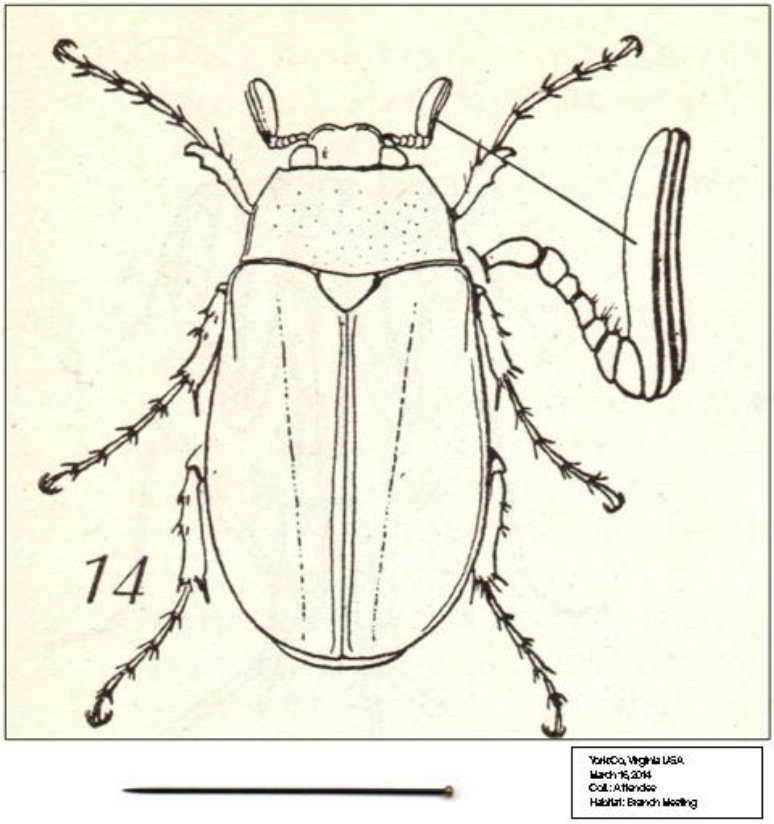
Entomological Society of America

Eastern Branch Meeting

Williamsburg, Virginia

March 15-18, 2014

85th Annual Meeting



Entomology: Key Science

The Encapsulated Program – 2014

Saturday, March 15

Evening	Event	Time	Location
	President's Informal Reception	5:00-7:00	Grant's/Jackson's
	Ento-Movie Night: "Them!" (1954) and "Beginning of the End" (1957)	7:30-11:30	Jeff Davis Amphitheater

Sunday, March 16

Morning	Event	Time	Location
	Registration	8:00-12:00	Clara Barton
	Executive Committee Meeting	8:00-11:00	Abe Lincoln Board
	MS and Undergrad Oral Talks	8:30-12:00	Hill's
	Multi-scale Approaches to the Ecology and Management	8:30-12:00	McClellan's
	Behavioral and Biological Control of Invasive Pests	8:30-12:00	Emory's

Afternoon	Event	Time	Location
	Registration	12:00-5:00	Clara Barton
	Student Poster Competition	12:00-2:00	Longstreet/Hooker/Early
	Contributed Posters	12:00-2:00	Longstreet/Hooker/Early
	Symposium Honoring Harvey Reissig	1:00-5:00	Hill's
	Ph.D. Oral Talks	2:00-5:00	McClellan's

Evening	Event	Time	Location
	President's Reception + ESA Awards, L.O. Howard and Herb Streu	5:30-7:30	Longstreet/Hooker/Early

Monday, March 17

Morning	Event	Time	Location
	Registration	8:00-12:00	Clara Barton
	IDEP What's Creeping Up on Us	8:00-12:00	Hill's
	Arthropod-microbe Interactions	8:00-12:00	McClellan's
	Student Symposium : Relating Graduate Research to the Public Through Extension	8:30-12:00	Emory's

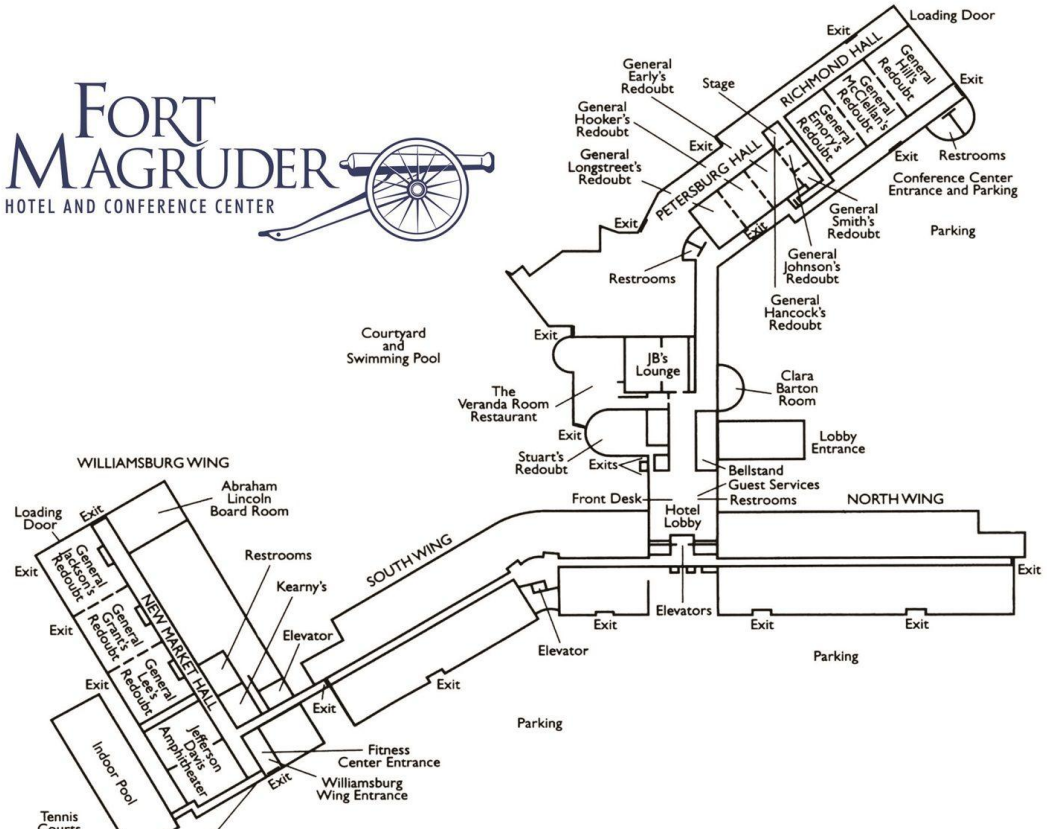
Afternoon	Event	Time	Location
	Registration	12:00-5:00	Clara Barton
	Linnaean Games	**12:00-1:30**	Jeff Davis Amphitheater
	Contributed Talks	1:00-5:15	Hill's
	Fascinating Insects, And the Lessons They Provide Symposium	1:00- 5:00	McClellan's
	Vegetable and Field Crops Symposium	1:00-5:00	Emory's

Evening	Event	Time	Location
	Social/Cash Bar	6:00-7:00	Longstreet/Hooker/Early
	Banquet – President's Address, Student Awards, Keynote Speaker Carol M. Anelli "BD Walsh (1808-1869): Defender of Darwin, Contributor to Evolutionary Theory, and Advocate for American Entomology"	7:00-10:00	Hill's/McClellan's

Tuesday, March 18

Morning	Event	Time	Location
	Final Business Meeting	7:00-8:00	Longstreet/Hooker/Early
	Pushing, Pulling, and Confusing: The Many Ways to Manipulate Insect Behavior in IPM Symposium	8:00-12:00	McClellan's
	Industry Symposium Career Reflections and Addressing Current Issues	8:00-12:00	Emory's

Event Room Capacities and Floor Plans



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- Secure your travel funding early
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Stay tuned to eNews and to ESA's website for program information.

www.entsoc.org/entomology2014

Questions? meet@entsoc.org

Mark these important dates on your calendar:

Program Symposia Deadline	January 31
Section & Member Symposia Deadline	February 28
Program Symposia Announced	March 3
Section & Member Symposia Announced	April 14
Paper/Poster Submission Deadline	May 30

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The Eastern Branch Herb T. Streu Meritorious Service Award

George Hamilton

Dr. Hamilton received his Ph.D. in Entomology in 1985 from Rutgers University and immediately joined the Rutgers faculty as an extension specialist in pest management to coordinate New Jersey's Pesticide Applicator Training and Pesticide Impact Assessment Programs. In 1998, Dr. Hamilton became the statewide IPM coordinator for New Jersey and was involved in reorganizing that program. He is currently the chair of the Department of Entomology at Rutgers.

Over the years, his research interests included working with Colorado potato beetle and alternative ways to control this pest, the use of hymenopteran parasitoids for the control of euonymous scale and the use of companion flower plantings to attract natural enemies for control purposes. His current research program centers on the biology, ecology and management of the brown marmorated stink bug, which he has worked with since 2004.

The Eastern Branch L.O. Howard Distinguished Achievement Award

Richard Casagrande

After earning degrees in entomology at Rutgers and Michigan State, Dr. Casagrande joined the faculty at the University of Rhode Island in 1976. Since then, he has pursued a career in biological control and found time for pursuing hobbies including fishing, woodworking, and ornamental horticulture. He serves as IPM coordinator, teaches courses in pest management, biological control, and basic entomology while directing biological control programs on key insect and weed pests of New England. Dick has organized and chaired the Northeast Regional Biological Control Project, served as president of the ESA Eastern Branch, and regularly attended Eastern Branch meetings since 1968.

John Henry Comstock Graduate Student Award

Eric Bohenblust

Eric graduated with a B.S. in Biology from Gettysburg College. After graduation, Eric worked as a research technician at the Penn State Fruit Research and Extension Center for a year under the guidance of Drs. Larry Hull and Greg Krawczyk on the Area-Wide Sex Pheromone Mating Disruption Program for codling moth and oriental fruit moth in tree fruits. Eric then pursued a master's degree in Entomology at Penn State continuing to work under Drs. Hull and Krawczyk. During his master's, Eric's work focused on mating disruption of codling moth and oriental fruit moth, including mating disruption efficacy trials, and effective monitoring of codling moth and oriental fruit moth. For his Ph.D., Eric worked with Dr. John Tooker at Penn State University. His doctoral work assessed the efficacy and value of transgenic insect-resistant Bt field corn hybrids for controlling European corn borer and corn earworm. Eric also received an US Environmental Protection Agency Science to Achieve Results Fellowship to pursue research investigating the effects of the herbicide dicamba on several non-target plant and insect species as part of his doctoral research.

The Asa Fitch Memorial Award

Anne Jones

Anne Jones received her BS in biology from Messiah College in December of 2010. Since beginning her MS in the Entomology Department at Virginia Tech, her research has focused on the effect of eastern hemlock health on the population and physiological health of the invasive hemlock woolly adelgid (*Adelges tsugae*). She published her first paper on the presence of fluorescent antifeedants compounds in *A. tsugae* in 2012 and, in addition to her thesis research, is continuing studies describing A. tsugae defensive mechanisms. She has enjoyed participating in a multitude of departmental and professional activities. At Virginia Tech, she has been challenged to focus her general enthusiasm and interest in insects to the relationships between insects and their plant hosts. While her current research focuses on the relationship between *A. tsugae* and the eastern hemlock, her curiosity is not limited to that particular insect or even the forest ecosystem. Anne will be starting the 2014 spring semester at Penn State as a PhD candidate in the Entomology Department's chemical ecology program. She anticipates involvement in research on the chemical ecology of plant and insect interactions.

Eastern Branch ESA Award Nominees

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, 2014 in Portland, Oregon

ESA Distinguished Achievement Award in Extension

John Losey

Dr. John Losey has published over 50 peer-reviewed journal articles but beyond sharing his research results with his peers, he is committed to developing novel and groundbreaking ways to integrate extension and research entomology. His largest accomplishment has been to develop the continually expanding Lost Ladybug Project, a nationally acclaimed citizen science project addressing the problem of once common and now suddenly rare native lady beetle species. The National Science Foundation has supported the development and dissemination of the project through two large Informal Education grants, totaling 4.2 million dollars. The Lost Ladybug Project has reached a total of over 700,000 people through the lostladybug.org website (including pages in Spanish) and Facebook page, an estimated 40,000 people have participated in event activities of the project, and over 10,000 people have submitted ladybug images. Over 23,000 images of ladybugs have been submitted to the Lost Ladybug database by citizen scientists from every state. In addition to making education and participation easy and available to everyone through the internet, the Lost Ladybug Project continues to incorporate the best of newer modes of outreach including social media and, most recently, a smart phone application. Through this broad project Dr. Losey looks to change both the perception of what an extension "audience" could and should be and to facilitate a shift from passive to active, participatory learning.

ESA Distinguished Achievement Award in Teaching

Carlyle Brewster

Dr. Carlyle C. Brewster received his Ph.D. from the University of Florida (UF) in 1996, and was awarded the College of Agriculture Graduate Research Award of Excellence—Outstanding Dissertation. Following his graduation, he worked as a postdoctoral researcher in the Insect Ecology and Population Modeling program within the Dept. of Entomology at UF. He joined the Dept. of Entomology at Virginia Tech (VT) as an Assistant Professor in January 1999 and was promoted to full Professor in 2013. Dr. Brewster has a split appointment in teaching and research in the areas of Quantitative Ecology and Information Technology. He is the author of 46 peer reviewed papers, 1 book chapter, and numerous presentations. He has also been the recipient of teaching grants from USDA Higher Education Challenge Grants and NSF S-STEM programs. In 2008, he received the W. B. Alwood Entomological Society Justin Morrill Award for outstanding contribution to the education of students in the Department of Entomology, VT. The following year, he was awarded the Gamma Sigma Delta Teaching Award of Merit, and in 2012, he won an Academy of Teaching, Certificate of Teaching Excellence Award from the College of Agriculture and Life Sciences, VT. His teaching program promotes an ecological approach to learning among students, which emphasizes learning as a student-centered, dynamic, and interactive process. Dr. Brewster has served on over 60 graduate student committees since 1999 and currently teaches courses in insect behavior and ecology, research methods in life sciences, and experimental design and statistics.

Entomological Foundation Award for Excellence in IPM

(*Sponsored by Syngenta Crop Protection)*

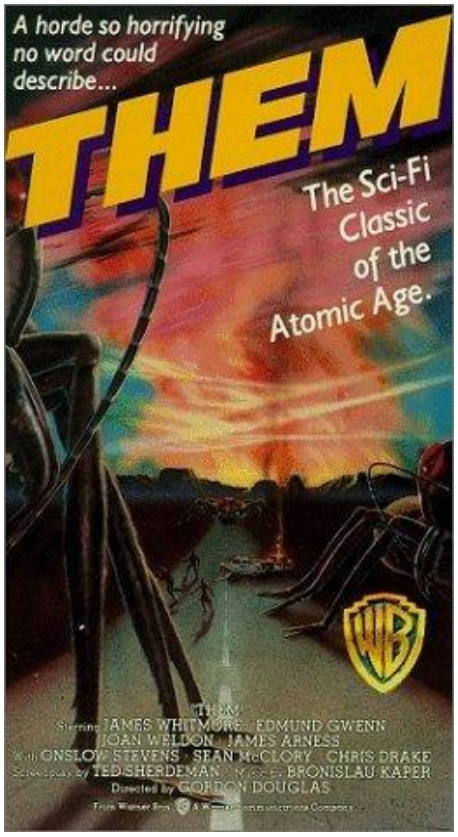
Tracy Leskey

Dr. Tracy Leskey received her B.S. in Biology, from Wilson College, Chambersburg, PA; her M.S. in Ecology at Penn State University, University Park, PA and her Ph.D. in Entomology at the University of Massachusetts at Amherst. She was award the John Henry Comstock Award by the Eastern Branch in 2001.She is employed as a Research Entomologist for USDA-ARS at the Appalachian Fruit Research Station in Kearneysville, WV, USA and is an adjunct faculty member in the Department of Entomology at Virginia Tech. Her research focuses on developing behaviorally-based monitoring and management tools for tree fruit pests to increase both ecological and economic sustainability of orchard production systems. In particular, she has focused her efforts on developing tools to better manage the brown marmorated stink bug (BMSB), native stink bugs, plum curculio, dogwood borer, and apple maggot. She has published over 60 peer-reviewed journal articles, two patents and seven book chapters and secured over $7.0 million dollar in extramural funding to support collaborative research efforts.

Saturday Evening, March 15, 2014

President's Informal Reception	Grant's/Jackson's	5:00-7:00
Ento-Movie Night	Jeff Davis Amphitheater	7:30-11:30

"Them!" and *"Beginning of the End"*



Sunday Morning, March 16, 2014

Registration	Clara Barton	8:00-12:00
Executive Committee Meeting	Abe Lincoln Board Rm	8:00-12:00

Sunday Morning, March 16, 2014

Undergraduate and Master's Oral Competition

General Hill's Redoubt 8:30-12:00

(See Appendix A for abstracts of talks for this session)

Moderators: Carlyle Brewster, Virginia Tech and Yong-Lak Park, WVU.

8:30 Introductory Remarks

8:35 1 The effect of various pesticide treatments on individual *Apis mellifera* nutrient levels. **Haley K. Feazel-Orr**, hkfeazel@vt.edu[1], Brenna E. Traver[1], Katelyn M. Catalfamo[2], Carlyle C. Brewster[1], Troy D. Anderson[1] and Richard D. Fell[1], [1]Virginia Tech, Blacksburg, VA, [2]Virgnina Tech, Blacksburg, VA

8:47 2 Factors affecting the distribution of Brown Marmorated Stink Bug (*Halyomorpha halys)* in soybean systems of Virginia. **Cameron Blank**, ceblank@vt.edu[1], Ames Herbert[2], Carlyle C. Brewster[3] and Thomas P. Kuhar[3], [1]Virginia Polytechnic Institute and State Univ., blacksburg, VA, [2]Virginia Tech, Suffolk, VA, [3]Virginia Tech, Blacksburg, VA

8:59 3 Standardization of visual sampling techniques for *Halyomorpha halys* in New Jersey peaches. **John Cambridge**, john.cambridge000@gmail.com and George C. Hamilton, Rutgers, The State Univ. of New Jersey, New Brunswick, NJ

9:11 4 The impact of thiamethoxam, a systemic neonicotinoid seed treatment, on both target and non-target insects in snap beans, *Phaseolus vulgaris*. **Louis Nottingham**, louisn@vt.edu and Thomas P. Kuhar, Virginia Tech, Blacksburg, VA

9:23 5 Effects of entomopathogenic fungi on the brown marmorated stink bug (*Halyomorpha halys*). **Thomas Pike**, tpike@umd.edu, Univ. of Maryland, College Park, MD

9:35 6 Improvements in hemlock woolly adelgid health and subsequent effects on reproductive success in the lab of the predatory beetle *Laricobius osakensis*. **Katlin Mooneyham**, katlinm@vt.edu, Scott Salom and Donald Mullins, Virginia Tech, Blacksburg, VA

9:47 7 Evaluating *Scymnus (Pullus) coniferarum* as a potential biological control agent of *Adelges tsugae.*. **Molly Darr**, mdarr@vt.edu, Virginia Polytechnic Institute and State Univ., Blacksburg, VA

10:11 Break

10:26 8 Does light and water availability alter hemlock woolly adelgid (*Adelges tsugae*) settlement? **Mauri Hickin**, mhickin@my.uri.edu and Evan L. Preisser, Univ. of Rhode Island, Kingston, RI

10:38 9 Plant reproductive phase and abiotic factors determine succesfful corn earworm (*Helicoverpa zea*) development in maize. **Daniel Olmstead**, dlo6@cornell.edu, Cornell Univ., Geneva, NY

10:50 10 Patterns of host use by *Halyomorpha halys* in woody plant nurseries. **Erik J. Bergmann**, ebergman@umd.edu, Holly M. Martinson, Paula M. Shrewsbury and Michael J. Raupp, Univ. of Maryland, College Park, MD

11:02 11 Not all dung is created equal: Dung beetles on organic and conventionally managed cattle pastures. **Mallory Hagadorn**, mh08195@gulls.salisbury.edu, Salisbury Univ., Salisbury, MD

11:14 12 Behavioral Analysis of Ticks of Southeastern Virginia: The Role of Chemical Attractants in the Use of Tick Traps for Life Stages of Tick Species *Ixodes scapularis, Dermacentor variabilis* & *Amblyomma maculatum*. **Pamela Kelman**, pkelm001@odu.edu, Old Dominion Univ., Norfolk, VA

11:26 13 Patterns in cerambycid abundance in urban forest fragments. **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, CA, [4]USDA, Forest Service, Newark, DE

11:38 14 Effects of urban forest fragmentation on the abundance, diversity, and health of native bees. **David Gardner**, dgardner@udel.edu, Univ. of Delaware, Newark, DE and Deborah A. Delaney, Univ. of Delaware, DE

11:50 15 An integrated IPM program using non-chemical controls to manage parasites in honey bee colonies. **Kathleen Evans**, kciola@udel.edu, University of Delaware, Newark, DE

Symposium: Multi-scale Approaches to the Ecology and Management of Forest Insect Pests in Eastern North America

General McClellan's Redoubt 8:30-12:00

Moderators and Organizers: David E. Jennings[1] and Derek Johnson[2], [1]Univ. of Maryland, College Park, MD, [2]Virginia Commonwealth Univ., Richmond, VA

8:30 Introductory Remarks

8:35 16 Low density population dynamics of outbreaking forest insects: why are they important? **Derek M. Johnson**, dmjohnson@vcu.edu and Kristine Grayson, Virginia Commonwealth Univ., Richmond, VA

8:55 17 Drivers and constraints of gypsy moth population growth and range expansion. **Patrick Tobin**, pc.tobin@gmail.com, USDA, Forest Service, Morgantown, WV

9:15 18 Geographical variation in the effect of the clerid predator *Thanasimus dubius* on the population dynamics of the southern pine beetle *Dendroctonus frontalis*. **Aaron S. Weed**, aaron.s.weed@dartmouth.edu[1], Matthew Ayres[1] and Andrew M. Liebhold[2], [1]Dartmouth College, Hanover, NH, [2]USDA, Forest Service, Morgantown, WV

9:35 19 Using life tables to understand population dynamics of emerald ash borer (*Agrilus planipennis*) in Maryland. **David E. Jennings**, david.e.jennings@gmail.com[1], Jian J. Duan[2] and Paula M. Shrewsbury[1], [1]Univ. of Maryland, College Park, MD, [2]USDA, Agricultural Research Service, Newark, DE

9:55 Break

10:10 20 Symbionts mediate the nutritional ecology of a global pest of pines, *Sirex noctilio* Fab. (Hymenoptera: Siricidae). **Daniel S. Gruner**, dsgruner@umd.edu and Brian M. Thompson, Univ. of Maryland, College Park, MD

10:30 21 Developing entomopathogenic fungi for biological control of Asian longhorned beetles. **Ann E. Hajek**, aeh4@cornell.edu, Tarryn Goble, Todd Ugine and Sana Gardescu, Cornell Univ., Ithaca, NY

10:50 22 Biological control of winter moth in New England. **Joseph S. Elkinton**, elkinton@ent.umass.edu and George Boettner, Univ. of Massachusetts, Amherst, MA

11:10 23 Continuing efforts toward management of hemlock woolly adelgid with emphasis on biological control. **Scott Salom**, salom@vt.edu, Virginia Tech, Blacksburg, VA

11:30 24 Biological control of EAB: a national perspective. **Juli Gould**, Juli.R.Gould@aphis.usda.gov, USDA - APHIS, Buzzards Bay, MA, Jonathan Lelito, USDA, Animal and Plant Health Inspection Service, Brighton, MI, Leah S. Bauer, USDA - Forest Service, East Lansing, MI, Jian J. Duan, USDA, Agricultural Research Service, Newark, DE, Paul Chaloux, USDA-APHIS, Riverdale, MD and Joseph Beckwith, USDA-APHIS, Raleigh, NC

Symposium: Are We Winning the Battle against Invasive Pests? The Brown Marmorated Stink Bug and Spotted Wing Drosophila

General Emory' s Redoubt **8:30-12:00**

Moderators and Organizers: Cesar Rodriguez-Saona[1] and Anne L. Nielsen[2], [1]Rutgers, The State Univ. of New Jersey, New Brunswick, NJ, [2]Rutgers, The State Univ. of New Jersey, Bridgeton, NJ

8:30 Introductory Remarks

8:35 25 Impacts of spotted wing drosophila on small fruit and grape pest management programs. **Douglas G. Pfeiffer**, dgpfeiff@vt.edu[1], Meredith Shrader[1], James Wahls[2] and Curt A. Laub[1], [1]Virginia Tech, Blacksburg, VA, [2]Virginia Tech Univ., Blacksburg, VA

8:55 26 The impact of SWD on New Jersey blueberry IPM practices. **Dean Polk**, polk@aesop.rutgers.edu[1], Eugene Rizio[2], Caryn Michel[2] and Rebecca Meissner[2], [1]Rutgers Univ., Chatsworth, NJ, [2]Rutgers New Jersey Agricultural Experiment Station, Mays Landing, NJ

9:15 27 Spotted wing drosophila: Overwintering biology and alternative hosts. **Gregory M. Loeb**, gme1@cornell.edu, Cornell Univ., Geneva, NY

9:35 28 Prospects for classical biological control of *Drosophila suzukii*. **Kim A. Hoelmer**, khoelmer@ars-ebcl.org, USDA, Agricultural Research Service, Montferrier, France, Kent M Daane, Univ. of California, Berkeley, Berkeley, CA, Emilio Guerrieri, Institute for Plant Protection, Portici, Italy and Massimo Giorgini, Consiglio Nazionale delle Ricerche, Portici (NA), Italy

9:55 29 Can mass trapping for SWD be made to work? **Richard Cowles**, Richard.Cowles@po.state.ct.us, Connecticut Agricultural Experiment Station, Windsor, CT

10:15 Break

10:30 30 Landscape factors influencing brown marmorated stink bug abundance and distribution vary with spatial scale. **P. Dilip Venugopal**, dilip@umd.edu[1], Galen Dively[2], Ames Herbert[3], Joanne Whalen[4] and William O. Lamp[1], [1]Univ. of Maryland, College Park, MD, [2]Univ. of Maryland, College Park Maryland, MD, [3]Virginia Tech, Suffolk, VA, [4]Univ. of Delaware, Newark, DE

10:50 31 Economics of BMSB in processing tomato: Influence of landscape and management. **Kevin Rice**, kbr10@psu.edu[1], Rachael Troyer[2], William Mitchell[1], Lynn Kime[3], Jayson Harper[2], John Tooker[2] and Shelby J. Fleischer[4], [1]Penn State Univ., Univ. Park, PA, [2]Pennsylvania State Univ., Univ. Park, PA, [3]Pennsylvania State Univ., Biglerville, PA, [4]Pennsylvania State Univ., State College, PA

11:10 32 The potential of trap crops for BMSB management on organic farms. **Anne L. Nielsen**, nielsen@aesop.rutgers.edu[1], Clarissa Mathews[2], Galen Dively[3], Cerruti RR Hooks[4], Brett R. Blaauw[1], John Pote[1] and Gladis Zinati[5], [1]Rutgers, The State Univ. of New Jersey, Bridgeton, NJ, [2]Shepherd Univ., Shepherdstown, WV, [3]Univ. of Maryland, College Park Maryland, MD, [4]Univ. of Maryland, College Park, MD, [5]Rodale Institute, Kutztown, PA

11:30 33 The who, where and what for indigenous natural enemies attacking brown marmorated stink bug. **Paula M. Shrewsbury**, pshrewsb@umd.edu, Cerruti RR Hooks and Ashley L. Jones, Univ. of Maryland, College Park, MD

11:50 34 Development of pheromone-based attract and kill systems for brown marmorated stink bug. **Doo-Hyung Lee**, doohyung.lee@ars.usda.gov[1], Brent Short[2] and Tracy C. Leskey[1], [1]USDA, Agricultural Research Service, Kearneysville, WV, [2]USDA, Agricultural Research Service, Appalachian Fruit Research Station, Kearneysville, WV

12:10 Concluding Remarks

Sunday Afternoon, March 16, 2014

Registration **Clara Barton** **12:00-5:00**

Student Poster Competition

General Longstreet's, Hooker's and Early's Redoubt **12:00-2:00**
(See Appendix B for abstracts of talks for this session)

Undergraduate Poster Submission

Moderators and Organizers: Carlyle Brewster, Virginia Tech and Yong-Lak Park, WVU.

DSP1 Seasonal activity and abundance of the blacklegged tick (*Ixodes scapularis*) and infection prevalence of the Lyme disease bacterium (*Borrelia burgdorferi*) in mid-western Pennsylvania. **James Shea**, jwpq@iup.edu, Michelle Claypole, Rebecca Kruise and Daniel Peles, Indiana Univ. of Pennsylvania, Indiana, PA

DSP2 The Impact of Federally Funded Pollinator Plantings on Natural Enemies and Crop Pests. **Abigail Cohen**, abigailcohen826@gmail.com, Rutgers Univ., New Brunswick, NJ and Daniel Cariveau, Rutgers Univ., Somerset, NJ

DSP3 Using scanning electron microscopy to understand and improve efficacy of entomopathogenicfungal applications. **Brittany Gale**, bgale@ferrum.edu and Glen Stevens, Ferrum College, Ferrum, VA

Masters Poster Submission

Moderators and Organizers: Carlyle Brewster, Virginia Tech and Yong-Lak Park, WVU.

DSP4 Forest edges enhance mate-finding in the European gypsy moth, *Lymantria dispar*. **Lily Thompson**, thompsonl2@vcu.edu and Derek Johnson, Virginia Commonwealth Univ., Richmond, VA

DSP5 Investigating the movement and host selection of Mexican bean beetle, *Epilachna varivestis* Mulsant, among five host plants using mark-release-recapture. **Louis Nottingham**, louisn@vt.edu and Thomas P. Kuhar, Virginia Tech, Blacksburg, VA

DSP6 Non-target effects of organic insecticides on *Podisus maculiventris* (Hemiptera: Pentatomidae). **Jakob Goldner**, jgoldner@mix.wvu.edu, Sunghoon Baek, Matthew McKinney and Yong-Lak Park, West Virginia Univ., Morgantown, WV

DSP7 Do white-tailed deer indirectly affect pupal mortality of the gypsy moth by altering predator habitat? **John Wojcikiewicz**, wojcikiewijs@vcu.edu and Derek Johnson, Virginia Commonwealth Univ., Richmond, VA

DSP8 Field and laboratory studies of *Scymnus (Pullus) coniferarum* as as potential biological control agent of *Adelges tsugae*. **Molly Darr**, mdarr@vt.edu, Virginia Polytechnic Institute and State Univ., Blacksburg, VA

PhD Poster Submission

Moderators and Organizers: Carlyle Brewster, Virginia Tech and Yong-Lak Park, WVU.

DSP9 Spatial distribution and population dynamics of hemlock woolly adelgids (Hemiptera: Adelgidae). **Sunghoon Baek**, shbaek007@hotmail.com and Yong-Lak Park, West Virginia Univ., Morgantown, WV

DSP10 Beneficial arthropod rebound after selective insecticide application in Virginia soybean. **Rebecca Whalen**, wrebec9@vt.edu[1], D. Ames Herbert, Jr.[2], Sean Malone[2] and Dominic Reisig[3], [1]Virginia Polytechnic Institute and State Univ., Blacksburg, VA, [2]Virginia Polytechnic Institute and State Univ., Suffolk, VA, [3]North Carolina State Univ., Plymouth, NC

DSP11 Natural history of pine bark adelgid, *Pineus strobi* (Hemiptera: Adelgidae), in Virginia. **Holly Wantuch**, hawantuc@ncsu.edu, Scott Salom and Thomas P. Kuhar, Virginia Tech, Blacksburg, VA

DSP12 Development and comparison of traps to monitor movement of *Halyomorpha halys* nymphs on trees. **Angelita Acebes**, aacebes@vt.edu, AHS Agricultural Research and Extension Center, Virginia Tech, Winchester, VA, J. Christopher Bergh, Virginia Tech, Winchester, VA and Tracy C. Leskey, USDA, Agricultural Research Service, Kearneysville, WV

DSP13 Effect of insecticides and entomopathogenic fungi on oviposition behavior of Japanese beetle, *Popillia japonica* (Coleoptera: Scarabaeidae). **Sudan Gyawaly**, gyawaly17@gmail.com, Curt A. Laub, Roger R. Youngman and Thomas P. Kuhar, Virginia Tech, Blacksburg, VA

DSP14 Day-length and dietary choices in *Aedes albopictus*. **Alexandra Villiard**, a.villiard@gmail.com, Rutgers, The State Univ. of New Jersey, New Brunswick, NJ

Contributed Posters

General Longstreet's, Hooker's and Early's Redoubt 12:00-2:00

DSP15 Monitoring brown marmorated stink bug, *Halyomorpha halys*, in organic crops to determine efficacy of sunflowers as a trap crop. **Taliaferro Trope**, talia84@vt.edu, Virginia Tech, Christiansburg, VA and Douglas G. Pfeiffer, Virginia Tech, Blacksburg, VA

DSP16 Management of the Red-Headed Flea Beetle (*Systena frontalis)* in Virginia Nurseries. **Hélène Doughty**, hdoughty@vt.edu, Virginia Polytechnic Institute and State Univ., Virginia Beach, VA and Peter B. Schultz, Virginia Tech, Virginia Beach, VA

DSP17 Egg Parasitism Levels of Squash Bug (*Anasa tristis*, DeGeer) in Virginia. **James M. Wilson**, jamesmw3@vt.edu, Thomas P. Kuhar and Troy D. Anderson, Virginia Tech, Blacksburg, VA

DSP18 The margined leatherwing beetle: an underestimated generalist predator in Virginia. **Elizabeth L. Fread**, elifread@vt.edu, Virginia Polytechnic Institute and State Univ., Blacksburg, VA, Christopher

R. Philips, Washington State Univ., Pullman, WA and Thomas P. Kuhar, Virginia Tech, Blacksburg, VA

DSP19 Invasive coleopteres species(Insecta,Coleoptera) recorded in Jamaica Bay Wildlife RefugeZaharia Z.Neculiseanu. **Zaharia Neculiseanu**, zneculiseanu@yahoo.com, ESA Easter Branch, Brooklyn, NY

DSP20 Brown maromrated stink bug (*Halyomorpha halys*) on the move: a survey in southern Ontario in 2013. **Hannah Fraser**, hannah.fraser@ontario.ca, Ontario Ministry of Agriculture and Food and Ministry of Rural Affairs, Vineland, ON, Canada, Cynthia Scott-Dupree, Univ. of Guelph, Guelph, ON, Canada, Tara Gariepy, Agriculture and Agri-Food Canada, London, ON, Canada and Tracey Baute, Ontario Ministry of Agriculture and Food and Ministry of Rural Affairs, Ridgetown, ON, Canada

DSP21 Evaluation of TREE-age (emamectin Benzoate) for Protection of Loblolly Pine from Black Turpentine Beetle. **Don Grosman**, dgrosman@arborjet.com, Arborjet Inc., Woburn, MA, William Upton, Texas A&M Forest Service, Lufkin, TX, Larry Spivey, Texas A&M Forest Service, N/a, TX and David L. Cox, Syngenta Crop Protection, LLC, Madera, CA

DSP22 Contribution to the knowledge of the genus *Dicronychus* (Coleoptera: Elateridae) from the Kingdom of Saudi Arabia. **Hathal Al Dhafer**, hdahfer@ksu.edu.sa, Dr., Riyadh, Saudi Arabia

DSP23 Monitoring spotted wing drosophila (*Drosophila suzukii*) populations with traps, fruit samples and salt water fruit immersion in Ontario, Canada. **Pam Fisher**, pam.fisher@ontario.ca, Ontario Ministry of Agriculture and Food and Ministry of Rural Affairs, Simcoe, ON, Canada and Hannah Fraser, Ontario Ministry of Agriculture and Food and Ministry of Rural Affairs, Vineland, ON, Canada

DSP24 Brown marmorated stink bug: terminating diapause for laboratory rearing. **Peter Coffey**, peterlcoffey@gmail.com and Galen Dively, Univ. of Maryland, College Park Maryland, MD

DSP25 Temporal Variation in Allee Effects at an Invasion Front. **Kristine Grayson**, kdattelbaum@vcu.edu[1], Patrick Tobin[2], Kyle J. Haynes[3] and Derek Johnson[1], [1]Virginia Commonwealth Univ., Richmond, VA, [2]USDA, Forest Service, Morgantown, WV, [3]Univ. of Virginia, Blandy, VA

DSP26 Population dynamics of brown marmorated stink bugs on wooded borders and their movement into soybean fields in Virginia. Thomas P. Kuhar[1], **Jamie Hogue**, jhogue@vt.edu[1], Ames Herbert[2], Cameron Blank[3] and John D. Aigner[1], [1]Virginia Tech, Blacksburg, VA, [2]Virginia Tech, Suffolk, VA, [3]Virginia Polytechnic Institute and State Univ., blacksburg, VA

DSP27 Damage, timing and varietal preference for two new invasive pests in New Jersey wine grapes, the brown marmorated stink bug (*Halyomorpha halys*) and spotted wing drosophila (*Drosophila suzukii*). **Bryan Petty**, bryanmpetty@gmail.com, Rutgers Univ., Bridgeton, NJ, Anne L. Nielsen, Rutgers, The State Univ. of New Jersey, Bridgeton, NJ and Dean Polk, Rutgers Univ., Chatsworth, NJ

DSP28 Diversity of Braconidae (Hymenoptera: Ichneumonoidea) for a tallgrass prairie in Kansas. **Katherine Nesheim**, katherinenesheim@gmail.com, Smithsonian Institution National Museum of Natural History, Washington, DC and Robert Kula, USDA Systematic Entomology Laboratory, Washington, DC

DSP29 Inheritance of spinosad resistance in Colorado potato beetle (*Leptinotarsa decemlineata*). **Mitchell Baker**, Mitchell.Baker@qc.cuny.edu, The City Univ. of New York - Queens College, Flushing, NY, Coby Klein, Graduate Center of CUNY, Flushing, NY and Saidan Qi, Queens College CUNY, Flushing, NY

DSP30 *Hypena opulenta* (Lepidoptera: Erebidae): the first biological control agent released for control of swallow-worts in North America. **Lisa Tewksbury**, lisat@mail.uri.edu[1], Richard Casagrande[1], Rob Bourchier[2], Aaron S. Weed[3] and André Gassmann[4], [1]Univ. of Rhode Island, Kingston, RI, [2]LRC, Agriculture and Agrifood Canada, Lethbridge, AB, Canada, [3]Dartmouth College, Hanover, NH, [4]CABI EU- Switzerland, Delémont, Switzerland

DSP31 Evaluating the Seedling Prodgeny of Eastern Hemlock (*Tsuga canadensis*) Resistant to Hemlock Wooly Adelgid (*Adelges tsugae*). **Elwood Roberts**, lwoodroberts@gmail.com, Univ. of Rhode Island, Kingston, RI

DSP32 The effect of hemlock woolly adelgid infestation on eastern hemlock foliar and fine root bacterial abundance. **Justin Vendettuoli**, jvendettuoli@my.uri.edu[1], Evan L. Preisser[1], David Orwig[2] and Jennifer Krumins[3], [1]Univ. of Rhode Island, Kingston, RI, [2]Harvard Univ., Petersham, MA, [3]Montclair State Univ., Montclair, New Jersey 07043, NJ

DSP33 Brown Marmorated Stink Bugs in Korea: Insight from Histroical and Current Data. **Chang-Gyu Park**, cgpark@hanmail.net[1], JeongJoon Ahn[2] and Yong-Lak Park[2], [1]National Academy of Agricultural Science, Suwon, South Korea, [2]West Virginia Univ., Morgantown, WV

DSP34 Pest Management of Mango-feeding Fruit Flies (Diptera: Tephritidae) in Senegal. **Assa Balayara**, balayara@vt.edu and Douglas G. Pfeiffer, Virginia Tech, Blacksburg, VA

DSP35 Development of Sampling Plans for Brown Marmorated Stink Bugs on Corn. **JeongJoon Ahn**, j2ahn33@snu.ac.kr and Yong-Lak Park, West Virginia Univ., Morgantown, WV

DSP36 Invertebrate responses to timber stand improvement and biomass removal treatments. **Glen Stevens**, gstevens3@ferrum.edu, Anthony Garcia and Todd Fredericksen, Ferrum College, Ferrum, VA

Symposium: Nimble Nozzles, Menacing Maggots, and Lovely Leafrollers: Honoring Harvey Reissig's Contributions to Fruit Pest Management

General McClelland's Redoubt **1:00-5:00**

Moderators and Organizers: Arthur Agnello[1] and Mark A. Sarvary[2], [1]Cornell Univ., Geneva, NY, [2]Cornell Univ., Ithaca, NY

1:00 Introductory Remarks

1:05 48 Lessons on why you should always have your hand lens. **Arthur Agnello**, ama4@cornell.edu, Cornell Univ., Geneva, NY

1:25 49 What do you get when you cross a hippie and a nozzlehead? **Anne Averill**, aaverill@ent.umass.edu, Univ. of Massachusetts, Amherst, MA

1:45 50 The evolving practice of research-based extension in fruit entomology. **Celeste Welty**, welty.1@osu.edu, Ohio State Univ., Columbus, OH

2:05 51 Theory and application of tritrophic interactions in mite biological control. **Jan P. Nyrop**, jpn2@cornell.edu, Cornell Univ., Geneva, NY

2:25 Break

2:40 52 The Pest Side Story. **Mark A. Sarvary**, mas245@cornell.edu, Cornell Univ., Ithaca, NY

3:00 53 Even nozzleheads can embrace advanced IPM. **Peter J. Jentsch**, pjj5@cornell.edu, Cornell Univ. - Hudson Valley Laboratory, Highland, NY

3:20 54 Lovely Leafrollers and Leaving Las Vegas. **Daniel Waldstein**, daniel.waldstein@basf.com, BASF, Sioux Falls, SD

3:40 55 Recollections and reflections from colleagues and friends. **Joe Kovach**, kovach.49@osu.edu, Ohio State Univ., Wooster, OH, Scott Lawson, Bayer CropScience, Research Triangle Park, NC and David Onstad, DuPont Agricultural Biotechnology, Wilmington, DE

4:00 56 What I have learned after working for 40 years at Cornell as an Applied Tree Fruit Entomologist, or: Reflections from a retiring "Nozzlehead". **Harvey Reissig**, whr1@cornell.edu, Cornell Univ., Geneva, NY

PhD Oral Competition

General Hill's Redoubt **2:00-5:00**

(See Appendix C for abstracts of talks for this session)

Moderators: Carlyle Brewster, Virginia Tech and Yong-Lak Park, WVU.

2:00 Introductory Remarks

2:05 35 Landscape features associated with brown marmorated stink bug (*Halyomorpha halys*) clustering in peach orchards. **Noel Hahn**, nghahn@gmail.com, George C. Hamilton and Cesar Rodriguez-Saona, Rutgers, The State Univ. of New Jersey, New Brunswick, NJ

2:17 36 Varietal preference testing of SWD in Virginia wine grapes. **Meredith Shrader**, mcassell@vt.edu and Douglas G. Pfeiffer, Virginia Tech, Blacksburg, VA

2:29 37 Prevalence of exotic and native plant food in the gut contents of *Melanoplus* grasshoppers: molecular d diet. **Alina Avanesyan**, alina.avanesyan@gmail.com and Theresa Culley, Univ. of Cincinnati, Cincinnati, OH

Cancelled

2:41 38 Performance and host preference of arrhenotokous and thelytokous onion thrips (*Thrips tabaci*) on two different host plants, onion and cabbage. **Xiaowei Li**, xl249@cornell.edu, Cornell Univ., New York State Agricultural Experiment Station, Geneva, NY

2:53 39 Exploring tick range expansions: landscape genetics and dispersal mechanisms of two Ixodid ticks. **Robyn Nadolny**, rnado002@odu.edu, Holly Gaff and David Gauthier, Old Dominion Univ., Norfolk, VA

3:05 40 The effects of consuming toxic monarch caterpillars on Chinese mantid fecundity. **Jamie L. Rafter**, jamierafter@my.uri.edu and Evan L. Preisser, Univ. of Rhode Island, Kingston, RI

3:17 41 Ticks and spotted fever group rickettsiae of southeastern Virginia. **Chelsea Wright**, cwrig024@odu.edu, Robyn Nadolny, Daniel E. Sonenshine, Wayne Hynes and Holly Gaff, Old Dominion Univ., Norfolk, VA

3:29 Break

3:44 42 Phenotypic variation in developmental characteristics of the black blow fly *Phormia regina* (Diptera: Calliphoridae) from three geographical regions in New Jersey. **Lauren M. Weidner**, laurenmweidner@gmail.com[1], Aaron Tarone[2] and George C. Hamilton[1], [1]Rutgers, The State Univ. of New Jersey, New Brunswick, NJ, [2]Texas A&M Univ., College Station, TX

3:56 43 Distribution of *Monodontomerus* spp. (Hymenoptera: Torymidae) in nests of *Osmia cornifrons* (Hymenoptera: Megachilidae). **Matthew I McKinney**, mm.entomology@gmail.com and Yong-Lak Park, West Virginia Univ., Morgantown, WV

4:08 44 Assessing the effects of Bt crops on *Amblyseius andersoni* Chant, a predator of the twospotted spider mite, *Tetranychus urticae* Koch. **Yanyan Guo**, yg78@cornell.edu, Cornell Univ.,New York State Agricultural Experiment Station, Geneva, NY

4:20 45 Comparison of courtship songs in *Cotesia* (Hymenoptera: Braconidae). **Justin Bredlau**, bredlauj@vcu.edu and Karen Kester, Virginia Commonwealth Univ., Richmond, VA

4:32 46 Temperature dependent development thresholds and adult emergence synchrony in the southern pine beetle: consequences for population dynamics. **Jeff Lombardo**, jeffrey.a.lombardo.gr@dartmouth.edu, Aaron S. Weed, Carissa Aoki and Matthew Ayres, Dartmouth College, Hanover, NH

4:44 47 Determining the Predators of Brown Marmorated Stink Bug: A Multidisciplinary Approach. **John Pote**, pote30@gmail.com and Anne L. Nielsen, Rutgers, The State Univ. of New Jersey, Bridgeton, NJ

Sunday Evening, March 16, 2014

President's Reception and Awards Ceremony

General Longstreet's, Hooker's and Early's Redoubt **5:30-7:30**

ESA, L.O. Howard, and Herb Streu Awards

Monday Morning, March 17, 2014

Registration **Clara Barton** **12:00-5:00**

Symposium: (IDEP) What's Creeping Up on Us? A Look at Detection, Movement, Establishment and Impact of some New and Potential Insect Pests

General Hill's Redoubt **8:00-12:00**

Moderators and Organizers: Robert Trumbule[1] and Lisa Tewksbury[2], [1]Maryland Dept. of Agriculture, Annapolis, MD, [2]Univ. of Rhode Island, Kingston, RI

8:00 Welcoming Remarks

8:05 Introductory Remarks

8:10 57 Keeping One Eye Open for the European Pepper Moth, *Duponchelia fovealis*. **Stanton Gill**, sgill@umd.edu, Univ. of Maryland, Ellicott City, MD

8:35 58 Mass trapping and early ripening avoidance of Spotted Wing Drosophila, *Drosophila suzukii* in highbush blueberry. **Heather Faubert**, hfaubert@mail.uri.edu, Univ. of Rhode Island, Kingston, RI

9:00 59 Lucid ID: Online identification resources for Lepidoptera. **James Young**, jim.d.young@aphis.usda.gov, USDA-APHIS-PPQ, Baltimore, MD

9:25 60 Ambrosia beetles: detection, prediction, and management in nurseries. **Peter B. Schultz**, schultzp@vt.edu, Virginia Tech, Virginia Beach, VA

9:50 Break

10:10 61 Thosand Canker Disease in Virginia: Three years of surveying and observing. **Norman Dart**, Norman.Dart@vdacs.virginia.gov, Virginia Dept. of Agriculture and Consumer Services, Richmond, VA

10:35 62 Early detection of Kudzu Bug, *Megacopta cribraria*, in Maryland. **Alan Leslie**, aleslie@umd.edu, Univ. of Maryland, College Park, MD

11:00 63 Early detection of exotic cerambycid species with semiochemical-baited traps. **Lawrence M. Hanks**, hanks@life.uiuc.edu, Univ. of Illinois, Urbana, IL and Jocelyn G. Millar, Univ. of California, Riverside, CA

11:25 64 "Them!": Battling the Imported Fire Ant in Maryland. **Mark Taylor**, mark.taylor@maryland.gov, Maryland Dept. of Agriculture, Salisbury, MD

11:50 Discussion

11:55 Concluding Remarks

Symposium: Arthropod-Microbe Interactions

General McClellan's Redoubt 8:00-12:00

Moderators and Organizers: Hameeda Sultana and Girish Neelakanta, Old Dominion Univ., Norfolk, VA

8:00 Welcoming Remarks

8:10 65 Antiviral immunity in disease vector mosquitoes. **Kevin Myles**, kmmyles@vt.edu, VirginiaTech, Blacksburg, VA

8:40 66 Tick-bacteria symbiosis. That's cool!. **Girish Neelakanta**, gneelaka@odu.edu, Old Dominion Univ., Norfolk, VA

9:10 67 Understanding the biological role of druggable targets in *Trypanosoma brucei*. **Zachary Mackey**, mackeyzb@vt.edu, VirginiaTech, Blacksburg, VA

9:40 68 Probing the microbiome of ticks. **Charles Apperson**, charles_apperson@ncsu.edu, North Carolina State Univ., Raleigh, NC

10:10 Break

10:25 69 Effect of La Crosse virus infection on the blood feeding and host-seeking behaviors of vectors. **Sally Paulson**, spaulson@vt.edu, Virginia Tech, Blacksburg, VA

10:55 70 Role of actin and actin binding proteins during *Anaplasma* survival in ticks. **Hameeda Sultana**, hsultana@odu.edu, Old Dominion Univ., Norfolk, VA

11:25 71 *Ixodes scapularis*, the vector of Lyme disease: final word on its genetic structure? **Lorenza Beati**, lorenzabeati@georgiasouthern.edu[1], Cynthia Chan[1] and John Ludwig[2], [1]Georgia Southern Univ., Statesboro, GA, [2]Georgia Southern Univ.,, Statesboro, GA

Student Symposium: The Give and Take in Research: Students, Industry, and Training

General Emory's Redoubt 8:30-12:00

Moderators and Organizers: James Wilson, Virginia Tech, Blacksburg, VA

8:30 Introductory Remarks

8:35 72 Novel findings in small packages: *Adelges tsugae* Health Assessments and Defenses. **Anne C. Jones**, annej@vt.edu, Virginia Polytechnic Institute and State Univ., Blacksburg, VA

8:55 73 Genetically Modified Crops and Insect Management in Field Crop Agroecosystems. **Eric Bohnenblust**, ewb14@psu.edu, Pennsylvania State Univ., Univ. Park, PA

9:15 74 Publishing in the *Journal of Integrated Pest Management* (JIPM): Student Q & A Session. **Tom Kuhar** tkhuar@vt.edu, Virginia Tech.

9:45 Break

10:00 75 How Students Can Benefit the Pest Management Industry Through Research and Training. **Molly L. Stedfast**, msted14@vt.edu, Virginia Tech, Blacksburg, VA

10:20 76 Graduate Experience Implementing Industry Supported Research. **John D. Aigner**, daigner@vt.edu, Virginia Tech, Blacksburg, VA

10:40 77 Out of Academia and Into the Real World: Options in Industry with a PhD in Applied Agriculture. **Nancy Brill**, nancy.brill@syngenta.com, Syngenta, Raleigh, NC

11:00 78 Opportunities in the Private Sector: Industry and Consulting. **James Steffel**, jim@labservices.com, LABServices, Hamburg, PA

11:20 79 Discussion Session: Training, Trends, Research, and Opportunities. **James M. Wilson**, jamesmw3@vt.edu, Virginia Tech, Blacksburg, VA

Monday Afternoon, March 17, 2014

Registration	**Clara Barton**	**12:00-5:00**
Linnaean Games	**Jeff Davis Amphitheater**	**12:00-1:30**

Contributed Oral Presentations

General Hill's Redoubt **1:00-5:15**

Moderators: Bryan Petty and Sunil Tewari, Rutgers University

1:00 Introductory Remarks

1:05 80 Brown marmorated stink bug (*Halyomorpha halys*) injury to field corn kernels and associated fungi and metabolites. **Hillary Mehl**, hlmehl@vt.edu[1], D. Ames Herbert[1] and Thomas P. Kuhar[2], [1]Virginia Tech, Suffolk, VA, [2]Virginia Tech, Blacksburg, VA

1:17 81 Totality™ WT: a new product for structural wood protection. **Dina Richman**, Dina.Richman@fmc.com, FMC Corporation, Philadelphia, PA

1:29 83 Effects of gypsy-moth defoliation and *Bacillus thuringiensis* var. *kurstaki* treatments on native forest moth diversity and abundance. **Rea Manderino**, rea.manderino@gmail.com, Blandy Experimental Farm, Boyce, VA, Thomas O. Crist, Miami Univ., Oxford, OH and Kyle J. Haynes, Univ. of Virginia, Blandy, VA

1:41 84 Organic Insecticides: What Works, What Doesn't. **Galen Dively**, galen@umd.edu and Terry Patton, Univ. of Maryland, College Park Maryland, MD

1:53 85 Biological control of Hemipteran pests in organic vegetable crops with an integrated trap crop and pheromone trap system. **Clarissa Mathews**, cmathews@shepherd.edu, Shepherd Univ., Shepherdstown, WV, Tracy C. Leskey, USDA, Agricultural Research Service, Kearneysville, WV and M. Haroun Hallack, Redbud Farm, LLC, Inwood, WV

2:05 86 Seasonal biology of leek moth, *Acrolepiopsis assectella* (Zeller) (Lepidoptera: Acrolepiidae), a new invasive insect pest of allium crops in the Northeast. **Masanori Seto**, ms545@cornell.edu and Anthony M. Shelton, Cornell Univ., NYSAES, Geneva, NY

2:17 87 Decisions, decisions, decisions ... oviposition behavior in *Trissolcus japonicus*, an egg parasitoid of *Halyomorpha halys* . **Christine Dieckhoff**, christine.dieckhoff@ars.usda.gov, Univ. of Delaware, Newark, DE and Kim A. Hoelmer, USDA, Agricultural Research Service, Montferrier, France

2:29 88 The influence of temperature on symbiont survival and transmission to first instar *Halyomorpha halys* nymphs. **Christopher Taylor**, cmjtaylor3@gmail.com, Univ. of Maryland, College Park, MD

2:41 89 Why do we have pepper weevil (*Anthonomus eugenii*) infestations in New Jersey? **Joseph Ingerson-Mahar**, mahar@njaes.rutgers.edu, Rutgers Univ., New Brunswick, NJ and Bernadette Eichinger, Rutgers Univ., Voorhees, NJ

2:53 90 Bentgrasses (*Agrostis* spp.) resistance to annual bluegrass weevils, *Listronotus macullicolis* and its mechanisms. **Olga Kostromytska**, kolgaent@rci.rutgers.edu[1], Albrecht M. Koppenhöfer[2] and Cesar Rodriguez-Saona[2], [1]Rutgers Univ., New Brunswick, NJ, [2]Rutgers, The State Univ. of New Jersey, New Brunswick, NJ

3:05 Break

3:20 91 Local Plant Diversity Across Multiple Habitats Supports a Rich Apple Pollinator Community. **Melanie A. Kammerer**, kma218@psu.edu[1], David J. Biddinger[2] and David A. Mortensen[1], [1]Pennsylvania State Univ., Univ. Park, PA, [2]Pennsylvania State Univ., Fruit Research & Extension Center, Biglerville, PA

3:32 92 Modifying Pennsylvania Apple IPM Programs To Include Pollinators. **David J. Biddinger**, djb134@psu.edu[1], Neelendra K. Joshi[1], Chris Mullin[2], Edwin Rajotte[2], Jing Chen[2], Mark Otieno[2] and Mace Vaughan[3], [1]Pennsylvania State Univ., Fruit Research & Extension Center, Biglerville, PA, [2]Pennsylvania State Univ., State College, PA, [3]The Xerces Society, Portland, OR

3:44 93 Effects of Brown Marmorated Stink Bug (*Halyomorpha halys*) on Corn. **William Cissel**, bcissel@udel.edu, Joanne Whalen and Charles E. Mason, Univ. of Delaware, Newark, DE

3:56 94 Lethal low temperature in harlequin bug (Hemiptera: Pentatomidae): the Polar Vortex takes its toll. **Anthony S. DiMeglio**, Anthony.Dimeglio@ars.usda.gov, Michael M. Athanas, Brennan Bathauer and Donald C. Weber, USDA Agricultural Research Service, Beltsville, MD

4:08 95 Attraction of harlequin bug (Hemiptera: Pentatomidae) to its aggregation pheromone and host plants in the field. **Donald C. Weber**, bogbug@aol.com[1], Guillermo Cabrera Walsh[2], Tracy C. Leskey[3], Anthony S. DiMeglio[1], Michael M. Athanas[1], Kamlesh R. Chauhan[1] and Ashot Khrimian[1], [1]USDA Agricultural Research Service, Beltsville, MD, [2]Fundación para el Estudio de Especies Invasivas, Hurlingham, Buenos Aires, Argentina, [3]USDA, Agricultural Research Service, Kearneysville, WV

4:20 96 Bug-Killing Bug: Potential of *Podisus maculiventris* (Hemiptera: Pentatomidae) to Control *Halyomorpha halys* (Hemiptera: Pentatomidae). **Yong-Lak Park**, Yong-Lak.Park@mail.wvu.edu, West Virginia Univ., Morgantown, WV

4:32 97 The role of landscape heterogeneity surrounding uniformly managed orchards in enhancing apple pollinator visitation. **Mark Otieno**, mxo22@psu.edu[1], David J. Biddinger[2], Neelendra K. Joshi[2], Shelby J. Fleischer[1] and Edwin Rajotte[1], [1]Pennsylvania State Univ., State College, PA, [2]Pennsylvania State Univ., Fruit Research & Extension Center, Biglerville, PA

4:44 98 Ecological Risk Assessment of Some Orchard Pesticides for Pollinators. **Neelendra K. Joshi**, nkj105@psu.edu[1], David J. Biddinger[1], Edwin Rajotte[2], Chris Mullin[2], Jacqueline L. Robertson[3], Jim Frazier[4], Mark Otieno[2] and Maryann Frazier[4], [1]Pennsylvania State Univ., Fruit Research & Extension Center, Biglerville, PA, [2]Pennsylvania State Univ., State College, PA, [3]LeOra Software, Petaluma, CA, [4]Penn State Univ., Univ. Park, PA

4:56 99 Independent Peer Review of Scientific Issues Associated with Pesticides by the EPA FIFRA Scientific Advisory Panel.. **Sharlene Matten**, matten.sharlene@epa.gov, U.S. EPA, Washington, DC

Symposium: Fascinating Insects, And the Lessons They Provide

General McClellan's Redoubt **1:00-5:00**

Moderators and Organizers: William O. Lamp and Alan Leslie, Univ. of Maryland, College Park, MD

1:00 100 Introduction. **William O. Lamp**, lamp@umd.edu, Univ. of Maryland, College Park, MD

1:05 101 Lessons from the cicadas: Why you don't have to wait 17 years. **Michael Raupp**, mraupp@umd.edu, Univ. of Maryland, College Park, MD

1:25 102 Insects as a link between science and society in the frozen world. **Lauren E. Culler**, Lauren.E.Culler@dartmouth.edu, Dartmouth College, Hanover, NH

1:45 103 Best kept secrets of small ponds: Mites and phytotelmata. **Norman J. Fashing**, njfash@wm.edu, College of William and Mary, Williamsburg, VA

2:05 104 The value of aquatic life in drainage ditch networks. **Alan Leslie**, aleslie@umd.edu, Univ. of Maryland, College Park, MD

2:25 105 Causes and consequences of *Coccinella novemnotata* decline: Lessons from the Lost Ladybug Project. **John Losey**, jel27@cornell.edu, Todd Ugine, Rakim Turnipseed, Leo Stellwag, Rebecca Smyth, Evan Hoki and Leslie Allee, Cornell Univ., Ithaca, NY

2:45 Break

3:00 106 Aquatic insect reintroductions: Lessons from the Green Drake Restoration Project. **Hannah L. Stout**, hxc16@psu.edu, The WHM Group, State College, PA

3:20 108 An inordinate fondness for dung beetles. **Dana Price**, DLPRICE@salisbury.edu, Salisbury Univ., Salisbury, MD

3:40 109 A perspective on the invasive kudzu bug and its impact on people, production, and international trade. **Wayne Gardner**, wgardner@griffin.uga.edu, Univ. of Georgia, Griffin, GA

4:00 110 Planthoppers and the systematics of confusion. **Charles Bartlett**, bartlett@udel.edu, Univ. of Delaware, Newark, DE

Symposium: Joint University and Industry Vegetable and Field Crop Symposium

General Emory's Redoubt **1:30-5:00**

Moderators and Organizers: Thomas P. Kuhar[1] and Joanne Whalen[2], [1]Virginia Tech, Blacksburg, VA, [2]Univ. of Delaware, Newark, DE

- **Brown Marmorated Stink Bug Management with Insecticides**
- **How To Best Use Neonicitinoid Insecticides In Vegetable Crops to Minimize Impact on Pollinators**
- **Insecticide Mixtures - Why, When and Where to Use in Vegetable and Field Crops**
- **Kudzu Bug Update in the Mid-Atlantic**
- **New Developments with Insecticide Resistance**
- **Resistance of Western Corn Rootworm to Some Cry3 Events in Bt Field Corn**

Monday Evening, March 17, 2014

Social/Cash Bar **Longstreet/Hooker/Early** **6:00-7:00**

Banquet **Hill's/McClellan** **7:00-10:00**
President's Address
Student Awards
Keynote Speaker, Carol M. Anelli
BD Walsh (1808-1869): Defender of Darwin, Contributor to Evolutionary Theory, and Advocate for American Entomology

Tuesday Morning, March 18, 2014

Final Business Meeting **Longstreet/Hooker/Early** **7:00-8:00**

Symposium: Pushing, Pulling, and Confusing: The Many Ways to Manipulate Insect Behavior in IPM

General McClellan's Redoubt **8:00-12:00**

Moderators and Organizers: Sunil Tewari[1] and Cesar Rodriguez-Saona[2], [1]Rutgers Univ., Chatsworth, NJ, [2]Rutgers, The State Univ. of New Jersey, New Brunswick, NJ

8:00 Introductory Remarks

8:05 111 Increasing crop genotypic diversity to alter behavior and performance for better pest control. **Ian M. Grettenberger**, img103@psu.edu, Pennsylvania State Univ., State College, PA and John Tooker, Pennsylvania State Univ., Univ. Park, PA

8:25 112 Practical uses of mating disruption in NY apple and peach production. **Arthur Agnello**, ama4@cornell.edu, Cornell Univ., Geneva, NY

8:45 113 Quantifying the effects of pollinator plantings on native bee communities. **Daniel Cariveau**, dancariveau@gmail.com, Rutgers Univ., Somerset, NJ

9:05 114 Combining visual and olfactory cues to develop an attract and kill system for the invasive spotted wing drosophila. **Tracy C. Leskey**, tracy.leskey@ars.usda.gov, USDA, Agricultural Research Service, Kearneysville, WV

9:25 115 Data-driven conceptual framework for using root volatiles to manipulate food-finding by grape root borer neonates. **J. Christopher Bergh**, cbergh@vt.edu[1], Jhalendra P. Rijal[1] and Aijun Zhang[2], [1]Virginia Tech, Winchester, VA, [2]USDA-ARS, BARC, Beltsville, MD

9:45 Break

10:00 116 Exploiting dispersal behavior: A more sustainable approach for managing brown marmorated stink bug. **Brett R. Blaauw**, blaauw@aesop.rutgers.edu and Anne L. Nielsen, Rutgers, The State Univ. of New Jersey, Bridgeton, NJ

10:20 117 Can we make crops more attractive to the natural enemies of herbivores?. **Cesar Rodriguez-Saona**, CRodriguez@RCE.Rutgers.edu, Rutgers, The State Univ. of New Jersey, New Brunswick, NJ

10:40 118 Attractiveness of flowering ornamentals to syrphids. **George C. Hamilton**, hamilton@aesop.rutgers.edu, Rutgers, The State Univ. of New Jersey, New Brunswick, NJ

11:00 119 Is there a place for mating disruption in orchards affected by invasive pests?. **Greg Krawczyk**, gxk13@psu.edu, Pennsylvania State Univ., Biglerville, PA, Larry A. Hull, Pennsylvania State Univ. - Fruit Research & Extension Center, Biglerville, PA and David J. Biddinger, Pennsylvania State Univ., Fruit Research & Extension Center, Biglerville, PA

11:20 Concluding Remarks

Symposium: (Industry) Career Reflections and Addressing Current Issues

General Emory's Redoubt **8:00-12:00**

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

8:05 120 On the Road to IPM in Ornamentals: From Cover Sprays to Plant Health Care. **Michael Raupp**, mraupp@umd.edu, Univ. of Maryland, College Park, MD

8:35 121 Reflections on a career in biological control. **Jim Lashomb**, lashomb@rci.rutgers.edu, Rutgers Univ., New Brunswick, NJ

9:05 122 Neonicotinoid stewardship in turf and ornamentals. **Joe Chamberlain**, jcham@valent.com, Valent USA Corporation, Altanta, GA and Julie Schlekau, Valent, Washington, DC

9:30 Break

9:45 123 Pesticides to biotech and more. **Paul Bystrak**, bystrakp@edenbio.com, Plant Health Care, Salisbury, MD

10:10 124 Information delivery to support changing pest management technology. **Joe Russo**, russo@zedx.com, Zedx, Inc., Bellefonte, PA

10:40 125 My life with the annual bluegrass weevil, *Listronotus maculicolli*. **Patricia J. Vittum**, pvittum@ent.umass.edu, Univ. of Massachusetts, Amherst, MA

11:10 126 Challenges and innovation in professional pest management. **Mark Coffelt**, markcoffelt@syngenta.com, Syngenta, Greensboro, NC

11:40 Concluding Remarks

Appendix A

Undergraduate and Master's Oral Competition

1. The effect of various pesticide treatments on individual *Apis mellifera* nutrient levels

The use of pesticides, including fungicides and miticides, has placed a stress on honey bees which could contribute to weaker hives and increased colony losses. Colonies were studied to examine the effects of pesticides on honey bee nutrient levels. Colonies were treated with fumagillin, *tau*-fluvalinate, or chlorothalonil. Samples were taken at pre-treatment, 2 weeks, 4 weeks post-treatment and in the following winter. Fifteen individual bees randomly selected from each colony were analyzed for total lipid, protein, and carbohydrate levels. Overall, bees from colonies treated with *tau*-fluvalinate had significantly higher mean protein levels. A significant increase in protein levels across time was observed when the data from all treatments were considered; however, mean protein levels decreased in all pesticide-treated colonies in the winter, while protein levels from bees in control colonies continued to increase. Mean lipid levels in bees did not differ significantly among treatments, although lipid levels among sampling periods differed significantly. Overall, lipid levels decreased from pre-treatment to 2 weeks post-treatment, and then increased through 4 weeks post-treatment and during the winter. Carbohydrate levels in bees were not significantly different between the control colonies and *tau*-fluvalinate-treated colonies; however, chlorothalonil and fumagillin-treated bees had significantly lower carbohydrate levels compared with the controls. Macromolecule levels followed similar trends in the fall and winter, regardless of pesticide treatment, leading to the conclusion that *tau*-fluvalinate, chlorothalonil and fumagillin do not have significant effects on macromolecule levels, and macromolecule differences observed were most likely due to other environmental factors.

2. Factors affecting the distribution of Brown Marmorated Stink Bug (*Halyomorpha halys)* in soybean systems of Virginia

Eight soybean, *Glycine max,* fields were sampled for stink bugs weekly or bi-weekly from late-July to early-November in Virginia, USA. Sampling occurred at 20 meter intervals along the field edge at 0 meter and 10 meter depths, as well as 10 random samples beyond 10 meters within the field. At each of these locations, variables of the field edge were recorded. Stink bug populations peaked during mid-August, with an average of 7.3 and 3.9 stink bugs at 0 and 10 meter depths respectively. *Halymorpha halys* was the most common stink bug identified in the samples, with *Chinavia hilaris* and *Euschistus spp.* at low densities. Higher densities of all stink bug varieties were correlated to proximity to field edge. *H. halys* distribution also correlated to the presence of suitable mid-season hosts such as Tree of Heaven, *Ailanthus altissima*. Higher concentrations within fields were also correlated to the presence of nearby alternative hosts, such as corn, *Zea mays.*

3. Standardization of visual sampling techniques for *Halyomorpha halys* in New Jersey peaches

Halyomorpha halys (Stål) (Hemiptera: Pentatomidae) is a nonnative, invasive pest that damages a wide variety of field, vegetable, nut, and fruit crops. Because this insect has only been a pest in the United States since 2007, management techniques are still being developed. This project was designed to increase the effectiveness of management programs by standardizing the population sampling methods. Specifically this work examined the impact of time-of-day on detectability and the difference between observers by conducting 24 sampling events in peach orchards in central and southern New Jersey between June and August 2013. Analysis of the 2013 data revealed significant differences in detectability based on time of day with the highest numbers observed seven hours after sunrise. This finding is primarily driven by the number of nymphs observed and is most apparent in July and August. The analysis of differences between observers will also be discussed.

4. The impact of thiamethoxam, a systemic neonicotinoid seed treatment, on both target and non-target insects in snap beans, *Phaseolus vulgaris*

Thiamethoxam, a systemic neonicotinoid insecticide is commonly used as a seed treatment to manage insect pests of snap beans, *Phaseolus vulgaris*. Although previous studies have shown how this seed-treatment can provide control for several important target pests, little is known about how this insecticide affects the overall insect community in snap bean agroecosystems. The objective of this research was to analyze the insect populations and to assess crop injury and yield among snap bean plots treated with thiamethoxam and those left untreated.

In Blacksburg, VA, in 2013, snap bean plots were sown with either thiamethoxam-treated seeds or with untreated seeds. Among these treatments, differences in the observable insect communities were negligible; however, stand counts and yield data revealed that thiamethoxam-seed treatment produced more viable plants, resulting in greater overall pod yields. Our data suggest that using thiamethoxam-treated snap bean seeds is an effective way to control early-season pests, without greatly altering mid- and late-season insect communities.

5. Effects of entomopathogenic fungi on the brown marmorated stink bug (*Halyomorpha halys*)

The brown marmorated stink bug (BMSB) is a highly destructive invasive pest that continues to be a substantial source of damage in both food crop and ornamental systems. While a number of pest management methods are being pursued, the use of entomopathogenic fungi for suppressing BMSB has been largely ignored until recently. To determine the effectiveness of entomopathogenic fungi as a potential avenue for management, several strains of fungi were tested on both nymphs and adults of BMSB. Fungi tested included strains of *Metarhizium anisopliae* and *Beauveria bassiana* as well as *Isaria fumosorosea,* two unidentified fungal strains and an industry standard. Results from these bioassays suggest that wild-type fungal strains would not be sufficiently effective at suppressing BMSB. Additional methods to increase the

pathogenicity of the fungi have been evaluated, such as transgenic alterations of the fungi as well as formulations for deploying the fungus.

6. Improvements in hemlock woolly adelgid health and subsequent effects on reproductive success in the lab of the predatory beetle Laricobius osakensis

High mortality of *Laricobius osakensis* adults due to early emergence from aestival diapause has been a concern for mass rearing of these predatory beetles. A major factor of concern for rearing *Laricobius osakensis* in the lab is maintaining the health of HWA prey on hemlock branches used to feed the predators. Cut hemlock branches infested with HWA are brought back to the rearing lab to be added into rearing funnels as a food source for these live, reproducing beetles. It is proposed that the issue of early emergence by these beetles from their larval stage is a result of inadequate nutrition during larval development. It is thought that the quality of the adelgid prey strongly influences the quality of the predator produced in the lab in terms of growth, survival and fecundity. Each HWA life stage offers some necessary nutrients required to sustain the predator, including total biomass, protein, lipid and carbohydrate content. Including nutrient additives to water baths where the hemlock cuttings are held should maintain the health of the hemlock cuttings and in turn provide better nutrition for the adelgids that feed on them. Four different foliage additives and a control of water are included in water baths where cut hemlock foliage is placed. Adelgid samples are processed and total nitrogen, total carbon and carbohydrates are quantified in conjunction with prescribed treatment. In addition to monitoring the biochemical differences in the adelgids, reproductive improvements will be monitored at each life stage and compared with that of previous years.

7. Evaluating *Scymnus (Pullus) coniferarum* as a potential biological control agent of *Adelges tsugae.*

The hemlock woolly adelgid (HWA), *Adelges tsugae* Annand, is an invasive pest of eastern hemlock (*Tsuga canadensis* (L.) Carrière) in eastern North America. *Scymnus (Pullus) coniferarum* Crotch (Coleoptera: Coccinellidae) is a small lady beetle that preys on HWA in the western U.S. and is absent from hemlock stands in the eastern US. While preliminary studies have shown its release to be of limited risk, more information is needed on the life history of *S. coniferarum* to determine if it will be a suitable biological control agent for HWA in the eastern US. We looked at host-range tolerance and reproductive potential of *S. coniferarum* in both field and laboratory settings. In a sleeve cage field study, *S. coniferarum* adults survived from December to June on HWA-infested *Tsuga canadensis*. Peak oviposition occurred in March and April. Adelgid densities on branches with predators were significantly lower than branches without predators through most of the sampling period. In a series of laboratory studies, we evaluated the effect of temperature and photoperiod on beetle ovipostion and development. Preliminary data suggests oviposition rates and developmental success were higher among the cohort exposed to a higher temperature and longer day length. Through further testing, we hope to gain a better understanding of the establishment and rearing potential for *S. coniferarum* in S.W. Virginia.

8. Does light and water availability alter hemlock woolly adelgid (*Adelges tsugae*) settlement?

Eastern hemlock (*Tsuga Canadensis*) is a dominant shade-tolerant tree in northeastern United States, but it has been declining since 1951 when hemlock woolly adelgid (*Adelges tsugae*) first arrived in Richmond, Virginia. Determining where HWA settles on hemlocks under different abiotic conditions is important in understanding the insect's expansion. Resource availability such as light and water can affect herbivore selectivity and damage. Using a 3*3 factorial design, we examined whether the settlement of HWA differed when their host trees were grown under shaded, full-sun, ample water, and water stressed conditions. 160 two-year-old hemlock saplings were placed in a greenhouse at the University of Rhode Island, Kingston, Rhode Island. Using shade cloth for all trees, eighty trees received a shade treatment with ten percent light availability, and the other eighty trees received a full-sun treatment with ninety percent light availability. Half of the trees in each light treatment received ample water, the other half were water stressed. The trees were grown under these conditions for six weeks prior to inoculating with HWA. Then, half of the trees in each treatment were inoculated with HWA. The other half remained uninfested. There were twenty trees in each of the eight treatments; watered/full-sun/infested, watered/full-sun/uninfested, watered/shaded/infested, watered/shaded/uninfested, water-stressed/full-sun/infested, water-stressed/full-sun/uninfested, water-stressed/shaded/infested, and water-stressed/shaded/uninfested. HWA settled more heavily on old growth ($p<0.001$) and on trees growing in shaded conditions ($p=0.0078$). Furthermore, HWA settled more heavily on trees under water stressed conditions, however, it was only marginally significant ($p=0.0569$). HWA did not impact plant growth ($p>0.05$).

9. Plant reproductive phase and abiotic factors determine succesfful corn earworm (*Helicoverpa zea*) development in maize

Maize producers use pheromone traps to decide whether and how often to spray insecticides against corn earworm, but this approach is sometimes a subjective process. Changing population dynamics, weather, climate, and biotechnology have created new opportunities and limitations for maize production in the northeast US. Recent analysis shows the likelihood of successful corn earworm development is best predicted when pheromone trap catches are considered in combination with reproductive phase of the maize host and other abiotic factors, not by trap catch alone. The potential of this well known agricultural pest to cause economic loss is a function of complex interactions that take place during a specific window of plant development.

10. Patterns of host use by *Halyomorpha halys* in woody plant nurseries

The brown marmorated stink bug (BMSB), *Halyomorpha halys* (Stål), is an invasive polyphagous insect native to Northeastern Asia. Since its introduction to the United States, BMSB has become an economically important agricultural and nuisance pest. Our research investigates patterns of host use on common woody landscape plants. Our goal is to identify species and cultivars of plants serving as food sources for active stages BMSB and those serving as egg-laying sites for reproductively active females. Observations made at two wholesale nurseries over three consecutive years revealed several important patterns of host use. First, the breadth of host use increased as BMSB progressed through development. Eggs were found on

the fewest plants and adults were found on the broadest range of plants while nymphs were intermediate. Second, gymnosperms were utilized far less frequently than angiosperms by active feeding stages and as oviposition sites by adults. Third, while some species of Asian origin were commonly used by BMSB nymphs and adults, comparisons of host use of Asian and North American species suggest that certain plants native to North America may be more heavily utilized than Asian congeners. Ecological underpinnings behind these patterns are discussed. With this information we will make recommendations for the types of trees and shrubs that can be planted to create sustainable landscapes refractory to BMSB.

11. Not all dung is created equal: Dung beetles on organic and conventionally managed cattle pastures

Dung beetles (Coleoptera: Scarabaeidae and Geotrupidae) are considered both ecologically and economically important for their role in the rapid degradation of animal excrement and their use in the biocontrol of dung-associated pests. Individual cattle are estimated to produce up to ten dung pats a day; therefore, littering fields with piles of excrement. Maryland sustains high populations of both beef and dairy cattle farms; thus various pasture management practices are currently in use to combat the accumulating amount of dung and pests. Our research utilized baited pitfall trap transects to examine dung beetle assemblages on sixteen conventionally and organically managed beef and dairy cattle farms throughout the state of Maryland. Results showed similar abundances between the two types of farms. However, we found significantly higher numbers of both the endemic species, *Onthophagus hecate,* on organically managed farms and the invasive species, *Onthophagus taurus,* on conventionally managed pastureland.

12. Behavioral Analysis of Ticks of Southeastern Virginia: The Role of Chemical Attractants in the Use of Tick Traps for Life Stages of Tick Species *Ixodes scapularis, Dermacentor variabilis* & *Amblyomma maculatum*

Amblyomma maculatum, Ixodes scapularis and *Dermacentor variabilis* are hard-bodied ticks that have been found in established populations in Southeastern Virginia. This study will explore three aspects of the appetence process: attractants, pursuit pattern and desiccation tolerance. One of the standard methods used for collecting ticks is the use of tick traps. These traditionally have used dry ice as an attractant to a layer of sticky tape. In order to find whether or not it is possible to capture all life stages of these three species of ticks in the field using tick traps, a series of experiments will be conducted using larval, nymphal and adult stages of *A. maculatum, I. scapularis* and *D. variabilis* ticks. Over the course of ninety minutes movements of the ticks will be monitored; recording movement toward or away from the five attractants: gaseous carbon dioxide, dry ice, deer musk, rodent musk and liquid ammonia. In addition to attractant observations, two of the tick species will be evaluated for pursuit pattern and desiccation viability in order to compare the impact of ambush strategy to hunter strategy. The desiccation study will occur over the course of days to weeks depending on how long the ticks survive in an environment containing limited humidity. This work will provide valuable information about the recently expanding *A. maculatum* population as well as possible methods of control for tick species added to the ongoing surveillance efforts of tick species in Southeastern Virginia by the Gaff laboratory at Old Dominion University.

13. Patterns in cerambycid abundance in urban forest fragments

We are evaluating the abundance and species richness of beetles in the family Cerambycidae in forest fragments in northern Delaware. These urban and suburban forests are part of the long-term Forest Fragments in Managed Ecosystems (FRAME) program, which comprises 30 sites in the Mid-Atlantic region of the eastern United States. All sites, including those used for this study, have been characterized in regards to soil, understory vegetation species and density, litter dwelling arthropods, and occurrence of amphibians, reptiles, birds, and mammals.

The cerambycid family is of particular interest because it contains a number of native and nonnative forest pests. Many of these can be brought to baited traps. We used a combination of three synthesized aggregation pheromones and ethanol as our bait at 24 different sites. Of the 24 sites, six of them had two traps, for a total of 30 traps. We collected all of the insects captured in these traps once a week from April 30 to September 26, 2013. The data gathered during this field season show that each species of cerambycid is impacted differently by differences in the forest fragment composition. The most important factors for influencing cerambycid occupancy and abundance are tree species and time of year. We are currently running more analyses to discover more drivers behind abundance patterns.

14. Effects of urban forest fragmentation on the abundance, diversity, and health of native bees

Habitat destruction is considered to be one of the main causes of species loss. Currently, farmers rely heavily on managed pollinators such as honey bees, bumble bees, and mason bees, which represent less than 11 of the total 20,000–30,000 species of bees. With overexploitation and an observed decrease in the health of managed pollinators, current research is demonstrating that native bee communities can be used as an insurance policy for managed bees. Specimens were sampled from 15 sites in Northern Delaware and Southeastern Pennsylvania associated with the university-wide FRAME (Forest Fragments in Managed Ecosystems) project. Bowl traps were placed at active points within each site and samples were taken every two weeks from late June through mid-September in 2012 and were taken every two weeks from March through mid-October for 2013 (the latter sampling time frame will be used for 2014). Time-constrained netting was completed at every site visit in the interior, edge, and into the surrounding landscape for 30 minutes each. Specimens retrieved from time-constrained netting will be analyzed for pesticide exposure. GIS data from the surrounding landscape will be correlated with pesticide exposure and molecular data to determine which types of land-use has the greatest impact on the overall health of pollinators. Anticipation of declining honey bee populations requires research to find alternatives for the pollination industry. Native pollinators are plentiful in many ecosystems and provide as much pollination as managed bees in some agricultural settings, and additionally continue to provide vital pollination services to native fauna.

15. An integrated IPM program using non-chemical controls to manage parasites in honey bee colonies

This research aims to develop and test the efficacy of an “Integrated pest management” (IPM) program to manage *Varroa destructor* and associated varroa-vectored viruses. Specifically it will test the efficacy of splitting and swarming in conjunction with drone brood removal on reducing mite populations and varroa vectored viruses and leading to an increase in overall colony survivorship. If effective, this strategy will be developed into an IPM practice for hobbyist and small scale beekeepers that will reduce the amount of time and costs beekeepers must spend on varroa control treatments and alleviate the need for additional control tactics. The IPM program represented has a large extension and outreach component. The program includes organizing field days, training sessions, workshops and web based and printed material regarding the IPM protocol. The focus of the project will be in the Mid-Atlantic region through statewide and regional Beekeeping Associations. The data collected will be valuable for long term management of bees and lead to greater understanding of the relationship between varroa mites and honey bees and provide a basis for sustainable honey bee management techniques.

Appendix B

Undergraduate Poster Submission

DSP1. Seasonal activity and abundance of the blacklegged tick (*Ixodes scapularis*) and infection prevalence of the Lyme disease bacterium (*Borrelia burgdorferi*) in mid-western Pennsylvania

The blacklegged tick (*Ixodes scapularis*) which vectors the Lyme disease bacterium (*Borrelia burgdorferi*) has primarily been studied in northeastern, and secondarily in north-central and mid-Atlantic regions of the United States. Little is known about its ecology in Pennsylvania which has the greatest number of recent Lyme disease cases. Classic 1990's *I. scapularis* population studies, conducted at the Louis Calder Center (LCC) (Westchester County, NY), were replicated in mid-western Pennsylvania at Blue Spruce County Park (BSCP) (Indiana County, PA). Vegetation plot (20x20m) data were collected at both sites. At BSCP the relative tick densities were determined biweekly, and absolute densities and collection efficiencies estimated during peak activity periods using a removal method for larvae and multiple mark-recapture method with DayGlo© powder for nymphs and adults. Both sites were deciduous forest with dense canopy (≥76.8±8.0%) and sparse understory (≤51.7±41.6 saplings and ≤17.3±20.0 shrubs/400m^2) and groundcover (≤17.9±18.9%). BSCP had markedly more leaf litter cover (83.4±14.2% vs. 19.9±16.2%). Activity of adults peaked in April and in late November, nymphs in early July, and larvae in late July. Absolute density of larvae was 63.3±35.8/m^2, nymphs 1.25±0.16/m^2, and adults 0.52/m^2. Collection efficiency for larvae was 24.5±5.7%, nymphs 9.7±2.5%, and adults 1.8%, using 1m^2 heavy muslin sheets. Presence of *I. scapularis* and *B. burgdorferi* DNA was tested in adults using standard PCR amplification. Infection prevalence for 93 ticks from Whites Woods Nature Center located 5.5km from BSCP was 68.8%. Our findings are comparable to those from the LCC located in a highly endemic Lyme disease area.

DSP2. The Impact of Federally Funded Pollinator Plantings on Natural Enemies and Crop Pests

Federally funded pollinator plantings are being installed across the United States to increase pollinator populations. A potential secondary benefit of these pollinator plantings is increasing abundance of natural enemies of crop pests. However, there is also a concern that the plantings will attract crop pests. This study tests whether pollinator plantings installed by landowners show significant increases in the abundance of natural enemies as well as crop pests. To test this, we used vacuum sampling to compare the abundance of natural enemies and crop pests in pollinator plantings to nearby old-field control sites. Insects were classified first to the family level, then classified as a natural enemy or crop pest. There were 80 different insect families found, with 27 natural enemy families, and 23 pest families. The total number of specimens found over two years is nearly 8,000. We did not find a significant difference between the treatment and control plots in the abundance of pests and natural enemies. While others studies have demonstrated that these plantings have a positive effect on pollinators, we did not find evidence for a secondary

benefit of an increase in natural enemies nor did we find a negative effect through an increase in crop pests.

DSP3. Using scanning electron microscopy to understand and improve efficacy of entomopathogenicfungal applications

Tools such as scanning electron microscopy (SEM) may be very effective means of assessing the fate of entomopathogenic fungal field sprays, and thereby obtaining information on factors such as application efficacy and spore germination rates. We conducted a series of laboratory and field-based assessments of entomopathogenic fungal applications, and then used SEM to determine where the spores ended up on insects and plant parts. Fungal applications were made on plant parts such as stems and flowers when no pests were present, and were also applied directly to infested plant tissues. After the applications, samples were collected and imaged using SEM to determine spore location. The spores had contacted the insects mainly on the dorsal side of the thorax and abdomen, with smaller amounts attaching to legs and the head. Spores applied using commercial equipment in the field conditions to pepper plants were found primarily on the top of leaves with very little on the base of the ovary of flowers. SEM allowed for direct assessment of rates of spore attachment and germination with different insect hosts and using different formulations and crop types. SEM appears to be a useful tool for assessing effectiveness of entomopathogenic fungal applications, measuring application efficiency under varying conditions, and directly assessing potential improvements to methods focused on contacting insect pests with fungal spores.

Masters Poster Submission

DSP4. Forest edges enhance mate-finding in the European gypsy moth, *Lymantria dispar*

Understanding the movement of individuals within a landscape is essential to identifying how habitat boundaries affect species abundances, ranges, and spread rates. Particularly in highly heterogeneous landscapes containing low-density populations, movement barriers due to habitat fragmentation may reduce mate-finding ability in some species, while characteristics of edge habitat may enhance mate-finding in others. The focus of this study is the effect of habitat type and habitat edge on mate-finding in an invasive defoliator, the European gypsy moth (*Lymantria dispar*), in fragmented forest. Gypsy moth invasion rates vary geographically across landscapes and are negatively correlated with levels of fragmentation. We hypothesize that mate-finding failure is elevated in small, isolated forest patches and this is a mechanism for reduced invasion rates. Adult European gypsy moths exhibit sex-specific movement with mate-finding by flighted males mediated through pheromones released by flightless females. We measured mate-finding success in a male release-recapture experiment using female-baited traps in fields, at forest edges, and in the forest interior. Mate-finding was highest at forest edges, intermediate in fields, and lowest within the forest interior. These data suggest that field habitats do not pose a substantial barrier to male gypsy moth mate-finding at the spatial scales measured. Moreover, moderate habitat fragmentation may enhance mate-finding in gypsy moth populations.

Therefore, if habitat fragmentation influences gypsy moth invasion rates, it does so either at larger scales than tested here or through a mechanism other than mate-finding failure.

DSP5. Investigating the movement and host selection of Mexican bean beetle, *Epilachna varivestis* Mulsant, among five host plants using mark-release-recapture

Mexican bean beetle, *Epilachna varivestis* Mulsant, feeds upon various bean crops in the United States. The level of suitability among many of these crops is described in previous research; however, little is known about how MBB exhibits preference when numerous host plants are available in one setting, such as a polyculture farm. Our research examined the movement and host selection of MBB among common host plants using mark-release-recapture field trials.

Experiments were conducted in a field plot, as well as inside a walk-in screen cage, located near Blacksburg, VA in 2013. In both experiments, 250 adult MBB were released into a plot planted with five replicates of five bean varieties (purple wax snap, yellow wax snap, green snap, lima and soy). Each beetle was painted with a color indicating the host plant on which it was released. Plots were sampled every two days until recapture rate dropped to 10%. Our data revealed that MBB movement was not random, even among the most suitable hosts (snap beans). More MBB originally released in purple wax beans remained in this crop. Also, more MBB move into purpled wax beans than any other crop. These results suggest that purple wax beans may be a suitable trap crop to manage MBB.

DSP6. Non-target effects of organic insecticides on *Podisus maculiventris* (Hemiptera: Pentatomidae)

The spined soldier bug, *Podisus maculiventris* (Hemiptera: Pentatomidae) is a generalist predator native to North America. Augmentative release of *P. maculiventris* has reduced numbers of several pest species in various production systems, and it is currently being assessed as a means of biological control of the brown marmorated stink bug, *Halyomorpha halys* (Hemiptera: Pentatomidae). The objective of this study was to determine the effect of residue of three organic pesticides on *P. maculiventris*. *P. maculiventris* adults were exposed to three organic pesticides following the pesticide labels: Pyganic ®, Azera ®, and insecticidal soap. The pesticides were administered by spreading over a petri dish and allowed to dry for 18 hours. Each insect was exposed to the residue for 4.5 hours, and then its survivor and behavior was recorded for ten days. This experiment was repeated 3 times per pesticide. The results of this study showed that Pyganic, Azera, and insecticidal soap caused 88%, 50%, and 35% mortality, respectively, indicating negative non-target effects on *P. maculiventris*. In addition, Azera application altered oviposition behavior of *P. maculiventris*; survived females laid eggs scattered instead of laying eggs in a cluster. This study demonstrated the potential negative effects of organic insecticides against *H. halys* on *P. maculiventris*.

DSP7. Do white-tailed deer indirectly affect pupal mortality of the gypsy moth by altering predator habitat?

Predators can suppress prey populations when predator densities are sufficiently high. Interactions with a third species can significantly alter predator densities, which would indirectly

affect predator-prey outcomes. Such density-mediated indirect effects can be hard to detect in complex systems that are difficult to manipulate experimentally. The gypsy moth (*Lymantria dispar*) is an invasive forest defoliator currently expanding its range in the U.S. The main predator of gypsy moth pupae is the white-footed mouse (*Peromyscus leucopus*), which shows a type II functional response to increasing pupal density. The white-tailed deer (*Odocoileus virginianus*) is a keystone herbivore that greatly affects the architecture of the forest understory and is a major consumer of acorns. White-footed mice prefer dense understory habitat and are reliant on acorns for overwinter survival; thus, populations may be reduced where deer are present. The goal of this study is to investigate indirect effects of the deer on gypsy moth through interactions with the moth's mammalian predators. Small mammal population densities, predation rates on gypsy moth pupae, and forest vegetation structure were compared between long-term deer exclosures and control plots in Shenandoah National Park, VA. Small mammal population densities and predation rates on gypsy moth pupae increased over the course of a season. Small mammal population densities and predation rates did not differ between forest with and without deer, despite differences in vegetation characteristics. These results suggest a lack of indirect effects of deer on gypsy moth via interactions with the small mammal predators of gypsy moth pupae.

DSP8. Field and laboratory studies of *Scymnus (Pullus) coniferarum* as as potential biological control agent of *Adelges tsugae*

The hemlock woolly adelgid (HWA), Adelges tsugae Annand, is an invasive pest of eastern hemlock (Tsuga canadensis (L.) Carrière) in the eastern North America. Scymnus (Pullus) coniferarum Crotch (Coleoptera: Coccinellidae) is a small lady beetle that preys on HWA in the western U.S. and is absent from hemlock stands in the eastern US. While preliminary studies have shown its release to be of limited risk, more information is needed on the life history of S. coniferarum to determine if it will be a suitable biological control agent for HWA in the eastern US. We looked at host-range tolerance and reproductive potential of S. coniferarum in both field and laboratory settings. In a sleeve cage field study, S. coniferarum adults survived from December to June on HWA-infested Tsuga canadensis. Peak oviposition occurred in March and April. Adelgid densities on branches with predators were significantly lower than branches without predators through most of the sampling period. In a series of laboratory studies, we evaluated the effect of temperature and photoperiod on beetle ovipostion and development. Preliminary data suggests oviposition rates and developmental success were higher among the cohort exposed to a higher temperature and longer day length. Through further testing, we hope to gain a better understanding of the establishment and rearing potential for S. coniferarum in S.W.Virginia.

PhD Poster Submission

DSP9. Spatial distribution and population dynamics of hemlock woolly adelgids (Hemiptera: Adelgidae)

Understanding spatial distribution of an insect pest can help determining where to sample and

target to apply control measures. This study was conducted to characterize the spatial distribution of ovisacs of the hemlock woolly adelgid, *Adelges tsugae* (Hemiptera: Adelgidae), on eastern hemlock stands. A total of 100 grids with each grid of 10 meter by 10 meter were laid out inside eastern hemlock stands in Blackwater Fall State Park (WV), Cathedral State Park (WV), and Buchanan State Forest (PA). In each grid, a tree located in the middle was selected to cut two 50 cm branches at peaks of ovisac occurrence from 2012 June to 2013. The cut branches were brought to the lab to count the number of ovisacs and map the spatial distribution of *A. tsugae* with Spatial Analysis by Distance Indices (SADIE). The results of this study showed that *A. tsugae* ovisacs were spatially aggregated (I_a = 1.34 - 2.64, p = 0.01) regardless of sites and sampling time. When the number of *A. tusgae* per tree was similar between generations, the distribution pattern was also similar. The result of this study suggests the potential for a site-specific management.

DSP10. Beneficial arthropod rebound after selective insecticide application in Virginia soybean

Research in Virginia and North Carolina soybean in 2013 found that following insecticide application some beneficial arthropod densities could drop temporarily and rebound later in the season, while others may never recover. If scouting after application determines pest populations are below economic threshold until later in the season, a rebound of beneficial arthropods could potentially eliminate the need for a second application.

To compare the effects of different insecticides on beneficial arthropods in soybean, five fields in Virginia and one in North Carolina were selected, with each field divided into four equal plots. Each plot was treated once with one of the following products currently labeled for use in soybean: a broad-spectrum traditional insecticide; one of two selective insecticides of the anthranilic diamide class, or no insecticide. Applications were made when soybeans reached beginning pod stage, as recommended by the selective insecticide manufacturers. Beneficial and pest population densities in each plot were surveyed weekly or biweekly using sweep nets, beat sheets and sticky cards for several weeks pre- and post- insecticide application. Analysis of the data will allow for comparison of immediate mortality caused by the different insecticides, determination if populations were able to recover, and if so, if there were differences in recovery time between species.

DSP11. Natural history of pine bark adelgid, *Pineus strobi* (Hemiptera: Adelgidae), in Virginia

The pine bark adelgid, *Pineus strobi* (Hemiptera: Adelgidae), is a native herbivore of eastern white pine, *Pinus strobus*, in eastern North America. Little is known of this adelgid's phenology or impact on *P. strobus*. Like other adelgid species, the pine bark adelgid is a phloem feeding insect with limited mobility. Spending the majority of its lifetime anchored to a single location on a tree, it can be found on either the bark, stem, or needle base. Though rarely damaging to trees in its native range, the pine bark adelgid may be more problematic in Europe, where it has been introduced. The only known predator to specialize on pine bark adelgid is *Laricobius rubidus* (Coleoptera: Derodontidae), which is closely related to *Laricobius nigrinus*, a biological control agent introduced for hemlock woolly adelgid. Recently it was found that the two

predator species successfully hybridize and produce fertile offspring. For these reasons, it is important to better understand pine bark adelgid and its associated predators.The present study aims to characterize the pine bark adelgid's life history, natural enemies, and impacts in Virginia forests.

DSP12. Development and comparison of traps to monitor movement of *Halyomorpha halys* nymphs on trees

Halyomorpha halys Stål (Hemiptera: Pentatomidae) has recently become an important orchard pest in the US Mid-Atlantic region. Large *H. halys* populations can develop on wild tree hosts adjacent to orchards and pose an ongoing threat to orchard crops. It is, therefore, essential to understand their seasonal patterns of host use between fruit tree and wild tree hosts in order to implement effective IPM strategies. This study explored the use of trunk traps to intercept walking nymphs moving onto and leaving trees. Three trunk traps were developed based on designs published in other studies; Circle, Hanula, and Moeed and Meads (M&M) traps. Trap efficacy was compared in a growth chamber and in the field. In the growth chamber, twenty 2nd instar nymphs were released at the top and bottom of individual logs of *Ailanthus altissima* (Mill.) Swingle and the nymphs captured were counted 24 hours after release. In the field, the three trap designs were deployed on *Ailanthus* trees adjacent to apple orchards near Winchester, VA. Nymphal and adult captures were recorded weekly from 24 Jul to 11 Sept, 2013. On average, Circle traps captured 80.63% of released nymphs moving up tree logs in the growth chamber and 27.5 bugs per week in the field. M&M traps captured 57.5% of released nymphs moving down the logs and 4.84 bugs per week in the field. These results suggest that trunk traps may have the utility to address important ecological questions about seasonal patterns of host use by *H. halys* nymphs.

DSP13. Effect of insecticides and entomopathogenic fungi on oviposition behavior of Japanese beetle, *Popillia japonica* (Coleoptera: Scarabaeidae)

In the northeastern U.S. including Virginia, Japanese beetle, *Popillia japonica* (Coleoptera: Scarabaeidae), is one of the major species of white grubs that attacks cool season turfgrass. For effective control, commercial insecticides or entomopathogenic fungi are typically applied during the summer to target the small (early instar) white grubs that are feeding near the soil surface. However, little is known about how these insecticides affect oviposition by female beetles. Greenhouse studies were conducted to examine the effect of combined applications of two insecticides, imidacloprid and chlorantraniliprole, and two species of entomopathogenic fungi, *Metarhizium anisopliae* and *Beauveria bassiana*, on Japanese beetle oviposition behavior. Treatments included two rates of the insecticides (one-quarter and one-half of the recommended rate), the full recommended rates of both fungi species, and each combination of insecticide plus fungi. For each treatment the number of eggs laid, depth of eggs in the soil, and percent hatchability of eggs was determined. Results showed that Japanese beetle females laid eggs mostly in the upper 4 cm of soil irrespective of the applied treatments. Both rates of imidacloprid either applied as a single treatment or as part of a combined treatment significantly reduced the number of eggs laid compared with untreated control ($P<0.05$).

DSP14. Day-length and dietary choices in *Aedes albopictus*

Temperate *Aedes albopictus* lay diapausing eggs when day-length decreases in the Fall. We hypothesized that females reared in short-day conditions (8:16 L:D) would alter their dietary choices to favor the production of diapausing eggs when compared to females reared in long-day conditions (16:8 L:D). We offered blood and sugar meals concurrently every three days, and tracked the choice patterns of 40 females in each treatment. Long-day females were 3 times more likely to choose blood first, and overall, short-day females took 33% more sugar meals. This may suggest that bite-rates per female are altered in the Fall, and that sugar meals may become more important at that time.

Appendix C

PhD Oral Competition

35. Landscape features associated with brown marmorated stink bug (*Halyomorpha halys*) clustering in peach orchards

This research was conducted to identify spatial and landscape features that contribute to brown marmorated stink bug, *Halyomorpha halys* (Stål) clustering in peach orchards. I hypothesized that *H. halys*' ability to overwinter in forested areas and structures coupled with its wide host range influences its spatial arrangement within nearby fields. Two orchards were surveyed weekly in 2012 and 2013 for *H. halys* using visual sampling. These data were mapped using GIS (Geospatial Information Systems) software. The relationship of brown marmorated stink bug population clustering to peach variety and distance from wooded edges was examined using multivariate analyses. The results of this analysis are discussed. The information gathered from this research will allow targeted control efforts in areas more likely to harbor high populations.

36. Varietal preference testing of SWD in Virginia wine grapes

Drosophila suzukii, also known as the spotted wing drosophila (SWD), is a pest of wine grapes and berry crops in Virginia. In order to ascertain if certain grape varieties were more susceptible to SWD attack both choice and non-choice tests was conducted in the Summer / Fall of 2013. Six grape varieties were chosen based on their skin color and thickness. Brix and penetration force data were also evaluated, since sugars increase as the grapes ripen. The tests were repeated weekly for four weeks with 12 replicates each for the choice test and four replicates each of the non-choice test. The experiments were conducted after the onset of véraison when grape sugars are just starting to accumulate. Fifteen male and female SWD were placed in mesh rearing cages with a 20 gram sample of each of the six grape varieties. The SWD adults were allowed to remain in the cages for four hours. Grapes were then placed in plastic rearing cups and monitored for 21 days. All flies that emerged were collected, counted and identified. An ANOVA was used to evaluate the data. No varietal differences were detected in the choice test results. However, in the non-choice test significantly more SWD adults emerged from the Petit Manseng and Viognier varieties. The field populations were too low to modify our conclusions.

37. Prevalence of exotic and native plant food in the gut contents of *Melanoplus* grasshoppers: molecular confirmation of diet

Accurate confirmation of food consumption is critical for determining feeding preferences of herbivorous insects and inferring their interaction with host plants. Among various techniques available for food-identification (including direct observation, feeding trails, and microscopical gut content analysis), PCR assays have shown to be an accurate and relatively quick method for

detecting ingested plants and determining plant-insect trophic interactions. We previously developed a PCR-based method of identifying ingested plant DNA in gut contents of *Melanoplus* grasshoppers. In this study, we apply the developed protocol to our main research question: Do *Melanoplus* grasshoppers demonstrate feeding preferences on exotic and native host plants under natural conditions?

Both grasshoppers and reference plants were collected from two study plots in Ohio and Maryland. Fragments (~500 bp) of the noncoding region of the chloroplast *trn*L (UAA) gene were isolated from grasshopper gut contents and from collected plants. DNA sequences obtained from reference plants were then BLASTed against NCBI GenBank database for plant identification using 98-100% match identity; DNA sequences obtained from ingested plants were then matched to DNA from reference plants. Preliminary analysis of the prevalence of exotic and native plants in grasshopper guts demonstrated strong preferences toward exotic food in grasshoppers collected in Ohio (p=0.001, Binomial Test) and no feeding preferences in grasshoppers collected in Maryland (p>0.05, Binomial Test). Sequence data for additional samples of grasshopper gut contents, as well as the effect of the prevalence of exotic and native plants in the field on grasshoppers' feeding choices are currently being analyzed.

38. Performance and host preference of arrhenotokous and thelytokous onion thrips (*Thrips tabaci*) on two different host plants, onion and cabbage

Onion thrips, *Thrips tabaci* Lindeman (Thysanoptera: Thripidae) is an important pest on onion and cabbage. Two reproductive modes, arrhenotoky and thelytoky are found in this species and can co-occurr in the field. In this study, we compared life table traits between arrhenotokous and thelytokous *T. tabaci* on cabbage and onion. Experiments were conducted in cages to determine which reproductive mode is more competitive. Additionally, host preference between arrhenotokous and thelytokous *T. tabaci* was investigated. Results from life table and cage experiments showed that arrhenotokous and thelytokous *T. tabaci* performed differently on onion and cabbage. On onion, arrhenotokous *T. tabaci* performed better than thelytokous *T. tabaci*, while on cabbage the opposite occurred. When comparing life table and demographic growth parameters on different host plants, we found that arrhenotokous *T. tabaci* preferred onion, whereas thelytokous ones preferred cabbage. Our results provide important knowledge about the relationships between these two reproductive modes and their roles in population regulation on different crops and this knowledge can be useful for pest management.

39. Exploring tick range expansions: landscape genetics and dispersal mechanisms of two Ixodid ticks

Incidence and prevalence of tick-borne diseases are on the rise throughout the US, and expanding tick distributions are resulting in unanticipated outbreaks of disease in new areas. A multi-year intensive active field surveillance program has revealed the recent establishment of two species in Virginia, the Gulf coast tick A*mblyomma maculatum*, and *Ixodes affinis*, a blacklegged tick related to *I. scapularis*, the principal vector of the agent of Lyme disease. In order to determine the origin of these newly established Virginia populations and examine gene flow between populations, we sequenced the mitochondrial 16S rRNA gene from ticks from Virginia and from the

historic ranges in the southern US. Distinct patterns of range expansion were observed, and we hypothesize that these patterns can be explained by examining the host preferences of each species. We will discuss the implications for modeling the movement of tick species into new areas.

40. The effects of consuming toxic monarch caterpillars on Chinese mantid fecundity

Monarch caterpillars feed on milkweed host plants and sequester toxic cardenolides as a chemical defense against predation. Although this strategy is effective against most predators, the Chinese mantid guts monarch caterpillars and consumes the remaining biomass without any apparent ill-effects. We have found that while both body and gut material contain similar overall cardenolide concentrations, different specific cardenolides are present in each tissue. Though mantids suffer no apparent ill-effects from consuming monarch bodies, they are still ingesting toxins that may have long-term impacts. We tested whether consuming monarch caterpillars reduces mantid fecundity. We assigned lab-reared adult mantids into one of four toxicity groups (non-toxic control, low, medium, and high) that differed in the number of caterpillars consumed over a 15-day period following eclosion. After this time, mantids were fed crickets daily until they were sacrificed and dissected on day 35. We determined the number of eggs produced, average egg length, and total egg weight.

Monarch consumption did not affect mantid egg production. Contrary to expectation, mantids in the high-toxicity treatment had longer eggs and devoted a greater percentage of their body mass to egg production than did mantids in the control treatment. Mantids in the control treatment were smaller than those in the high-toxicity treatment but there were no between-treatment differences in total prey biomass consumed over the 35-day experiment. Thus, consuming monarch caterpillars did not reduce mantid fecundity. Together with previous research, our results indicate that Chinese mantids suffer neither acute nor chronic ill-effects from consuming cardenolide-laden monarch caterpillars.

41. Ticks and spotted fever group rickettsiae of southeastern Virginia

The incidence of tick-borne rickettsial disease in the southeastern United States has been rising steadily through the past decade, and the range expansions of tick species and tick-borne infectious agents, new and old, has resulted in an unprecedented mix of vectors and pathogens. The results of an ongoing 4-year surveillance project describe the relative abundance of questing tick populations in southeastern Virginia. Since 2009, more than 66,000 questing ticks of 7 species have been collected from vegetation in a variety of habitats, with *Amblyomma americanum* constituting over 95% of ticks collected. Other species represented included *Ixodes scapularis*, *Dermacentor variabilis*, *Amblyomma maculatum*, *Ixodes affinis*, *Haemaphysalis leporispalustris*, and *Ixodes brunneus*. We found that 26.9–54.9% of *A. americanum* ticks tested were positive for *Rickettsia amblyommii*, a non-pathogenic symbiont of this tick species. We also found no evidence of *R. rickettsii* in *D. variabilis* ticks, although they did show low infection rates of *R. montanensis*(1.5–2.0%). *Rickettsia parkeri* and *Candidatus* R. andeanae were found in 41.8–55.7% and 0–1.5% *A. maculatum* ticks, respectively. The rate of *R. parkeri* in *A. maculatum* ticks is among the highest in the literature and has increased in the 2 years since *R. parkeri* and *A. maculatum* were first reported in southeastern Virginia. We conclude that tick

populations in southeastern Virginia have recently undergone dramatic changes in species and abundance and that these populations support a variety of rickettsial agents with the potential for increased risk to human health.

42. Phenotypic variation in developmental characteristics of the black blow fly *Phormia regina* (Diptera: Calliphoridae) from three geographical regions in New Jersey

Blow flies (Diptera: Calliphoridae) collected from human remains can greatly assist homicide investigators in determining a time since death by producing a minimum post mortem interval (min-PMI). However, some species of blow fly vary in their developmental characteristics based on geographical region, potentially reducing the accuracy of the min-PMI. Black blow flies (*Phormia regina*) are common throughout much of the United States, but little is known of their biology in the northeast. To address this deficiency, we examined this species' phenotypic variation from three different geographical regions across New Jersey (north, central, and south). This is the first study investigating the developmental variation of this species in addition to examining intrastate populations of *P. regina*. Populations of *P. regina* from each region were studied at 25 °C, 14:10 h L: D and ~ 56% RH. In total, 3,900 first instar larvae were used in this experiment (13 containers of 100 larvae per region). Developmental characteristics such as survivorship, pupal weight, and adult weight were quantified. Of the original 3,900 larvae, 1,978 (51%) pupated and 1,617 (41%) became viable adults. The southern population had the lowest mean weight for both pupae (0.0267 g) and adults (0.00651 g), while the northern population had the largest mean pupal weight (0.0317 g) and the central population had the largest mean adult weight (0.00784 g). Our results will improve min-PMI estimates across New Jersey, and future work will involve increasing the temporal replication of the experiment.

43. Distribution of *Monodontomerus* spp. (Hymenoptera: Torymidae) in nests of *Osmia cornifrons* (Hymenoptera: Megachilidae)

Osmia cornifrons is managed in Japan and the eastern U.S. for pollination of early season fruit crops. *Osmia cornifrons* nests naturally in reeds or similar structures and is often managed for pollination in bundles of cardboard straws which contain a series of mud partitioned cells, each containing a single egg and pollen provision. Eggs laid toward the back of *O. cornifrons* nests develop into females, and those laid near the front of the nest will develop into males. Near the end of *O. cornifrons* seasonal activity, in the late spring, *Monodontomerus* spp. emerges and begins to lay eggs in *O. cornifrons* nest cells. When *Monodontomerus* eggs hatch, the larvae consume the developing *O. cornifrons*. To determine the effect of *Mondontomerus* on male and female mortality, the distribution of *Mondontomerus* in 122 infested cardboard nest straws was compared to the distribution of male and female *O. cornifrons* in 22 un-infested cardboard nest straws using non-linear regression. *Mondontomerus* were found in larger numbers in cells commonly occupied by male *O. cornifrons*. To determine the distribution of *Monodontomerus* in cardboard straw bundles, the number of *Monodontomerus* emergence holes in each straw was recorded for ten bundles of 100 straws. The spatial trend of *Mondontomerus* infestation was determined using kriging. The trend was first order, indicating greater parasitism in peripheral straws in the bundle. The results of this study indicate that male *O. cornifrons* in nests located on the outside of cardboard straw bundles are at the highest risk of parasitism by *Monodontomerus*.

44. Assessing the effects of Bt crops on *Amblyseius andersoni* Chant, a predator of the twospotted spider mite, *Tetranychus urticae* Koch

Crops producing Cry proteins from the bacterium, *Bacillus thuringiensis*(Bt), have become an important tool for controlling pests on cotton and corn. However, the effects of Bt crops on non-target organisms, especially natural enemies that control pests, are required in a risk assessment. The predator, *A.andersoni* (Acari: Phytoseiidae), occurs throughout Europe and North America and one of its most important target pests is the twospotted spider mite, *T.urticae* (Acari: Tetranychidae) which feeds on cotton and corn. A tritrophic study was conducted to evaluate the potential effects of Cry1Ac/Cry2Ab cotton and Cry1F corn on fitness parameters (larval survival, development time, fecundity and egg hatch) of *A.andersoni.* Our results indicate there were no differences in any of the fitness parameters of *A.andersoni.* Additional studies confirmed that the prey and the predator contained bioactive Cry proteins. These results show that *A.andersoni* is not affected by Cry1Ac/Cry2Ab cotton and Cry1F corn.

45. Comparison of courtship songs in *Cotesia* (Hymenoptera: Braconidae)

Male courtship songs function in species recognition and to advertise mate quality. Among closely related and cryptic species of *Cotesia*, perhaps the most speciose genus of parasitic wasps, courtship songs may play an important role in premating isolation. Prior research on four *Cotesia* spp. demonstrates that songs are generated by wing fanning and pulses in stereotypical patterns. We characterized courtship songs produced by an additional eight of ~80 described species of *Cotesia* in North America. Songs of emergent males from wild caterpillar hosts were recorded with miniature omnidirectional microphones in a noise reduction booth. Pattern, frequency, and duration of song components were analyzed using Raven Pro. Species-specific songs varied significantly in structure and duration of repeating pulse and buzz components. Differences in courtship songs loosely mirror the proposed phylogeny by Michel-Salzat & Whitfield (2004) in that songs of more closely related species are more similar than those of more distantly related species. Two species that have not been genetically characterized can be placed provisionally into the "*rubecula*" group, one of four characterized lineages, based on similarity of song structure. Courtship song analysis may aid in identifying closely related cryptic species and provide insight into the evolution of this highly diverse and agriculturally important taxon.

46. Temperature dependent development thresholds and adult emergence synchrony in the southern pine beetle: consequences for population dynamics

Physiological tolerances to environmental conditions is a major determinant of the distribution and abundance of species. For terrestrial ectotherms, temperature is one of the most important of these factors, and the broad scale effects of climate change are predicted to alter the population dynamics of many of these species. In this study we examine the effects of varying larval development temperature on population stage structure, and consequences for population growth rate. We explore these concepts using a tree killing bark beetle, the southern pine beetle, as a model system. Pitch pine bolts from six different trees infested with mid stage (2^{nd} – 3^{rd} instar) southern pine beetle larvae were collected from two locations in the pinelands region of NJ, and placed in one of four temperature treatments in a factorial design (12, 18, 21, 15-21 degrees C)

for a period of three weeks. Adult emergence was subsequently monitored at 25C. Treatments resulted in varying stage structure of the population in association with the specific temperature-development thresholds of different life stages. Furthermore, the 12C treatment produced a highly synchronous emergence of new adult beetles which may enhance population growth rate given the positive density dependence of this species at initially low population size.

47. Determining the Predators of Brown Marmorated Stink Bug: A Multidisciplinary Approach

Brown marmorated stink bug (BMSB) is a high-profile invasive pest of American agriculture. As a relatively recent invader, little is known about the predators of BMSB in American agricultural landscapes. We have undertaken a multifaceted approach to determine the insect predators and parasitoids of BMSB. This research includes the utilization of sentinel egg masses, video equipment for observation of predation and parasitism in the field and molecular techniques for identifying BMSB DNA in the digestive tracts of predators. Each method has unique advantages and pitfalls which highlight the importance of multiple research strategies.

ESA EASTERN BRANCH COMMITTEES

The following is a 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 15 to Tuesday, March 18, 2014 at the Crown Plaza Fort Magruder Inn in Williamsburg, VA. If you are considering volunteering a portion of your time for committee service this year, please contact either the current chair of the respective committee, the Branch Secretary, Dr. Daniel Frank, or Eastern Branch President, Mr. Eric Day. 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 – Daniel Frank, Secretary.

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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)*

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Student Affairs Committee *(responsible for John H. Comstock and Asa Fitch student awards)*
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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)
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Awards and Honors *(term: 11/16/11 - 11/19/14)*
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Eastern Branch Ad Hoc Committees, 2012-2013

Archivist-Historian *(term: 5 years, appointed by President)*
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Board and Associate Certified Entomologists *(term: indefinite)*
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Linnaean Games Committee *(term: indefinite)*
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Local Arrangements *(term: annual)*
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Registration & Hospitality Committee *(term: annual)*
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Student Paper Competition Committee *(term: annual)*

Oral Competition
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