [2]Cornell Univ., Ithaca, NY

8:45 111 A two decade retrospective on *Trichogramma ostriniae* in the US. **Jeffrey Gardner**, jg48@cornell.edu and Michael P. Hoffmann, Cornell Univ., Ithaca, NY

9:05 112 Ecology of introduced parasitoids of the invasive emerald ash borer (*Agrilus planipennis*). **David E. Jennings**, name@umd.edu[1], Paula M. Shrewsbury[1] and Jian J. Duan[2], [1]Univ. of Maryland, College Park, MD, [2]USDA, Agricultural Research Service, Newark, DE

9:25 113 Analysis of *Tiphia* parasitoids pre-ovipositional behaviors and of scarab host defensive responses. **Piyumi Tilanka Obeysekara**, piyumi.obeysekara@uconn.edu and Ana Legrand, Univ. of Connecticut, Storrs, CT

9:45 Break

10:00 114 Host range evaluations of *Trissolcus* spp. - potential biological control agents of the brown marmorated stink bug, *Halyomorpha halys*. **Christine Dieckhoff**, christine.dieckhoff@ars.usda.gov, USDA, Agricultural Research Service, Beneficial Insects Introduction Research Laboratory (BIIRL), Newark, DE and Kim A. Hoelmer, USDA, Agricultural Research Service, Montferrier, DE, France

10:20 115 Natural enemies associated with the brown marmorated stink bug in ornamental nurseries. **Ashley L. Jones**, ashleyj@umd.edu, Paula M. Shrewsbury and Cerruti Hooks, Univ. of Maryland, College Park, MD

10:40 116 Pathogenicity of entomopathogenic fungi against three greenhouse aphid pests. **John Sanderson**, jps3@cornell.edu[1], Sarah Jandricic[1], Melanie Filotas[2] and Stephen P. Wraight[3], [1]Cornell Univ., Ithaca, NY, [2]Ontario Ministry of Agriculture, Food & Rural Affairs (OMAFRA), Guelph, ON, Canada, [3]USDA, Agricultural Research Service, Ithaca, NY

11:00 117 Regional biological control issues. **Richard Casagrande**, casa@uri.edu, Univ. of Rhode Island, Kingston, RI

11:20 Concluding Remarks and Discussion

APPENDIX A

Student Competition, Oral Presentations Abstracts

009. Systematics of *Caenodelphax* Fennah (Hemiptera: Fulgoroidea: Delphacidae)

Delphacid planthoppers (Hemiptera: Fulgoromorpha: Delphacidae) are of worldwide economic interest as crop pests and vectors of plant diseases. Despite their importance, much of their evolutionary history remains poorly understood and many genera within Delphacidae need revision. *Delphacodes* Fieber, 1866 once included more than 136 species, including many New World species, but was redescribed with a more limited definition, reducing it to only 10 western Palearctic species. This left the majority of *Delphacodes* species in need of reassignment to other genera.

Hamilton (2002) hypothesized that 10 New World *Delphacodes* species belong to *Caenodelphax* Fennah, 1965. This project undertook an investigation of Hamilton's hypothesis by examining a subset of 13 *Delphacodes* and 4 *Caenodelphax* species with reference to morphological phylogenetic analyses to determine their evolutionary relationships. Phylogenetic analyses using maximum parsimony did not support Hamilton's hypothesis, and instead suggested that eight ingroup species belong in a separate, new genus. *Caenodelphax* is redescribed here as a monotypic taxon; eight species are transferred to the new genus, *Flavoclypeus*, and two species are synonymized.

010. Competitor avoidance drives within-host selection in hemlock woolly adelgid (*Adelges tsugae*), a passively-dispersed herbivore

The hemlock woolly adelgid (HWA*; Adelges tsugae*), a lethal exotic hemipteran pest on eastern hemlock (*Tsuga canadensis*) frequently shares its host with another exotic but non-lethal hemipteran, the elongate hemlock scale (EHS; *Fiorinia externa*). HWA colonization on EHS-infested trees results in a 40% decrease in HWA population densities, suggesting that EHS-induced changes in foliage quality negatively affect HWA performance and survival. Thus, there may be a selective advantage for HWA crawlers that are capable of detecting and avoiding EHS-infested foliage within a host. The objective of this study was to determine if HWA actively demonstrate preference for uninfested vs. EHS-infested foliage. We studied HWA preference at the needle and shoot level by using a combination of laboratory choice tests and observational field studies.

In the dual choice tests, a higher percentage of HWA crawlers were present on uninfested-shoots than on EHS-infested shoots from the same tree ($P = 0.03$, $n = 48$). In the field, HWA and EHS co-occurred on the same needle less frequently than predicted by chance ($P < 0.001$, $n = 75$). This pattern was consistent among the three different field sites studied. Although HWA crawlers are passively dispersed between trees, these results suggest that HWA can actively avoid EHS-infested foliage at small, within-host scales. This avoidance behavior may minimize the impact of EHS on HWA by reducing resource competition, and in the long-term it could result in HWA adaptations that might exacerbate the negative impact of this pest on the eastern hemlock.

011. Diurnal and nocturnal activities of the brown marmorated stink bug, *Halyomorpha halys*, in a Pennsylvania orchard

The brown marmorated stink bug, *Halyomorpha halys*, (BMSB) is an invasive pest in orchards and a variety of field crops across the United States. While little is still known about BMSB biology and behavior, new studies are being conducted to better understand factors influencing future management programs. BMSB adults and nymphs were used for behavioral field observations conducted in orchards located at the Pennsylvania State University Fruit Research and Extension Center in Biglerville, PA. Clear mesh sleeves were placed on tree limbs of various apple, peach, and nectarine cultivars. The field observations ran from May until August 2011 and 2012. During multiple time intervals over a 24-hour period, activities such as feeding, moving, and resting behaviors were recorded to better understand BMSB diurnal and nocturnal behavior.

In 2011, results indicated an overall difference between adult and nymphal behaviors, a difference between adult behavior at different times of day, and a difference between behavior among different fruit varieties. Meanwhile, for nymphs alone, the impact of both time of day and fruit variety was not significant. During the season 2012, there was not a difference between overall adult and nymphal behavior, however differences existed among adult behaviors at different times of day. Fruit variety did not affect behavior of BMSB adults. Similarly in nymphs, fruit variety was not a significant, but the time of day was significant. Better understanding of BMSB behavior may be used for improvement of future management practices.

012. The impact of drought and herbivory on the invasive annual vine *Persicaria perfoliata*

Mile-a-minute weed, *Persicaria perfoliata*, is an invasive annual vine currently established in 12 mid-Atlantic and northeastern states. A fully factorial greenhouse experiment exposed mile-a-minute to drought and herbivory conditions over an eleven week period. Drought was maintained by withholding water until plants showed signs of water stress. The herbivory treatment consisted of caging the biological control agent *Rhinoncomimus latipes* (Coleoptera: Curculionidae) with the plants. Both the total number of seeds produced and base stem thickness of the plants were significantly reduced by both the drought and herbivory treatments. The final dry biomass of the plants was only reduced by drought, while seed weight was not significantly affected by either treatment. The environmental factors that influence the weed's interactions with its control agent may be important for managing new and established populations over its range.

013. A comparison of Lepidoptera communities inhabiting restored and degraded pitch pine-scrub oak barrens in Pennsylvania

Scrub oak barrens were once distributed throughout portions of the northeastern United States. This fire-dependent community covered approximately two million acres in Pennsylvania during the mid-1900s, but was reduced to about 17,600 acres by the late-1900s. Decline of scrub oak barrens is attributed to human development, fire suppression, and colonization by fire-intolerant trees. In recent years, the Pennsylvania Game Commission and The Nature Conservancy have partnered to restore large amounts of degraded scrub oak barrens through prescribed fire. Scrub oak barrens are a state imperiled ecosystem, and support high species richness including several endemic species. For example, scrub oak barrens are known for supporting high Lepidoptera (butterfly and moth) diversity. Our study examined Lepidoptera communities in recently burned scrub oak barrens in northeastern Pennsylvania. We used black light traps and bait stations to compare Lepidoptera diversity and abundance across six burned sites and three degraded unburned sites. Sites were sampled two nights per month in June, July, and August 2012. A total of 13,386 individuals were identified, representing 397 species. Seven species are rare or state listed with three species exclusive to treatment sites. No differences in Lepidoptera species richness, diversity or evenness were found between burned and unburned scrub oak barrens. Several species (n=207) were found in both burned and unburned sites. However, several species were unique to burned (n=54) and unburned sites (n=136). Our data suggest scrub oak barrens should be managed to create a mosaic of burned and unburned patches if Lepidoptera diversity is a conservation goal.

014. The life cycle of *Pineus strobi* in southwest Virginia and associated predators

The release of biological control agent *Laricobius nigrinus* for hemlock woolly adelgid, *Adelges tsugae*, in the eastern United States is having an unintended consequence on a native congener, *Laricobius rubidus*. *Laricobius nigrinus* and *L. rubidus* have been shown to hybridize and complete development on *A. tsugae*. *Laricobius rubidus* is a predator of a native adelgid species, pine bark adelgid, *Pineus strobi*, which infests eastern white pine (*Pinus strobus*). At present, there is little information on the native adelgid and its associated predators, making it difficult to assess the impacts that hybridization may have on the natural system. Additionally, knowledge of predators associated with pine bark adelgid may be used to determine suitability of potential biological control agents. Rearing efforts of *L. rubidus* may also benefit from additional insight into environmental conditions present during various stages of their life cycle in the Appalachian region. Over the course of two years, the life cycles of *P. strobi* and other associated predators will be observed at four sites located in southwest Virginia. This project has thus far yielded different phenologies of *P. strobi* and *L. rubidus* from those found in the published literature. Predators found to be associated with *P. strobi* include various Coccinellids, Chamaemyiids, and Cecidomyiids. These three families contain species used for biological control and the further identification of these individuals associated with *P. strobi* would be of use to other research into biological control of forest pests.

015. Dynamics of hydrophilic and hydrohobic tracing dyes in honey bee (*Apis mellifera)* hives

Many chemical treatments are often tested for their impact on honey bees (*Apis mellifera)* in a hive setting. This is frequently done via feeding whole hives treated sugar syrup and or treated pollen patties. The purpose of this type of exposure is to mimic natural consumption when testing lethal or sub-lethal effects of a given treatment. It would be useful to know how a compound's basic chemical properties and the way that chemical is fed to honey bees effect where it ends up in the hive. Here we used two chemically different fluorescent tracing dyes and exposed a group of 20 hives either to dyed pollen patties, sugar syrup, both, or none. We then sampled adult workers, larvae, pupae, wax, pollen, and honey, at regular intervals, and royal jelly at the end of the study. These samples were later processed and the level of dye present in each sample was detected using a spectrophotometer.

016. Host plant feeding preferences of the Asiatic garden beetle

The Asiatic garden beetle (AGB), *Maladera castanea*, is an invasive scarab pest of turfgrass, crops, and ornamentals. The beetle has been minimally studied, and is resistant to many traditional controls. A better understanding of adult habits, which influence larval location and adult damage, could suggest better management strategies, for example selecting plants less palatable to adult AGBs.

Field and laboratory experiments were conducted to investigate AGB feeding preferences. The field experiments used beetle counts to indicate comparative preference for three cultivars each of nine edible plants: basil, beet, carrot, eggplant, kohlrabi, parsnip, hot pepper, sweet pepper, and turnip. AGBs were counted in a common garden with a randomized complete block design in 2011 and 2012.

The laboratory experiments estimated concrete feeding preferences, using a no-choice format where change in mass and area of leaf pieces represented willingness to feed. These tests included the basil, beet, and kohlrabi varieties used in the field experiments, and, in 2012, also included six ornamental landscape plants: elderberry, viburnum, green ash, red maple, sugar maple, and American sweetgum.

The 2011 and 2012 field experiments indicated a strong preference for basil over other crop plants. This was supported by the 2012 lab leaf area change data. Statistically significant differences were not discernable among other edible plant varieties. The 2012 laboratory no-choice tests indicated that sugar maple was significantly less likely to be eaten than the other landscape plants tested, which were not significantly different from one another in terms of AGB feeding.

017. Prey handling of toxic and non-toxic Lepidopteran prey by the Chinese mantid, *Tenodera sinensis*

Monarch caterpillars, *Danaus plexippus*, sequester toxic cardenolides from milkweed plants. This defense is effective against most predators, but the Chinese mantid, *Tenodera sinensis*, is able to consume them without any apparent ill effects. It has been shown that mantids consume monarch caterpillars by gutting them, allowing the gut material to fall from the prey without further attempt to consume it. They do not engage in this behavior when consuming non-toxic European corn borers, *Ostrinia nubilalis*, or wax worms, *Galleria mellonella*, suggesting avoidance of prey toxicity. It may also be avoidance of more toxic/less nutritive plant material, since mantids are consuming cardenolides even when feeding only on the body of toxic monarchs. We furthered this research by rearing monarch caterpillars and cabbage loopers, *Trichoplusia ni*, on toxic and non-toxic plants, and conducting behavioral trials observing mantid predator-prey encounters with these prey. In addition, we offered mantids starved and un-starved monarch caterpillars reared on toxic and non-toxic plants as well as corn borers.

Mantids gut both toxic and non-toxic monarch caterpillars and cabbage loopers, but not starved monarchs (gut clear of plant material). This suggests that the gutting behavior likely reflects a general avoidance of plant material. Intriguingly, mantids did not gut corn borers that recently fed on corn kernels. This may indicate that the mantids respond differently to caterpillars that ingest plant material of different nutrient content (seeds vs. leaves). We plant to run a CNH analysis on collected gut and body material as well as food source to test this.

018. Evaluating the potential impact of *Halyomorpha halys* on grape production in the Finger Lakes

Our study aims to determine how *Halyomorpha halys* will affect grape production if the invasive insect becomes well established in the Finger Lakes. We measured the impact of increasing density, gender, and life stage of *H. halys* on Concord and Chardonnay grapevines. We confined insects on a single grape cluster using a fine mesh bag, which we replicated five times each for Concord and Chardonnay. Each replicate consisted of the following treatments: a bag lacking insects; 2nd instar nymphs in densities of 5, 10, and 20; adult females in densities of 1, 2, and 5; and adult males in densities of 1, 2, and 5. The insects remained caged on the clusters for 2 weeks during the period of fruit set, after which damaged and undamaged berries were enumerated. At this point, we found a strong positive correlation between density and both number and percentage of berries damaged for both nymphs and adults. After this data was collected the bags were returned to the clusters until harvest, at which point clusters were removed from the vines, damaged and undamaged berries were once again counted, and berries were massed. Density of insects was found to decrease weight per cluster and increase the proportion of damaged berries. The proportion of damaged berries was also found to be higher as a result of female feeding than male feeding. This study establishes important groundwork for developing control thresholds for *H. halys* in Finger Lake vineyards.

019. Assessment of movement behavior of third instar European corn borer, *Ostrinia nubilalis*, on *Bt* corn

European corn borer (*Ostrinia nubilalis*) is a major economic pest of *Zea mays L*. The introduction of transgenic *Bt* corn has led to a significant decrease in the damage and control costs associated with European corn borer. With wide adoption rates of *Bt* corn, concerns that resistance will evolve to *Bt* corn traits. In attempts to better predict and implement resistance management strategies investigators need to understand the movement behaviors of European corn borer larvae, specifically during the third instar growth stage in which larvae begin to bore into corn stalks causing physiological damage to corn plants. In my experiment third instar ECB larvae were infested on an array of treatments designed to represent a seed mix refuge strategy. Larvae were allowed to move and fed freely for 72 hours. After 72 hours larvae were recaptured and third instar larval movement was accessed.

020. Relationship between total and amino nitrogen in HWA (*Adelges tsugae*) and the health of its host tree

Nitrogen content between phytophagous insects and their host plants can determine the insect's success. The hemlock woolly adelgid (HWA) is a small invasive insect that settles at the base of hemlock needles (*Tsugae* spp.). While infested eastern hemlock (*T. canadensis* Carriere) can die within as little as four years, many hemlocks survive for ten years or more in poor health. Healthy trees that become infested by the adelgid are depleted of nutrients, leading to a reduction of the adelgid population. It has been observed that hemlocks will make a partial health recovery, only to undergo re-colonization of the adelgid the following season. Since the adelgid is dependent on hemlock for nutrients, feeding on trees in poor health may affect the insect's ability to obtain necessary nutrients. We examine the adelgid's physiological state based on comparisons of total and amino nitrogen content in relation to the relative health of their host.

021. Does floral provisioning enhance pollination of Cucurbita and Cucumis crops by bee communities?

Floral provisioning strips a set of native flowers that are planted adjacent to crop fields with the intention of attracting pollinators to crop bloom and providing supplemental provisions (pollen and nectar) to support and enhance pollinator communities within an agroecosystem. We recorded bee communities and visitation rates of bees on Cucurbita and Cucumis crops, and on adjacent floral provisioning strips for three years at our research plot in central Pennsylvania. Crop yield, fruit weight and seed count of Cucurbita and Cucumis were compared between a floral provisioning supplemented field and a control field to assess if floral provisioning enhances crop production. Our results suggest that floral provisioning strips may not enhance pollination and crop production in small-scale fields.

022. Distribution and biodiversity of blow flies (Diptera: Calliphoridae) throughout New Jersey

One of the most important aspects where insects can benefit criminal cases is the determination of colonization time, which can subsequently be used to predict a minimum post-mortem interval (m-PMI). Development rate can vary between different blow fly species and within a species across populations. A survey of adult blow flies collected from six geographical regions in New Jersey from January through December (2012) was conducted. Species within the following genera were identified; Calliphora, Cynomya, Lucilia, Phormia and Pollenia. Abundance and diversity of these species will be discussed. A goal of this study is to determine a model species for future studies examining developmental plasticity as related to temperature and geographic location in New Jersey.

023. Distribution of *Chaetodactylus krombeini* (Acari: Chaetodactylidae) in nests of *Osmia cornifrons* (Hymenoptera: Megachilidae)

Chaetodactylus krombeini (Acari: Chaetodactylidae) is a cleptoparasitic mite of *Osmia cornifrons* (Hymenoptera: Megachilidae), the Japanese hornfaced bee. *Chaetodactylus krombeini* negatively impacts the survivorship of *O. cornifrons* through consuming the developing larvae's pollen provision or through directly attacking larvae. The consumption of the pollen provision can cause reduced body size in *O. cornifrons*, and direct attacks may result in mortality. The objective of this study was to determine whether male or female *O. cornifrons* were more greatly impacted by *C. krombeini*. Mite distributions based on presence/absence and categorical density values were analyzed for 89 additional nests and regression analysis was used to determine mite distribution within the nests. Cocoons from 20 infested *O. cornifrons* cells were examined to determine if mites could be found inside cocoons. Trends in *O. cornifrons* gender distribution showed that female bees were located in the rear of the nest and that males were located in the center of the nest. Regression analysis of *C. krombeini* showed a preference for the inner cells of the nest. No mites were found inside *O. cornifrons* cocoons. These trends indicate that *C. krombeini* may have a greater effect on mortality in the egg and larval stages of female *O. cornifrons* than in male *O. cornifrons*.

024. Influence of landscape simplification on pollination services to strawberry

Globally, more than 70% of food crops rely to some extent on pollination services provided by insects. Conservation of pollination services depends upon our understanding of the processes that influence pollinators at farm and landscape-scales. In this study we assessed the influence of the proportion of agricultural land in a 1 km radius around our field sites on the composition of the pollinator community and the level of services provided to cultivated strawberry (*Fragaria ananassa)*. In addition we determined which floral visitors are the most effective pollinators. Using a combination of pan trapping and sweep netting, we collected pollinators on 15 farms in the Finger Lakes region of New York State with a gradient of 15 to 75% agricultural area in the surrounding landscapes. Landscapes with a greater proportion of agricultural area had significantly lower pollinator abundances but species richness was not affected. Similarly species richness had no effect on the level of pollination services; however, fruit weight tended to increase with greater honey bee abundance. Interestingly, wild pollinators in the genus *Andrena*, not honey bees, were the best pollinators of strawberry flowers on a single visit basis. Our results show that a high proportion of agricultural area in the landscape negatively impacts pollinator abundance, which in turn decreases pollination services to strawberry. Conservation strategies that preserve areas of semi-natural habitat in the landscape will be important for managing agro-ecosystems that are capable of sponsoring their own ecosystem services and maintaining yields.

025. Effect of pheromone release rate, plant volatiles and ratios of pheromone components on trap captures of the Asian longhorned beetle, *Anoplophora glabripennis* in China

The Asian longhorned beetle (ALB) threatens to cause $669 billion in damages to urban forests in the U.S. if left uncontrolled. Developing an effective trapping system to detect this invasive woodborer has been a goal of the eradication program. Our lab has spent the past 5 years developing and optimizing a plant volatile (PV) blend that is used in combination with a 2-component male produced pheromone (MP) to capture beetles. During the summer of 2012, lures were tested in China with different release rates of pheromone and different ratios of pheromone components. All treatments except an unlured control also contained a 3-component PV mixture. Ten blocks each containing 9 different treatments were setup in Harbin, China. Traps were checked every 3 days and rotated to control for position effects. A total of 42 beetles were caught over a 27-day period, including 24 females and 18 males. Lures that released MP at 1 mg/day and 4 mg/day at a 1:1 ratio both caught significantly more beetles than any other treatment. Lures releasing MP at 4 mg/day at 1:1 caught more beetles earlier in the season compared to the 1 mg/day treatment. Lures releasing MP at 8 mg/day at a 1:1 ratio only captured 1 beetle at the end of the experiment. The PV only treatment caught 6 male beetles. Results indicate that using a lure that releases MP at 4 mg/day (1:1) + PV is optimal for early season ALB catches. A PV only treatment may increase catches of male ALB.

026. Exposure to an insect-derived olfactory cue enhances plant defense responses

Olfactory cues play a central role in many ecological interactions, including those among plants and insects. Well-documented examples of such interactions include pheromonal communication among insects and the use of plant odors as foraging cues by insect pollinators, herbivores and predators. Recent work demonstrates that plants themselves can also perceive and respond to olfactory cues. Some plant species ready their defenses against herbivores in response to volatile cues emitted by their insect-damaged neighbors. In this study, we demonstrate for the first time that plants can also perceive and respond to olfactory cues emitted by the insects themselves. Our research suggests that tall goldenrod (*Solidago altissima*) plants exhibit enhanced defense responses following exposure to the volatile emissions of a specialist herbivore, the gall fly *Eurosta solidaginis*. In a field experiment, female *E. solidaginis* flies avoided ovipositing in plants that had been exposed to male flies and these plants received less herbivore damage than control plants. In laboratory assays, goldenrod plants previously exposed to the male fly or crude extracts of its emission also suffered significantly less insect-feeding damage than control plants. Moreover, plants exposed to volatile compounds from the fly exhibited stronger induction of the key defense signaling hormone jasmonic acid following damage. These results suggest that goldenrod plants eavesdrop on signals of their insect antagonists and exploit them as indicators of impending herbivory, thus documenting an entirely new class of olfactory-mediated interactions with broad significance for the evolutionary ecology of plant-insect interactions.

027. The mycobiomes of sympatric native and invasive paper wasp species

Many insects are associated with prolific fungal symbionts that are established plant pathogens. However, few insects have been studied for their full associated fungal community. This is particularly true for invasive insects that construct nests—potentially novel fungal habitats. Paper wasps are a group of globally distributed, social hymenoptera that construct nests annually out of macerated plant material and saliva. Disparate studies have suggested that paper wasp nests contain culturable fungi, including a previously uncharacterized fungal species, but the full diversity of these communities remains unexplored. We extend these preliminary studies by investigating the

fungal diversity of the bodies and nests of congeneric, sympatric paper wasps in Massachusetts— the native *Polistes fuscatus,* and the invasive *P. dominulus*. We measured the fungal abundance and diversity associated with these wasps across multiple nesting locations to investigate how location and species correlate with fungal community patterns. Fungal communities were assessed qualitatively and quantitatively using culture-dependent methods to investigate fungal abundance, specific fungal isolates' identities, and viability. Additionally, we used culture-independent methods, such as light microscopy and high-throughput sequencing of ITS rDNA, to establish total fungal diversity and abundance. Contrary to the general understanding that these nest habitats are constructed solely out of macerated paper and saliva, our results indicate that paper wasp nests and bodies contain an abundance of diverse, viable fungi. These nests and bodies represent reservoirs of fungi, suggesting that paper wasps are an unexplored contributor to fungal dispersal—including fungi that are potential plant pathogens and symbionts.

028. Burrowing invertebrate communities in small and large agricultural drainage ditches

Biogeochemical processes occurring within drainage ditches are of special interest for their ability to remove pollution from water draining from agricultural fields. Bioturbation by macroinvertebrates is an important process that contributes to the regulation of biogeochemical processes occurring at the sediment-water interface of aquatic habitats. A quantitative survey of sediment-dwelling macroinvertebrates was done to determine the extent to which bioturbation is occurring in drainage ditches. Macroinvertebrates were sampled from sediment cores taken from four pairs of small (field) and large (collection) ditches on Maryland's Eastern Shore monthly from March 2011 to February 2012. Species were assigned to functional groups of bioturbation according to trophic position and modes of burrowing. Patterns in burrowing invertebrate density, diversity, and community composition were analyzed in relation to ditch size class and seasonal changes to water quality and quantity. Results from this study will help to determine the extent to which burrowing benthic invertebrates may be considered for management of drainage ditches to improve water quality.

029. Food-finding by larval grape root borer, *Vitacea polistiformis* (Lepidoptera: Sesiidae) in a soil column bioassay

Grape root borer is an oligophagous pest of grapevines in parts of the eastern USA. After hatching from eggs deposited on the above-ground parts of grape vines and other plants, neonates must burrow through the soil to locate grape roots, on which they feed. As an extension of my research on their behavioral response to grape root stimuli in Petri dish bioassays, I developed a soil column bioassay to evaluate larval grape root borer food-finding under conditions that more closely simulated those in nature. We evaluated the effect of a food source on larval recovery in vertical columns, the effect of vertical column length on larval recovery, and larval movement in a horizontal column. Soil columns consisted of PVC pipes filled with sifted soil at 25% water content. An adaptor and pipe cap at the bottom of vertical columns or at both ends of horizontal columns contained pieces of grape root and/or a sticky disc to recover larvae. A single egg from which larval emergence was imminent was placed in a small a dish at the top of vertical columns or in a hole at the mid-point of horizontal columns. The number of larvae recovered from the end(s) of columns were recorded. The presence of food did not influence the number of larvae recovered. Larvae were recovered from vertical columns up to 120 cm in length and from both ends of horizontal columns. These results are discussed in relation to planned future studies of food-finding by larval grape root borer.

030. Environmental and spatial factors influencing patterns in stink bug communities in soybean

Globally, stink bugs are economically important soybean pests. Understanding the factors influencing stink bug community patterns may help predict and manage outbreaks. Using a large-scale survey dataset, we analyzed the beta-diversity patterns in soybean stink bug communities (6 species, 89 fields spread over 6838 km^2 in western Maryland, West Virginia & Virginia) and the spatial and environmental factors (topographic, climatic and land use) influencing the patterns.

Redundancy analysis (RDA) showed that environmental variables significantly explained variation in stink bug communities (R^2adj=0.25, p=0.01). The first RDA axis (96% of the total explained variance) was correlated with elevation (r = - 0.85), forest cover proportion at 5km and 2.5km radii (r = - 0.74 each), and maximum temperature (r = 0.53). The invasive *Halyomorpha halys* received positive scores along Axis 1. *Halyomorpha halys* was negatively associated with elevation and forest cover proportion while being positively associated with daily maximum temperature and developed areas proportion. The native *Acrosternum hilare* received negative scores along Axis 1 and was positively associated with elevation and forest cover proportion.

Variation partitioning using Moran's Eigenvector Maps as spatial predictors identified significant fractions of pure broad-scale spatial (R^2adj=0.10, p=0.005), pure environment (R^2adj = 0.08, p = 0.01), broad-scale structured

environment (R^2adj=0.4, p=0.015), fine-scale structured environment (R^2adj=0.02, p=0.03). These results indicate prominent effects of both environmental drivers (altitude, forest cover, and temperature) and large-scale spatial processes on the beta-diversity patterns of soybean stink bug communities, and have implications for landscape scale management of stink bugs as soybean pests.

031. Resistance to a multi-host parasite; it's good to be rare

Closely related host species are known to show variation in the level of resistance towards the same or similar parasite species, but this phenomenon is largely unstudied. In this study, we examine the expression of resistance of two closely related species of damselflies (*Nehalennia irene* and *N. gracilis*) against *Arrenurus* sp. water mites, from two isolated sphagnum bogs. We show that both host species have statistically indistinguishable measures of parasitism (both prevalence and intensity) by larvae of a single mite species. Even though both species had the same levels of parasitism, the regionally rare host (*N. gracilis*) completely resisted the parasite in a novel way, whereas, the more regionally widespread species (*N. irene*) did not resist any of the parasites. These results suggest a strong historical selection from this mite on *N. gracilis* in a closed system.

032. Assessing corn earworm infestations in Pennsylvania field corn, and the value of *Bt* for control of ear damage

Field corn hybrids expressing Bt toxins are popular choices for controlling European corn borer, *Ostrinia nubilalis*, and western corn rootworm, *Diabrotica virgifera*; however, these hybrids also have activity against several noctuid pests, including the corn earworm, *Helicoverpa zea*. Across the United States, corn earworm is an important pest of many agricultural crop species. To understand corn earworm infestations in Pennsylvania field corn and the value of *Bt* hybrids for control, we assessed ear damage at sixteen sites across four maturity zones in 2010, ten sites in 2011, and three sites in 2012. We also used mid-season captures of corn earworm in pheromone traps to predict ear damage at the end of the season. Corn earworm damage in non-*Bt* hybrids exceeded one bushel/ha at only four locations over three years, and caterpillars generally damaged less than 15% of ears. *Bt* hybrids suppressed corn earworm damage by 40-70% relative to non-*Bt* hybrids, but all *Bt* events provided similar control. Analyses of moth captures and in-field damage revealed that cumulative male captures through July were strongly correlated with damage at the end of the season. Moth captures may give growers an estimate of damage caused by corn earworm, and also provide insight into whether growers are gaining economic benefits by using *Bt* hybrids for corn earworm control. Our research suggests that corn earworm populations in field corn remain low and investing in *Bt* hybrids targeting corn earworm may not provide an economic return unless damage from other caterpillar species is significant.

033. Feeding preferences of the generalist insect herbivore, *Melanoplus femurrubrum* grasshopper, on invasive and native plants

The interaction between insect herbivores and plants is a mechanism, which may allow an exotic plant species to become invasive in the introduced range. Although there have been many studies on grasshopper feeding, only some of these examined feeding on native versus invasive plants; the question of whether grasshoppers as a generalist insect herbivore actively select native plants still remains unanswered.

I studied feeding of *Melanoplus femurrubrum* grasshoppers (Acrididae: Orthoptera) on two cultivars of a potentially invasive exotic chinese silver grass, *Miscanthus sinensis* ('*Zebrinus*' and '*Gracillimus*') and two native grasses, *Andropogon gerardii* (big bluestem) and *Bouteloua curtipendula* (sideoats grama). I performed no-choice and choice feeding experiments with juvenile plants and their leaves. I determined feeding preferences of grasshoppers by quantifying the leaf damage as volume of leaves (mm^3) consumed by grasshoppers on each plant species. The results demonstrated that grasshoppers consumed more of *M. sinensis* '*Zebrinus*' (p = 0.02) than of *A. gerardii* in the experiments with juvenile plants, but the results showed no feeding preferences in the experiments with leaves (p = 0.5). These results suggest that the feeding behavior of grasshoppers differs under natural and artificial conditions, and the resistance of plant leaves may change after they have been clipped. The data on grasshoppers feeding on *M. sinensis* '*Gracillimus*' versus *B. curtipendula* are currently being analyzed.

APPENDIX B

Student Competition, Poster Presentations Abstracts

D001. Effects of photoperiod on competition between container-dwelling mosquitoes

The invasive Asian tiger mosquito, *Aedes albopictus* has displaced many native populations in the United States, often due to its superior competitive abilities. Since photoperiod causes life history shifts in *A. albopictus*, we wished to determine its effects on the interactions of *A. albopictus* with other species. We experimentally investigated the effect of photoperiod on interspecific competition between *A. albopictus* and *Aedes aegypti*, the yellow fever mosquito. There were three competition treatments: 40 *A. albopictus* larvae, 40 *A. aegypti* larvae or 20:20 *A. albopictus*: *A. aegypti* larvae; each crossed with one of three different photoperiod treatments (light:dark): short day (9:15), control (12:12), and long day (15:9). We measured larval development time, adult size, and survival across all treatment combinations. We compared the effects of intra-vs. interspecific competition and determine if the outcome is condition-specific to photoperiod treatments.

D002. Maximum lethal temperature and its potential use in predicting the distribution of the brown marmorated stink bug (*Halyomorpha halys)* in the US

The brown marmorated stink bug (BMSB) is an invasive insect from east Asia that has rapidly become a major agricultural and household pest throughout the mid-Atlantic U.S. The extent to which this bug is capable of spreading in North America and elsewhere is currently difficult to determine because the temperature extremes at which these bugs can survive are unknown.

This project investigates the maximum lethal temperature of the BMSB and its potential use in predicting BMSB distribution. Field-collected BMSB nymphs (ten bugs per rep) were placed in a Fisher Scientific Isotemp Incubator and exposed to elevated temperatures ranging from 35 to 45 ˚C for up to four hours or until all bugs died. Brown marmorated stink bug nymphs were placed in the oven at five different temperature ranges (35-36, 37-38, 39-40, 41-42, and 43-45 ^{o}C). Temperatures from 40-42 ^{o}C resulted in 40% mortality and temperatures greater than or equal to 43 ^{o}C (109 ^{o}F) produced 100% mortality in fewer than four hours.

Certain areas of the United States typically experience temperatures that may be detrimental to BMSB. The results of this experiment were used to create predictive maps of the potential geographic distribution and the climatic limits of the BMSB.

D003. Macroinvertebrate community response to a restored stream in Lancaster County, PA

Big Spring Run (BSR), a tributary of the Conestoga River, is a heavily incised, agriculturally-impaired stream located in Lancaster County, PA. Specifically, BSR has been influenced by historic mill dams constructed in the 18th century, prompting the restoration effort to remove such legacy sediments that were immobilized within the bank. During the summer of 2011, a 300 meter section of BSR was restored to reflect conditions prior to human impairment. The purpose of this study was to determine the impact of stream channel redesign and riparian buffer rehabilitation on structure. A BACI (Before/After/Control/Impact) sampling design was implemented to sample macroinvertebrates from three control reaches and one impact (restored) reach. Macroinvertebrates were collected using a Surber Sampler and returned to the laboratory for sorting and identification. All invertebrate samples to the generic (Genus) level and a Macroinvertebrate Aggregated Index for Streams (MAIS) were used to determine impact within all study reaches. Preliminary post-restoration analysis shows that there is not a significant difference between the pre- and post-restoration MAIS scores.

D004. Phenotypic plasticity in life history in an invasive mosquito (*Aedes albopictus*) across photoperiod regimes

We investigated the effects of photoperiod on the life history of the invasive mosquito, *Aedes albopictus*. Larvae were hatched and raised in one of three photoperiod treatments (light:dark); control (12:12), short day (9:15), and long day (15:9). Emergence date, size, and longevity were recorded for each mosquito. There was a significant effect of photoperiod on size and development time, but not longevity. Mosquitoes that emerged from the short day treatment were significantly larger than those that emerged from the control treatment. In addition, the development time in the

long day treatment was significantly longer than those in the control treatment. We discuss the importance of these results with respect to seasonal variation and invasion biology of this introduced species.

D005. Differences in prey handling of larval and adult monarchs, *Danaus plexippus,* by Chinese Mantids, *Tenodera sinensis*

Prey use a variety of anti-predator defenses to increase survival. In herbivores, one such defense involves the consumption and subsequent sequestration of toxins as an anti-predator defense. One well-known example of this defense is the monarch caterpillar, *Danaus plexippus*, which sequesters toxic cardenolides from plants in the genus *Asclepias*. While this defense is normally effective, previous research shows that Chinese mantids, *Tenodera sinesis*, can partially consume them without any apparent ill-effects. The mantid eats the monarch caterpillar's skin but does not consume its gut content, allowing it to fall from the prey. In contrast mantids consume nontoxic European corn borers, *Ostrinia nubilalis,* and waxworms, *Galleria mellonella*, in their entirety. To further understand mantid responses to chemically-defended prey, we conducted behavioral assays in which we observed the behavior of naïve mantids presented with 'toxic' (raised on cardenolide-rich *A. syriaca*) or 'non-toxic' (raised on no-cardenolide *A. incarnata*) monarch caterpillars and adults.

Mantids handled toxic and nontoxic prey similarly, but handled caterpillars and adult butterflies differently. They always gutted both toxic and nontoxic caterpillars, but never gutted adult butterflies. Instead, they consumed the body of the butterflies and discarded the wings, legs, and antennae. These results indicate that mantids treat prey life stages differently and may be avoiding plant matter within prey gut. Future experiments into this complex predator-prey interaction should research the underlying mechanisms controlling this mantid behavior.

D006. Stink bug community in primocane- bearing raspberry planting in southwest Virginia

Knowledge on the stink bug community and its pest status in raspberry plantings is not well understood. In addition, the impact of invasive brown marmorated stink bug, *Halyomorpha halys,* on the abundance of native stink bugs has not yet been studied in the mid-Atlantic States. Therefore, sampling of stink bugs was performed in a primocane-bearing raspberry planting in southwest Virginia in 2011 and 2012. The brown stink bug, *Euschitus servus*, was major stink bug species in 2011 and 2012. In 2011, *E. servus* made up 56.36 % of overall composition followed by *H. halys* 23.64 % and the green stink bug, *Chinavia hilare* 3.64%, Similarly, *E. servus* was also the major stink bug species in 2012 and made up 29.46 % of the overall composition. The twice-stabbed stink bug, *Cosmopepla lintneriana,* made up 33.04%, *H. halys* 23.64 % and *C. hilare* 13.39 %. Six species of stink bugs were found. *H. halys* was the second most abundant stink bug in 2011; however, the population density dropped in 2012. The unprecedented high abundance of *C. lintneriana* in 2012 caused it to surpass *H. halys*. Stink bugs were found from mid-July to September. This corresponds to the presence of fruit. No egg masses of stink bugs were found suggesting that raspberry is not a reproductive host. However, raspberry is a feeding host, as the stink bugs were observed feeding on the fruiting structure. Stink bug causes injury to the berries by inserting their stylets into ripening berries.

D007. Does refuge availability alter the effect of predation risk on prey growth?

While being eaten by a predator has obvious costs for prey fitness, prey avoidance of predation risk can also incur substantial fitness costs through risk-induced changes in reproduction, growth and survival. Prey that respond to predation risk by utilizing refugia, for instance, may face a greater degree of within-refuge competition. We tested whether cricket (*Acheta domesticus*) responses to a predator (the Chinese mantid, *Tenodera sinensis*) are altered by the presence of refuges by conducting a 2*2 factorial experiment where the presence/absence of a predator was crossed with the presence/absence of a prey refuge. Each treatment was replicated ten times; ten crickets were placed in each replicate enclosure, and one mantid in each predator-present replicates. To protect against direct predator mortality, the mantids did not have access to the crickets. The crickets in each replicate were weighed before the experiment started, and after one week. We found that predation risk did not affect prey growth. When predators were absent, however, prey with access to a refuge grew more than prey without a refuge ($p<0.05$). On the basis of these results, we conducted another experiment examining specifically how refuge presence/absence affects prey growth. Because this experiment was specifically interested in the impact of refuges, it did not include a predation risk treatment. The second experiment had 20 replicates per treatment, with ten crickets per replicate, and lasted one week. Despite the results of the first experiment, there was no difference in cricket growth between the refuge and no-refuge treatments.

D008. Examining the influence of garden land use, management practices, and landscape context on pest and beneficial insects in urban vegetable gardens

Compared to their rural counterparts, urban gardeners and farmers face reduced abundance and diversity of beneficial insects and increased invertebrate pest density. Fostering conservation biological control of insect pests in urban gardens could substantially enhance the productivity and sustainability of urban agriculture. As a basis for developing ecologically-based pest management strategies for urban gardens, we sought to answer the question: How do garden-level land use & management practices, and landscape context, affect pest and beneficial insect populations in urban vegetable gardens?

From June through September of 2011, we collected biweekly scouting data and yellow sticky card data on insect pests and beneficials on tomatoes, brassicas, and cucurbits in 24 community gardens in Brooklyn, Harlem, and the Bronx. Pests monitored included: aphids; flea beetles; Lepidopteran larvae; whiteflies; cucumber beetles; squash vine borer; squash bugs; thrips; and two-spotted spider mites. Beneficial arthropods monitored included: larvae of ladybird beetles, syrphid flies, and lacewings; minute pirate bugs; spiders; and parasitic wasps. In each garden, we collected information on land use and plant diversity, average light availability, and garden management practices. We also conducted GIS analysis of the landscape context for each garden in 200- and 500-m buffers.

Using multiple regression, various land use and management characteristics were found to be associated with the different groups of pest and beneficial insects. We discuss the implications of our findings for urban gardeners and provide recommendations for garden land use patterns, plantings, and management practices to attract beneficial insects and reduce insect damage on crops.

D009. Assessing the effects of local and landscape factors on the abundance of *Tipula paludosa* in turfgrass habitats

Tipula paludosa is an invasive species that has quickly become established as a major pest in North American turfgrass, causing economic loss across both commercial and residential settings. Current patchy local (i.e., within a site) and landscape (i.e., among sites) distributions displayed by *T. paludosa* suggest factors operating at multiple scales are impacting population distributions. Our objective was to determine which local and landscape factors impact *T. paludosa* abundance at sites located along a gradient of urbanization. We used a generalized linear model to explain *T. paludosa* abundance in relation to local and landscape factors. Local factors included sand, clay, and organic matter content and the abundance of endemic entomopathogenic nematodes found at each site; a landscape factor of percent impermeable surfaces surrounding each site was also included. Results indicated that local factors of percent sand and organic matter, acting as bottom up effects, and the abundance of endemic entomopathogenic nematodes, acting as a top down effect, are negatively correlated with *T. paludosa* abundance. The amount of impermeable surfaces within a 0.5 km buffer around each site was also negatively correlated with *T. paludosa* abundance. The results suggest that at the local scale, both biotic and abiotic factors impact larval abundance. At the landscape scale, the amount of impermeable surfaces surrounding a site can impact its suitability for *T. paludosa*. The findings of this study can be used to create effective control programs for *T. paludosa* and underlines the importance of scale in invasive species management.

D010. Cold tolerance and cold shock response in wild type and TPI mutant fruit flies

The TPI sugarkill (SGK) mutation causes profound metabolic deficits in adult *D. melanogaster* that increase stress sensitivity and shorten lifespan; however, nothing is known about cold sensitivity in these mutants. Acute low temperatures may cause insects to experience their incipient lethal temperature (ILT), but this effect is mitigated by recent prior exposure to moderate cold (i.e. cold shock). We measured ILTs for three age groups (3, 10, and 25 days) of mutant and wild type (WT) flies, exposing them to -2.5, -5.0 and -7.5 C for 1 and 2 h. Both genotypes had nearly equivalent levels of survival following the various treatments of 1 and 2 h at -2.5 C. Both genotypes also survived similarly when exposed to -5.0 C for 1 or 2 h; however, mortality increased as the flies aged showing significance as survivorship decreased. No flies survived exposure to -7.5 C. Shock was induced by exposing flies to 1 h at -2.5 C and then allowing recovery for 1 h at 23 C. Upon subsequent exposure to -5.0 C for 2 h, WT (37%) and SGK (21%) had survival rates that greatly exceeded their baseline survival under this condition (near 0%). Older flies of both genotypes showed almost complete intolerance of the shock treatment. Therefore, *D. melanogaster* with TPI mutation are fully capable of dealing with cold stress comparably to WT flies, and they possess only a modest reduction in the ability to develop cold hardening responses versus the WT flies.

D011. Sapped of energy: The role of invasive herbivores (*Adelges tsugae* and *Fiorinia externa*) as a resource drain on hemlock (*Tsuga canadensis*) trees

Eastern hemlock (*Tsuga canadensis*) is a foundation species across eastern North America, providing ecosystem services as a habitat for numerous species and in regulation of soil chemistry. Two invasive species, hemlock woolly adelgid (HWA, *Adelges tsugae*) and elongate hemlock scale (EHS, *Fiorinia externa*) frequently attack Eastern hemlocks at high densities throughout their range. HWA causes stress and rapid mortality in attacked trees, while the effects of EHS are much milder.

We compared the effects of these herbivores to elucidate mechanisms of HWA-induced hemlock decline. We hypothesized that herbivory would lead to induced sequestration, with more carbon transferred to the main stem and roots (in the form of soluble sugars), away from herbivore attack. Over time, attacked plants were expected to become resource-stressed and decrease growth.

One focal branch per tree was exposed to isotopically labeled carbon dioxide. Following uptake via photosynthesis, the labelled carbon was transported to carbon-deficient regions of the tree, and measured in each tissue. We also measured growth, and sugar and starch content.

HWA feeding led to an increase in soluble sugars in the main stem. HWA- attacked trees transported more labeled carbon to the main stem and to the roots. This suggests induced sequestration of carbon away from HWA attack. Additionally, control trees were more vigorous and grew more in height than HWA- attacked trees. Control tree branches elongated significantly more than those of EHS-attacked trees. These results indicate that stress due to herbivory is impacting tree growth, potentially more severely in HWA-attacked than EHS-attacked plants.

D012. Variation in cornuti in the leaf-roller moths (Lepidoptera: Tortricidae: Tortricinae)

Based on the examination of over 4,000 slide-mounted preparations of male and female genitalia of tortricine moths, representing all major clades of the subfamily worldwide, we propose a classification system for cornuti based on four criteria: (1) presence/absence; (2) deciduous/non-deciduous; (3) type of attachment; and (4) shape. In general, the taxonomic distribution of deciduous vs. non-deciduous cornuti is in conformance with a recent phylogenetic hypothesis of the family. Some sister groups (i.e., tribes) have remarkably similar cornuti (e.g., Atteriini and Sparganothini); however, in others, features of the cornuti (presence/absence, attachment, shape, size, etc.) provide little or no evidence of these relationships (e.g., Ceracini and Archipini). Our studies suggest that if deciduous cornuti are homologous throughout Tortrticidae, which seems likely, this feature arose near the base of the tree at the branch that supports the sister groups Olethreutinae + Tortricinae. The least derived Tortricinae (i.e., Phricanthini) posses typical deciduous cornuti as do most Archipini, Epitymbiini, Sparganothini, and Atteriini in Tortricinae, and many Eucosmini and Grapholitini in Olethretinae.

D013. Evaluation of combined applications of insecticide and entomopathogenic fungi for masked chafer grub *Cyclocephala* spp. (Coleoptera: Scarabaeidae), control in turfgrass

Masked chafer grubs, *Cyclocephala* spp. (Coleoptera: Scarabaeidae), are one of the important pests of turfgrass in Virginia. Insecticides provide effective control of grubs, however, most of the insecticides available are only effective against early instars. Entomopathogenic fungi are labeled for white grub control in turf but are not very effective when applied alone. This study was conducted to determine the efficacy and interactions of combined applications of an insecticide (chlorantraniliprole) and two species of entomopathogenic fungi, *Metarhizium anisopliae* and *Beauveria bassiana,* against third instar masked chafer. Treatments included two rates of the insecticide (one quarter and one half of the recommended rate), the full recommended rates of the both fungi species, and each combination of insecticide plus fungi. Mortality was determined four weeks after treatment. The result of this study showed that the combined application of one half the recommended rate of the insecticide plus the full recommended rate of the fungus *B. bassiana* caused the highest (55%) grub mortality four weeks after treatment. However, the single and combined applications did not vary significantly. The efficacies and interactions of combined applications of the insecticide and entomopathogenic fungi are discussed.

D014. Temperature and floral abundance: Biotic and abiotic determinants of pollinator activity in the mountain steppe of northern Mongolia

There are many sources of variation that may explain plant-pollinator interactions, including temporal variation and spatial variation. Additionally, there are biotic and abiotic ecological components, such as floral abundance and air temperature, respectively, that are also critical in determining pollinator activity. This study set out to investigate the

variation in pollination at different time scales (*i.e.* throughout the summer and within a given day), and spatial variation (*i.e.* at two different locations). In the summer of 2011, we observed plant-pollinator interactions in the mountain steppe of northern Mongolia. There was significant variation in pollinator activity across the summer season and within the day, at both locations. But the drivers determining plant-pollinator interactions were different at the two locations, which were only 300 m apart. Path analysis showed that at Site A temperature played a large and significant role but floral abundance was not significant; whereas at Site B, temperature and floral abundance were approximately equal in determining plant-pollinator interactions. Given the recent surge of plant-pollinator studies that incorporate a global change perspective and use new methodological approaches, such as network analysis, these results demonstrate the importance of biotic and abiotic components as well as temporal and spatial variation when studying plant-pollinator interactions.

D015. Modeling temperature-dependent development and survival of *Podisus maculiventris* (Hemiptera: Pentatomidae): Implications for biological control

Effects of temperature on stage-specific development and survival of the spined soldier bug, *Podisus maculiventris* (Say), were examined at eight constant temperatures (13.2, 18.4, 21.7, 23.7, 27.2, 32.7, 35.2, and 40.6°C) using yellow mealworms as prey. The stage-specific development and survival of *P. maculiventris* were quantitatively described by applying empirical models as a function of temperature over a wide thermal range. Survival model using log-normal equations showed bell-shape patterns for all stages, and estimated that the temperatures with the highest survival were 19.9, 24.3, and 24.5°C for egg, nymph, and egg to adult, respectively. Developmental rates at the eight temperatures were fitted with a nonlinear Briere model, which estimated optimal temperatures for the development as 31.2, 30.6, and 30.6°C for egg, nymph, and egg to adult, respectively. Operative thermal ranges, in-between the lower and upper developmental thresholds, were estimated to be 8.9–35.2°C, 12.8–35.2°C, 12.7–35.2°C for egg, nymph, and egg to adult, respectively. In a linear model, the lower thresholds and thermal requirements (DD) were 10.9°C (70.1 DD), 13.1°C (241.7 DD), and 13.0°C (307.6 DD) for egg, nymph, and egg to adult, respectively. Overall, findings herein provide comprehensive data and explanations on the temperature-dependent survival and development of *P. maculiventris.* Implications for mass rearing, prediction of seasonal phenology, timing for augmentative release, and estimation of establishment potential were discussed.

D016. Spatial distribution of brown marmorated stink bug (*Halyomorpha halys*) in peach orchards

Brown marmorated stink bug, *Halyomorpha halys* (Stål), is an invasive pest of multiple crops in the mid-Atlantic region that has caused significant reductions in crop yield. Its ability to overwinter in forested areas and structures coupled with its wide host range have allowed it to establish populations in New Jersey farms since its introduction in 1996. The spread of *H. halys* threatens the marketability and productivity of peaches in New Jersey. Knowledge of their movement into and within orchards and the landscape factors that may influence its distribution and spread will allow for localized and efficient insecticide use. Understanding the landscape context around farms will also help to predict locations susceptible to establishment by this pest. The distribution and movement of *H. halys* in peach orchards was investigated in the summer of 2012. Twenty-three orchards (broad scale: ten in southern New Jersey and thirteen in northern New Jersey) were monitored weekly for *H. halys*. These orchards were chosen based on surrounding land use. GIS (Geospatial Information Systems) software was used to map *H. halys* populations and categorize land use around each orchard. Additionally, two orchards were sampled at a fine scale in which every tree was sampled.

D017. Evaluation of intercropping as organic, integrated pest management in northeastern hops

The demand for locally sourced hops has reached the farming community resulting in a sharp increase in northeastern hop producers from six in 2009 to twenty two in 2011. In 2011 hop producers in the region began reporting serious insect pressure resulting in damage to hop quality and quantity. To avoid insect pressure putting a quick end to this fledgling industry, IPM research specific to the northeast region is currently underway at Borderview Farm's organic hopyard in Alburgh, VT. This project studies intercropping between hop rows as a method of IPM for hop culture. The first season of pest and natural enemy arthropods from hop plants and flowering intercrops have been collected and preliminary data is presented here. Hop intercropping aims to attract natural enemies, increasing the entire arthropod community, and therefore reaching a predator-prey equilibrium. This study aims to provide necessary methods of IPM to hop farmers through evaluating flowering intercrops for three functions 1) attracting natural enemy arthropods, 2) decreasing pest arthropod species and therefore, 3) maintaining yield quality and quantity.

D018. Investigating the relationship between an ornamental plant and an introduced pollinator: *Stachys byzantina* (lamb's ear) and *Anthidium manicatum* (European wool-carder bee)

Anthidium manicatum (European wool-carder bee) is an exotic invasive species that first appeared in North America in the early 1960s. Since then its range has expanded to cover much of the continental United States. This species could have a potentially devastating impact on the local ecosystem. Males are notoriously aggressive to heterospecifics, and females strip nearby plants of their valuable trichomes for nesting material. This project explores the impact of female *A. manicatum* on their preferred trichome source, *Stachys byzantina* (lamb's ear). Trichomes fill several functional roles for plants, but most importantly they help deter herbivory. The removal of trichomes by *A. manicatum* is known as "carding", and results in a section of the leaf or stem being stripped bare of trichomes. Three main findings were established in this study: (1) incidences of carding occur near each other on lamb's ear plants. This suggests that something is attracting *A. manicatum* to the same leaf or area of a plant to gather nesting material; (2) the volatile organic compounds (VOCs) given off by *S. byzantina* change after removal of trichomes via mechanical carding. This was established using gas chromatography and flame ionization detection and we propose that this change in VOCs is responsible for attracting further incidents of carding by *A. manicatum*; (3) herbivores (earwig nymphs) are found at significantly higher rates on carded areas of leaves than on non-carded areas of *S. byzantina* leaves ($p<0.001$, Chi-square test) indicating a significant risk to the plant following trichome removal.

ESA EASTERN BRANCH COMMITTEES

Following is the list of the Entomological Society of America – Eastern Branch officers, Executive, Standing and Ad Hoc Committees and their chairs, and ESA Standing Committees with representatives from the Eastern Branch. The ESA Eastern Branch includes Society members from (in the United States) Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia and (in Canada) New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario (east of 80° longitude), Prince Edward Island, and Quebec. The Branch depends upon volunteers to perform the critical functions that keep our Branch and Society active and productive. Without the participation of members in these committees we would be unable to provide quality service to the Society and programming for our annual meeting.

The next Eastern Branch annual meeting is scheduled for Saturday, March 16 to Tuesday, March 19, 2013 at the Eden Resort and Suites in Lancaster, Pa. If you're considering volunteering a portion of your time for committee service this year, please contact either the current chair of the respective committee or the Branch Secretary, Mr. Dan Gilrein, or Eastern Branch President, Dr. Chris Bergh. Check our website (http://www.entsoc.org/Eastern) for details and more information about the meeting and the Eastern Branch.

On behalf of the entire Eastern Branch membership, please accept my thanks for your willingness to serve – Dan Gilrein, Secretary.

EB Executive Committee, 2012-2013 *(elected)*

President *(term: 1 year)*
Dr. J. Chris Bergh (2012-2013)
Virginia Tech AHS AREC
595 Laurel Grove Rd
Winchester, VA 22602-2852
Phone: 540-869-2560 ext 32
Email: cbergh@vt.edu

President-Elect *(term: 1 year)*
Eric Day (2013 – 2014)
205A Price Hall
Insect Identification Lab
Department of Entomology
Virginia Tech
Blacksburg, VA 24061-0319
Phone: 540-231-4899
Fax: 540-231-9131
Email: idlab@vt.edu

Past President *(term: 1 year)*
George C. Hamilton (2012-2013)
Department of Entomology
Rutgers University
93 Lipman Drive
New Brunswick, NJ 08901-8525
Phone: 848-932-9801
FAX: 848-932-7229
Email: hamilton@AESOP.Rutgers.edu

Secretary *(term: 3 yrs)*
Daniel Gilrein (2007-2010, 2011-2013)
Cornell University
Coop. Ext., Suffolk County
Long Island Hort. Res. and Ext. Center
3059 Sound Ave.
Riverhead, NY 11901
Phone: 631-727-3595 ext 25
FAX: 631-727-3611
Email: dog1@cornell.edu

Treasurer *(term: 3 years)*
Mark C. Taylor (2010-2012, 2013-2015)
Plant Protection & Weed Management
Maryland Department of Agriculture
27722 Nanticoke Road, Unit 2
Salisbury, MD 21801
Phone: 410-543-6613
FAX: 410-543-6660
Email: mark.taylor@maryland.gov

Governing Board Representative *(term: 3 years***)**
Douglas G. Pfeiffer, Chair (2011–2013)
Department of Entomology
216-A Price Hall
Virginia Tech
Blacksburg, VA 24061-0319
Phone: 540-231-4183
FAX: 540-231-9131
Email: dgpfeiff@vt.edu

Member-at-Large *(term: 3 yrs)*
Mary Purcell-Miramontes (2011-2013)
USDA NIFA
1400 Independence Avenue SW, Stop 2201
Washington, DC 20250-2201
Phone: 202-401-5168
Fax: 202-401-6488
mpurcell@nifa.usda.gov

Eastern Branch ESA Standing Committees *(terms: 3 yrs, chairs designated by Executive Committee except as indicated)*

Awards Committee (responsible for L.O. Howard and Herbert T. Streu EB awards, members include 5 most recent past presidents)
George C. Hamilton, Chair (2012-2013)
Department of Entomology
Rutgers University
93 Lipman Drive
New Brunswick, NJ 08901-8525
Phone: 732-932-9801
FAX: 732-932-7229
Email: hamilton@AESOP.Rutgers.edu
Members: Harvey Reissig (to 2016), Lok Kok (2015), Jim Lashomb (2014), Art Agnello (2013)

Insect Detection, Evaluation, and Prediction (IDEP) Committee
Robert Trumbule, Chair (2014)
Maryland Dept of Agriculture
6 Forestway
Greenbelt, MD 20770-1707
Phone: 301-653-8944
Email: rtrumbule@erols.com
Members: Dick Bean, Eric Day, Mark Taylor, Jim Young and Sven Spichiger

Meeting Site Selection Committee
Mark C. Taylor, Chair (2012)
Plant Protection & Weed Management
Maryland Department of Agriculture
22772 Nanticoke Road, Unit 2
Salisbury, MD 21801
Phone: 410-543-6613
FAX: 410-543-6660
Email: TaylorMC@mda.state.md.us

Nominations Committee
Dr. Donald Weber (2012-2014)
USDA-ARS Insect Biocontrol Lab
Bldg 011A Room 107; Barc-West
Beltsville, MD 20705
Phone: 301-504-8369
Fax: 301-504-5589
Email: Don.Weber@ars.usda.gov

Program Committee
Dr. Cesar Rodriguez-Saona, Chair (2011-2013)
Department of Entomology
PE Marucci Blueberry/Cranberry Center
Rutgers University
125A Lake Oswego Road
Chatsworth, NJ 08019-2006
Office: 609-726-1590 ext 4412
E-mail: crodriguez@aesop.rutgers.edu

Co-chair: Dr. Tracy Leskey (2013 – 2015)
Appalachian Fruit Research Station
2217 Wiltshire Rd
Kearneysville WV 25430
Email: Tracy.Leskey@ars.usda.gov

Consultant/Advisor: Dean Polk (2013)
Rutgers Fruit Research & Extension Center
283 Route 539
Cream Ridge, NJ 08514-9634
Office: 609-758-7311
Email: polk@rce.rutgers.edu

Public Information Committee
Faith B. Kuehn, Chair (2011-2013)
Delaware Department of Agric.
2320 S. DuPont Highway
Dover, DE 19901-5515
Phone: 302-698-4587
Email: Faith.Kuehn@state.de.us

Rules Committee
Dr. Matthew Petersen (serves annually until notified otherwise)
Cornell University
630 W North St.
Geneva, NY 14456-1371
Phone: 315-787-2475
Email: mjp266@cornell.edu

Screening for ESA Awards Committee *(Selects Branch nominees for ESA Distinguished Achievement Awards in Teaching and in Extension, and Entomological Foundation Award for Excellence in IPM)*
Yolanda Chen, Chair (11 - 13)
Hills Agricultural Building
105 Carrigan Drive
Burlington, VT 05405
Phone: 802-656-2627
Fax: 802-656-4656
Email: Yolanda.Chen@uvm.edu

John F. Tooker, Co-Chair (2011-2013)
Center for Chemical Ecology/Department of Entomology
Pennsylvania State University
501 ASI Building
University Park, PA 16802
Phone: 814-865-7082
Email: tooker@psu.edu

Student Affairs Committee *(responsible for John H. Comstock and Asa Fitch student awards)*
Julia Mlynarek, Chair (2012-2013)
Carleton University

Biology Department, Nesbitt Building
1125 Colonel By Drive
Ottawa, ON, K1S 5B6
Tel: 613-520-2600 ext: 3872
e-mail: jmlynare@connect.carleton.ca
or julia.mlynarek@gmail.com

Peter Meng (co-chair) (2013)
509 ASI
Penn State Univ.
University Park, PA 16802
Email: meng.peter@psu.edu
Work Phone: 814-863-4640

ESA Standing Committees – Eastern Branch Representatives
(Terms 2 years, appointed or by election at Branch discretion)
More information at http://www.entsoc.org/about_esa/governance/other/committees/standing_index

Student Affairs (term 11/16/12 – 11/19/14)
Ashley Kennedy
250 Townsend Hall
531 S. College Avenue
Newark, DE 19716
Phone: 703-307-4041
Email: kennedya@udel.edu

Finance *(term: 05/06/2011 - 11/14/2014)*
Susan McKnight
Susan McKnight, LLC
mcknight_susan@snet.net

Awards and Honors *(term: 11/16/11 - 11/19/14)*
Dr. Donald Weber
USDA-ARS Insect Biocontrol Lab
Bldg 011A Room 107; Barc-West
Beltsville, MD 20705
Phone: 301-504-8369
Fax: 301-504-5589
Email: Don.Weber@ars.usda.gov

Education and Outreach *(term: 11/25/11 – 11/16/12)*
Faith B. Kuehn
Delaware Department of Agric.
2320 S. DuPont Highway
Dover, DE 19901-5515
Phone: 302-698-4587
Cell: 302-475-1028
Email: Faith.Kuehn@state.de.us

Membership *(term: 11/16/11 - 11/19/14)*
Dr. Louela A. Castrillo
Dept. of Entomology
Cornell University
Robert W. Holley Center for Agriculture
Tower Road
Ithaca, NY 14853
Phone: 607-255-7008
FAX: 607-255-1132
Email: lac48@cornell.edu

Eastern Branch Ad Hoc Committees, 2012-2013

Archivist-Historian *(term: 5 years, appointed by President)*
George C. Hamilton (serves annually until notified otherwise)
Department of Entomology
Rutgers University
93 Lipman Drive
New Brunswick, NJ 08901-8525
Phone: 732-932-9801
FAX: 732-932-7229
Email: hamilton@aesop.rutgers.edu

Auditing *(term: indefinite)*
Julie Byrd Hebert
BEES Program
Dept. of Entomology
University of Maryland
4172 Plant Science Building
College Park, MD 20742-0001
Phone: 301-405-8919

Board and Associate Certified Entomologists
(term: indefinite)
Chris Stelzig, Membership Services Manager/Certification Programs
10001 Derekwood Lane, Suite 100
Lanham, MD 20706-4876
http://www.entocert.org
Phone: 410-263-3622
Email: cstelzig@entsoc.org

Corporate Support Coordinator *(term: indefinite)*
James E. Steffel
LABServices 305 Chestnut Street
Hamburg, PA 19526
Phone: 610-562-5055
FAX: 610-562-5066
Email: jim@labservices.com

Linnaean Games Committee *(term: indefinite)*
Douglas G. Pfeiffer
Department of Entomology
216-A Price Hall
Virginia Tech
Blacksburg, VA 24061-0319
Phone: 540-231-4183
FAX: 540-231-9131
Email: dgpfeiff@vt.edu

Listserv and Website Manager *(Branch Secretary, term concurrent)*
Daniel Gilrein
Cornell Coop. Ext. Suffolk County
Long Island Horticultural Research and Extension Center
3059 Sound Ave.
Riverhead, NY 11901
Phone: 631-727-3595 ext 25

FAX: 631-727-3611
e-mail: dog1@cornell.edu

Local Arrangements *(term: annual)*
Tim Abbey (2013)
Penn State Extension – York County
112 Pleasant Acres Road
York, PA 17402-9041
Phone: 717-840-7408
Fax: 717-755-5968
Email: tma13@psu.edu

Parliamentarian *(term: indefinite)*
Dr. Donald Weber
USDA-ARS Insect Biocontrol Lab
Bldg 011A Room 107; Barc-West
Beltsville, MD 20705
Phone: 301-504-8369
Fax: 301-504-5589
Email: Don.Weber@ars.usda.gov

Registration & Hospitality Committee *(term: annual)*
Xiangfeng Jing
Dept. of Entomology
Cornell University
5123 Comstock Hall
Ithaca, NY 14853-2601
Phone: 979-739-8213
Email: xj43@cornell.edu

Student Paper Competition Committee *(term: annual)*

Oral Competition
William O. Lamp, Associate Professor
Department of Entomology
4112 Plant Sciences Bldg (mail)
4138 Plant Sciences Bldg (office)
University of Maryland
College Park, MD 20742-4454
Phone: 301-405-3959
Fax: 301-314-9290
lamp@umd.edu

Posters
Tim Tomon
Forest Entomologist
West Virginia Department of Agriculture
Plant Industries Division
1900 Kanawha Blvd., E.
Charleston, WV 25305-0191
Phone: 304-558-2212
Fax: 304-558-2435
ttomon@wvda.us

Author Index

Trotter, R. Talbot	025
Vaughan, Mace	075
Vendettuoli, Justin	017, **D005**
Venugopal, P. Dilip	**030**
Vincent, Charles	**059**
Walker, Karen	**046**
Wallace, John R.	D003
Walters, Terrence	047
Weber, Donald C.	**008**
Weidner, Lauren M.	**022**
Welbaum, Greg	D033
Whalon, Mark E.	**100**
Wheeler, Terry A.	**066**
Whisler, Sally	039
Whitmore, Mark	**039**
Whittington, Sarah	D004
Wiles, John	D023
Wraight, Stephen P.	116
Wright, Starker E.	089
Yocom, Suzanne	**D009**
Young, James	**049**
Youngman, Roger R.	D013

Scientific Name Index

Hemiptera Pentatomidae *Euschitus servus*	D006
Hemiptera Pentatomidae *Halyomorpha halys*	018, 062, 095, D016, 006, 007, 008, D021, 089, D022, D026, 030, D006, 097, 011, D002, D031
Hemiptera Pentatomidae *Podisus maculiventris*	D015, D025
Hymenoptera	068
Hymenoptera Apidae *Apis*	067
Hymenoptera Apidae *Apis mellifera*	015, D029
Hymenoptera Apidae *Bombus bombus terrestris*	094
Hymenoptera Brachonidae *Spathius agrili*	034
Hymenoptera Crabonidae *Cerceris fumipennis*	035
Hymenoptera Eulophidae *Tetrastichus planipennisi*	034
Hymenoptera Megachilidae *Anthidium manicatum*	D018
Hymenoptera Megachilidae *Osmia cornifrons*	023
Hymenoptera Tenthredinoidea *Pristiphora appendiculata*	D033
Hymenoptera Tiphiidae *Tiphia popilliavora*	D030
Hymenoptera Tiphiidae *Tiphia vernalis*	D030
Hymenoptera Vespidae *Polistes dominulus*	027
Hymenoptera Vespidae *Polistes fuscatus*	027
Insects	096
Lamiales Lamiaceae *Stachys byzantina*	D018
Lepidoptera	093
Lepidoptera Crambidae *Ostrinia nubilalis*	019, 055
Lepidoptera Gelechiidae *Tecia solanivora*	056
Lepidoptera Noctuidae *Helicoverpa zea*	032, 099
Lepidoptera Noctuidae *Trichoplusia ni*	017
Lepidoptera Nymphalidae *Danaus plexippus*	017, D025, D005
Lepidoptera Pyralidae *Galleria mellonella*	D009
Lepidoptera Sesiidae *Vitacea polistiformis*	029, 057
Lepidoptera Tortricidae	D012
Mantodea Mantidae *Tenodera sinensis*	017, D005
Mecoptera Mesopsychidae *Lichnomesopsyche gloriae*	069
Naneuroptera Nakalligrammatidae *Naoregramma naillecebrosa*	069
Orthoptera Acrididae *Melanoplus femurrubrum*	033
Parasitiformes Varroidae *Varroa destructor*	D029
Pinales Pinaceae *Tsuga canadensis*	D011
Poales Poaceae *Spartina alterniflora*	D028
Rosales Elaeagnaceae *Elaeagnus umbellata*	098
Rosales Rosaceae *Crataegus*	098
Thysonaptera	064
Trombidiformes Tetranychidae *Tetranychus tetranychus urticae*	D008
Zygoptera Coenagrionidae *Nehalennia gracilis*	031
Zygoptera Coenagrionidae *Nehalennia irene*	031