International Organization for Biological Control
Nearctic Regional Section
Organisation Internationale de Lutte Biologique
Section de la Region Néarctique

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IOBC-NRS NEWSLETTER

INSIDE THIS ISSUE:

Ann Hajek Receives IOBC-NRS Distinguished Scientist Award

Dr. Ann Hajek has had a long and illustrious career studying the fundamental interactions between natural enemies and arthropod pests (including work with entomopathogens, predators and parasitoids) and their applications in implementation of biological control programs.

Ann received her undergraduate degree from the University of California, Berkeley in Conservation of Natural Resources, and her M.S and PhD degrees UC Berkeley in Entomology & Parasitology. After receiving her doctorate, Ann accepted a position at the Boyce Thompson Institute (BTI) at Cornell where she remained for 10 years, before becoming a Professor in the Department of Entomology at Cornell University.

Much of Ann's research has focused on biological control of insects associated with forests and trees. Her master's research was on the smaller European elm bark beetle *Scolytus multistriatus* and her doctoral research focused on aphids of urban birch trees. For both of these systems, the natural enemies of interest were parasitoids or predators and Ann only began working on entomopathogens after starting working at BTI. But that change in direction has influenced much of her career.

Ann is most often recognized for her long-term interest in understanding and documenting the impact of the fungal pathogen, *Entomophaga maimaiga*, on gypsy moth, which is a major invasive insect pest of northeastern North American forests. Not surprisingly, among her more than 170 peer reviewed publications and book chapters are dozens of contributions on gypsy moth and its natural enemies. . . . *(continued on next page)*

IOBC NRS Carabid Short Course Slated for June

Lead instructor Jonathan Lundgren has just announced that the International IOBC Nearctic Regional Section will offer the short course "Natural History and Taxonomy of the Carabidae" for a grand third time, 15-19 June 2012, at the Oak Lake Field Station, Brookings County, South Dakota (http://www.sdstate.edu/nrm/facilities/oaklake/index.cfm) . . . *(continued on page 8)*

Message From the President:
Tackling the Grand Challenges:[1] Biological Control and Food Security

Securing a sustainable food supply for the earth's expanding human population is one of the biggest challenges facing society today. A quick look at the numbers reveals the magnitude of the task. Sometime in the fall of 2011, the 7 billionth human joined us on earth. Within many of our lifetimes (2050), it is estimated the global population will rise by an additional 2 billon people. Humans already use nearly 40% of the earth's terrestrial land surface for crops or grazing, and yet one in seven people still remain undernourished. How to feed an expanding human population without further depleting the natural resources on which agriculture relies (soil, water, biodiversity) is one of the central questions of our time.

Fortunately, some other startling statistics point to solutions that biological control can directly influence. By some estimates, 40% of our current food supply is lost to pre- and post-harvest pests, with insects alone consuming enough food to feed an additional 1 billion people per year. In spite of such losses, insect biocontrol services to US agriculture alone are valued at nearly $4.5 billion annually. These facts suggest that to enhance food security we will need to invest in enhancing biological pest suppression. Indeed, a number of recent analyses have specifically called for increasing "agro-ecological" approaches to pest suppression in agriculture.

How do biocontrol scientists respond?

So how do biocontrol scientists respond? First, we need the very best minds to address this grand challenge. I hope many of you view food security as the overarching issue that you are addressing via your research, teaching, outreach and commercial efforts. Second, food security has many dimensions; from improving biocontrol in home gardens and smallholder farming, to addressing the needs of large–scale agriculture. We need new information and improved techniques for biocontrol of pests across all of these systems. Finally, we need to make our voices heard. Thinking of your work as contributing to global food security may provide a vehicle to reach new audiences and to enhance the impact of your biocontrol efforts.

Potato farmers in Kenya. Photo, Centro Internacional de la Papa (Lima)

Douglas A. Landis, landisd@msu.edu
Michigan State University, East Lansing

[1]In this year's Presidents Message I plan to explore the role of biological control in addressing some of the grand challenges in science including food security, invasive species, and land use change.

2011 Distinguished Scientist Award to Ann Hajek

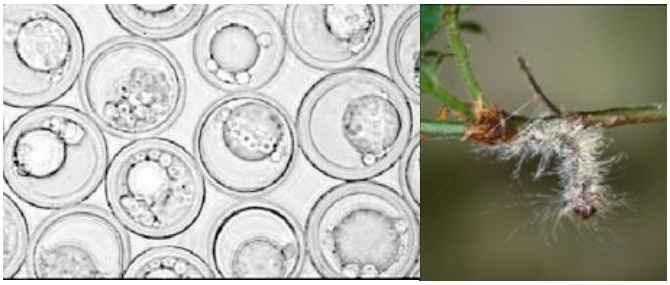
(*continued from front page*) . . . .

However, Ann's research is much broader than her work with gypsy moth. She has also worked on pathogens associated with Colorado potato beetle, and predators/parasitoids of soybean aphid, Asian longhorned beetles, and the invasive woodwasp *Sirex noctilio*. During her career, she has served as principal advisor for 11 post-dos, 8 PhD and 1 MS student as well as 20 graduate minor degree students. Her students have conducted important research on fungal pathogens of forest tent caterpillars, cassava green mite and many other pests. Much of this work has been supported by major grants she has received from multiple agencies within USDA (ARS, USFS, NIFA, APHIS), the National Science Foundation and private foundations.

In addition to working with entomology majors, for many years, Ann has taught a non-major's course on biological control at Cornell for which she wrote the textbook *Natural Enemies: An Introduction to Biological Control*.

Among her many honors, Ann is frequently invited to give national and international presentations. Most recently she has served as 2011-12 Velux Visiting Professor at the University of Copenhagen, Denmark.

Ann has been a Member-at-Large on the Executive Committee of the IOBC and an Associate Editor for *BioControl* for 10 years, and has also been active in the Society for Invertebrate Pathology and the Entomological Society of America.



Entomophaga maimaga resting spores, and a gypsy moth victim.

Julie A. Peterson Wins Robert J. O'Neil Outstanding PhD in Biological Control Award

The recipient of the IOBC-NRS Robert J. O'Neil Outstanding PhD Student Award for 2011 is Julie A. Peterson. Ms. Peterson received her BA in Zoology from Ohio Wesleyan University in 2007. Currently she is completing her PhD in Entomology at the University of Kentucky in the lab of Dr. James D. Harwood. Her thesis is entitled "Delineating the influence of genetically modified crops and non-prey food resources on generalist predator food webs." In May 2012, Julie will be joining the lab of Dr. George Heimpel at the University of Minnesota as a post-doctoral research scholar.

Julie's research focuses on the ecology of generalist predators, such as spiders (Araneae) and ground beetles (Coleoptera: Carabidae) in agricultural systems, with an emphasis on food-web interactions in transgenic crops. Her research objectives include: 1) Examining the potential for pollen consumption by linyphiid spiders, 2) Elucidating food webs and feeding biology of generalist predators in transgenic corn fields, and 3) Quantifying and tracking Bt endotoxin uptake in non-target arthropods. Julie's project uses a multi-faceted approach, utilizing antibody-based (ELISA) and DNA-based (PCR) techniques with field and laboratory studies, which provides a significant advance in understanding the movement of Bt-corn proteins in invertebrate food webs, aiding risk assessment of genetically modified organisms in the environment. Also, her research examines the potential for spiders to utilize corn pollen as a supplementary resource in their diets.

Julie has published four peer-reviewed articles, one book chapter, and received several major grants in support of her research, in addition to giving over 30 presentations at national and international meetings. She has been very active in service and outreach, serving as chair of the ESA's North Central Branch student affairs committee and President of the University of Kentucky's graduate student organization, as well as organizing five symposia at entomology meetings. Her engaging talk for the IOBC Symposium was entitled "Consumption of crop pollen by a generalist predator: nutrition and implications for biological control."

ARS Offers Early Retirements; Shutters 12 labs; Biological Control Projects Impacted

As a result of a reduction in budget of $38.6 million (total is now $1.0946 billion) for the USDA's Agricultural Research Service (ARS), specified in the President's FY 2012 budget and passed by Congress on November 18, early retirements effective end of December 2011 were taken by over 300 of approximately 8000 employees.

In addition, on January 10, the agency announced publicly that 12 labs at 10 locations would be shuttered, and those employees reassigned to other locations, moving to them by mid-June. ARS now has just under 100 locations.

Locations affected including Fairbanks, Alaska; Shafter, California; Lane, Oklahoma; Weslaco, Texas; Brooksville, Florida; Watkinsville, Georgia; Clemson, South Carolina; Beaver, West Virginia; and Coshocton, Ohio; in addition, the termite research program at New Orleans, Louisiana, is also being eliminated. 233 permanent employees are affected, along with additional temporary staff.

Several ongoing projects involving biological control, mostly in the "Crop Protection and Quarantine" National Program 304, will be discontinued. These include the following:

- Integrated pest management for high latitude agriculture (Fairbanks);
- Integrated management of cotton pests: plant genetics, biological control & novel pest estimation (Shafter);
- Organic and reduced input fresh market specialty crop production systems for the southern Great Plains (Lane);
- Biological control of invasive pests of orchard and vegetable crops in the subtropical South (Weslaco);
- Biological control strategies for invasive weeds of southwestern U.S. watersheds (Weslaco);
- IPM strategies for managing pests of subtropical row crops (Weslaco);
- Development of quarantine alternatives for subtropical fruit and vegetable pests (Weslaco);
- Integrated water, nutrient and pest management strategies for subtropical crops (Weslaco); and
- Termites: chemical and biological control for integrated pest management of invasive species (New Orleans).

A number of IOBC members were affected, and we wish them the best at their new locations.

4th INTERNATIONAL SYMPOSIUM ON BIOLOGICAL CONTROL OF ARTHROPODS

Pucón, Chile
4-8 March 2013

Where can I get updated information of the Symposium?

You can find more information about the symposium in the web site: www.isbca.org.

Please send your suggestions or any questions to the symposium secretariat at isbca2013@isbca.org

Members get Free Access to "Progress in Biological Control" Series from Springer

Springer, the publisher of our journal BioControl and the book series Progress in Biological Control has created a webpage for IOBC members: www.springer.com/IOBC. On this webpage you will find information about selected articles published in BioControl that you can download for free. Also, as a member of IOBC, you have free access to the Progress in Biological Control books.

In order to be able to get free access to the books, you will need to apply for a password (an IOBC Springer Token) with the Secretary-Treasurer of OUR regional section, Stefan Jaronski (<—click).

You must be a paid-up member to get this benefit!

Award Nominations, please!
See page 7 for details!

Your membership is crucial to our society!
If you have not renewed your membership for 2012, please take a moment to do so!
Cntrl-CLICK HERE, or contact Stefan Jaronski (bug@midrivers.com) with questions.

Biocontrol Musing: Parasitoid Soldiers

I don't usually like to make military analogies for biological control, but well . . . here I go. Philosophers since the times of St. Augustine have pondered what factors constitute a 'Just War', and these deliberations continue to this day of course. The main facets of the so-called Just War tradition have not changed much though over the last millennium or two. Some of the important criteria used to justify war within this framework are: (i) Last Resort (we should only take up arms when other methods such as diplomacy have been exhausted), (ii) Proportionate Cause (the potential good produced by the war should outweigh the pain and suffering), and (iii) Reasonable Prospect of Success (if goals are not achieved suffering will have been in vain). These criteria remind me of the goals that we strive for in classical biological control, namely that it should be Necessary, Safe and Effective. The parallels between going into battle and sending biological control agents into battle for us are pretty clear. Might it be that we have something to learn from this comparison? Both war and classical biological control have the potential to right horrible wrongs, but they also both carry very real risks. A conceptual framework is needed in both cases that leads to judicious use of the strategy in a way that maximizes benefits and minimizes risks.

Guthrie C. & Quinlan M. (2007) Just War - The Just War Tradition: Ethics in Modern Warfare. Walker Publishing Company, New York, NY, USA.

McEvoy P.B. & Coombs E.V. (2000) Why things bite back: unintended consequences of biological weed control. In: Nontarget Effects of Biological Control (eds. Follett PA & Duan JJ), pp. 167-194. Kluwer, Dordrecht, The Netherlands

George Heimpel
Department of Entomology
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RESEARCH BRIEFS

more research briefs on page 6 —>

Biological Control of Emerald Ash Borer in North America: Current Progress and Potential for Success

The emerald ash borer (EAB) (*Agrilus planipennis*), a buprestid native to northeast Asia, was first discovered in North America near Detroit in 2002. EAB has since spread to at least 15 U.S. States and two Canadian provinces, threatening the existence of native ash trees (*Fraxinus* spp.). A classical biocontrol program was initiated by the USDA Forest Service and APHIS immediately following the discovery of EAB, and led to introduction of three species of hymenopteran parasitoids in 2007: *Spathius agrili* (Braconidae), *Tetrastichus planipennisi* (Eupelmidae), and *Oobius agrili* (Encyrtidae). While the former two parasitoid species attack EAB larvae, the latter parasitizes EAB eggs.

Figure 1: An ovipositing female of *Spathius* sp. recently collected from the Russian Far East (Vladivostok) (Photographed by JJD, USDA ARS). Like its Chinese congener (*S. agrili*), this Russian *Spathius* is a gregarious ectoparasitoid attacking late-instar EAB larvae.

With the recent establishment of the USDA APHIS EAB biocontrol rearing facility in Brighton, Michigan in 2009, large numbers of introduced parasitoids have since been reared with field-collected EAB hosts and released in ash stands in 12 EAB-infested states. As of fall 2011, the results of field studies confirmed that at least one of these introduced Chinese parasitoids is successfully established in five states (Michigan, Maryland, Ohio, Illinois, and Indiana), although their combined impacts on EAB population growth or ash health are still unknown. We hope that populations of these exotic parasitoids will establish themselves in more EAB-infested areas, increase over time, and exert significant control of EAB populations within next few years in the U.S.

Figure 2 (above). An ovipositing female of *Atanycolus picipes* recently collected from the Russian Far East region (Vladivostok) (Photographed by JJD, USDA ARS). It is a solitary ectoparasitoid attacking 2nd- to 4th -instar EAB larvae.

Figure 3. An encyrtid egg parasitoid examining a freshly laid EAB egg. This egg parasitoid was recently collected from Vladivostok, Russia.

More recent foreign exploration conducted by the USDA researchers and collaborators in the Russian Far East (near Vladivostok) resulted in discovery of two additional Asiatic braconids attacking EAB larvae – *Spathius* sp. (Fig.1) and *Atanycolus picipes* Telenga (Fig.2), as well as one undescribed encyrtid egg parasitoid (Fig.3). These Russian parasitoids were imported to the USDA ARS/APHIS quarantine facilities and are being evaluated for host specificity and possible non-target effects. Climate-matching analyses suggested that parasitoids from the Russian Far East are more cold tolerant than those parasitoids from China, especially *S. agrili*, and these species will also be considered for introduction.

In addition to this classical biocontrol effort, extensive surveys of indigenous natural enemies were conducted in the U.S. Currently several indigenous hymenopteran parasitoids are known to attack larvae of EAB in Michigan, Pennsylvania, Ohio, and Maryland. The role of these indigenous parasitoids in suppressing EAB population growth and spread in North America is not clear and the observed parasitism is generally low. However, one group of North American native braconids (*Atanycolus* spp. – Fig. 4) in Michigan were found to inflict high (>50%) parasitism in some forest stands. Extensive field investigations into the potential roles of the introduced and indigenous natural enemies in suppressing EAB population growth and spread are ongoing in both the epicenter of the EAB infestation (Michigan) and in newly infested areas (Maryland and New York). The introduction and establishment of parasitoids from EAB's native range — China and Russia — will likely continue to be a critical component of EAB management strategies in North America.

———

Jian J. Duan, USDA ARS Beneficial Insects Introduction Research Unit, Newark, DE (correspondence: jian.duan@ars.usda.gov)
Leah S. Bauer, USDA Forest Service, Northern Research Station, East Lansing, MI
Juli R. Gould, USDA APHIS-PPQ, Center for Plant Health and Technology, Buzzards Bay, MA
Jonathan P. Lelito, USDA APHIS-PPQ, Emerald Ash Borer Biological Control Lab, Brighton, MI

Figure. 4. An ovipositing female of native *Atanycolus cappaerti,* recently discovered in Michigan (Photographed by JJD, USDA ARS). This species along with several other congeners have become the most abundant parasitoids attacking emerald ash larvae in many forested areas in Michigan.

RESEARCH BRIEFS

Moscamed Biological Control Laboratory in Guatemala supports multiple biocontrol projects

The Moscamed Biological Control Laboratory in San Miguel Petapa, Guatemala, is part of the joint USDA-APHIS-PPQ, Mexico, and Guatemala effort to create a barrier to Mediterranean fruit fly (Medfly) movement from Central America into Mexico and the US. The Fruit Fly Mass Rearing Facility is a world class center for Mexican fruit fly and Medfly Sterile Insect Technique (SIT). Also, parasitoids are mass produced on these fruit flies pests, and used for augmentative control in Guatemala and Mexico.

Since olive fruit fly was accidentally introduced into California, the laboratory has been supplying the braconid *Psyttalia humilis* (which parasitizes Medfly and olive fly) to the USDA-ARS San Joaquin Valley Agricultural Sciences Center (SJVASC) in Parlier, California, for olive fly biological control projects supported by the California Olive Committee.

Other parasitoids, all braconids, are mass-reared in San Miguel Petapa, including medfly parasitoid *Fopius ceratitivorus,* or maintained in culture such as *Psyttalia cosyrae* and *Diachasmimorpha longicaudata* (the former a parasite of Medfly, the latter of many Tephritidae). California and Texas have benefited greatly from the SIT rearing and parasitoid production programs in San Miguel Petapa. The laboratory has trained workers throughout the world and collaborates with diverse international scientists.

New parasitoid production methods such as host sterilization to prevent introductions of fertile fruit flies with parasitoid releases, have been developed in collaboration with colleagues at the ARS SJVASC and University of California. New parasitoid rearing, quality control, packaging, and shipping methods have been evaluated and implemented through these efforts.

The biological control quarantine facility has served as a repository for biological control agents discovered in foreign exploration and is a valuable resource for biological control specialists. The San Miguel Petapa facility works in tandem with the famous El Pino Medfly production facility which supplies the Southern California Medfly Preventative Release Program with sterile Medfly pupae.

Above, Left: Trays of larval diet for fruit fly rearing. ***Center***: Egg parasitoid, *F. ceratitivorus* emergence cage. Apples with Medfly eggs are exposed to parasitoids, sectioned and placed over larval diet until pupation. Parasitized pupae are collected and held for parasitoid emergence. ***Upper right***: Emergence cages for the larval parasitoid *P. humilis*. Parasitized Medfly pupae are placed in trays inside these mesh cylinders. Parasitoids that emerge are provided with honey and water and collected for shipment to California. ***Lower right:*** Perforated ovipositional globes tested as fruit mimics for Medfly egg laying and parasitism by *F. ceratitivorus*.

Below, Left: Entrance to the Fruit Fly Mass Rearing Facility, and BC Quarantine facility plaque. ***Right***: Alicia Aldana (left), Pedro Rendon (Station Leader), and Carlos Cáceres (Facility Director) USDA-APHIS-PPQ-CPHST, San Miguel Petapa, Guatemala, and Victoria Yokoyama, Research Entomologist, USDA-ARS-SJVASC Parlier, CA.

For additional info contact:
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(pedro.rendon@aphis.usda.gov),
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Victoria Y. Yokoyama,
USDA, ARS, SJVASC, Parlier, CA

Call For Nominations for IOBC-NRS Awards!

IOBC-NRS Distinguished Scientist Award

The IOBC-NRS solicits nominations for its 2012 Distinguished Scientist Award. Nominees must have spent most of their career in the Nearctic Region, and have made significant contributions to biological control., but need not be members of IOBC.

Nomination narratives are restricted to one page in length and should contain a thorough but concise summary of the principal contributions of the nominee. The nominator should include the names and current contact information of both nominator and nominee on a separate page. A copy of the nominee's CV (no page limit) should also be included that provides the nominee's professional record (employment affiliations), list of prior awards, description of biological control related activities, publications lists, and extramural grant record.

The recognition of those scientists who have made outstanding contributions to the science and implementation of biological control over the course of their careers is an important function of IOBC. Many members have expressed their enjoyment seeing colleagues honored with our Distinguished Scientist Award. Help us honor our deserving colleagues!

Please send nominations or questions electronically by June 15, 2012 to IOBC NRS President, Doug Landis, LandisD@msu.edu

IOBC Graduate Student Awards

The IOBC-NRS sponsors two Graduate Student Awards — The Robert O'Neil Award for Outstanding PhD Student in Biological Control, and a Master's-level award — to be awarded to students whose contributions are likely to shape the future of biological control. The recipients will be recognized at the IOBC-NRS Symposium held at the ESA Annual Meeting in November 2012, Knoxville, Tennessee. Winners will receive cash awards ($300 for PhD, $200 for Master's), and the PhD winner will also give a research presentation during the IOBC Symposium and Meeting.

Eligibility: All students enrolled in a graduate program in Bermuda, Canada, or the U.S., and who are members of the IOBC at the time of the application deadline are eligible.

Application guidelines: Students should send as a single PDF file: a letter that details the significance of their research and its relevance to biological control; a CV that includes contact information; and two letters of recommendation. See IOBC NRS website for information on previous winners and specific criteria for assessment of nominations.

Application materials and questions should be sent electronically to Jonathan Lundgren, Jonathan.Lundgren@ars.usda.gov .

Application deadline is June 30, 2012.

NEW Early Career Outstanding Scientist Award

Your Executive Board has inaugurated a NEW IOBC NRS award, and YOU know someone who should be nominated for the Early Career Outstanding Scientist Award. In 2012, IOBC NRS will accept nominations for a new Early Career Outstanding Scientist Award. Nominees should be no more than 10 years post PhD and have made significant contributions to the field of biological control through research, teaching, and/or extension/outreach. Nominees must have spent most of their career in the Nearctic Region and be a current IOBC member.

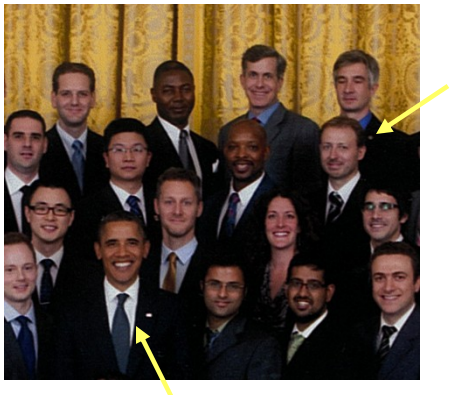
NEW

Nomination narratives are restricted to one page in length and should contain a thorough but concise summary of the principal contributions of the nominee. The nominator should include the names and current contact information of both nominator and nominee on a separate page. A copy of the nominee's CV, which provides the nominee's professional record (i.e., employment affiliations), list of prior awards, description of biological control related activities (in paragraph form), publications list, and extramural grant record, (no page limit) should also be included.

Please **submit nominations or ask questions electronically by 15 June: IOBC NRS President, Doug Landis, LandisD@msu.edu**

TALK ABOUT AWARDS!

Spot the President, and the future President (of IOBC NRS, that is!). Jonathan Lundgren, our very own President-Elect, was the recipient in late 2011 of the USDA Early Career Scientist of the Year Award, and, with other federal & university researchers nominated by their respective agencies, was honored at the Smithsonian National Museum of Natural History, at which your Corresponding Secretary attended, and afterwards at the WHITE HOUSE, where these photos were taken!



International Organization for Biological Control Nearctic Regional Section
Organisation Internationale de Lutte Biologique Section de la Region Néarctique

ALWAYS Visit our website: www.iobcnrs.com

The International Organization for Biological Control—Nearctic Regional Section Newsletter is published 3 times a year to provide information and to further communication among members of the Region (Bermuda, Canada, & the United States).

Send items for the IOBC-NRS Newsletter to:
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Invasive Insect Biocontrol & Behavior Laboratory
USDA-ARS, BARC-West Building 011A
Beltsville, MD 20705 USA
E-mail: Don.Weber@ars.usda.gov

Featured Event June 15-19, 2012

Natural History and Taxonomy of the Carabidae
IOBC NRS Short Course

... continued from page 1

The team of instructors is:

- ◊ Jonathan Lundgren, USDA-ARS, Brookings South Dakota
- ◊ Kamal Gandhi, Warnell School of Forestry, University of Georgia, Athens
- ◊ Foster Purrington, Ohio State University, Ohio
- ◊ Kip Will, Essig Museum of Entomology, Berkeley, California

Carabids are an abundant and diverse group of organisms that have much to teach us regarding the biology and ecology of insects and biological control. The course will explore beginning carabid taxonomy (to the genus level for many common groups), collection methods, carabid structure and function as it pertains to feeding ecology, carabid defenses, communication systems, and carabid invasion biology. The course is unit-based and very hands-on, with each topic being overseen by a national expert.

Tentative cost per student is $415 (incl. food & modest lodging) Class space is limited. Please contact Jonathan Lundgren (jonathan.lundgren@ars.usda.gov) ASAP but no later than May 1, 2012 if you are interested!

Upcoming Meetings

2012

27-29 March **The 7th International IPM Symposium** in Memphis, Tennessee. Email margaret.appleby@ontario.ca http://www.ipmcenters.org/ipmsymposium12/

10 May National Academies of Science National Summit on **Strategies to Manage Herbicide-Resistant Weeds**, Washington, DC Register at http://nas-sites.org/hr-weeds-summit/sample-page/summit/

15-19 June **Natural History and Taxonomy of the Carabidae IOBC NRS Short Course**, Brookings SD. Email Jonathan.Lundgren@ars.usda.gov by May 1.

4-8 August **American Phytopathological Society** Annual Meeting, Providence, Rhode Island. Email BFord@scisoc.org 651-454-3848 http://www.apsnet.org

19-25 August **The 24th International Congress of Entomology** in Daegu, South Korea. Email president@int-cong-ent.org. http://ice2012.org.

04-07 November **Entomological Societies of Canada and Alberta,** Joint Meeting, Edmonton, Alberta, Canada. Contact see: http://www.esc-sec.ca/annmeet.html

11-14 November **Entomology 2012, the 60th Annual Meeting of the Entomological Society of America,** Knoxville, Tennessee. Email Meet@entsoc.org. http://www.entsoc.org

2013

4-7 February **Weed Science Society of America Annual Meeting** (joint with NE WSSA) Baltimore, Maryland Email KCounter@allenpress.com http://www.wssa.net.

4-8 March **4th International Symposium on Biological Control of Arthropods** in Pucón, Chile, March 4-8, 2013. Contact Tania Zaviezo at tzaviezo@uc.cl www.isbca.org

10-14 August **American Phytopathological Society** Annual Meeting, Austin, Texas. BFord@scisoc.org http://www.apsnet.org

18-24 October **150th Entomological Society of Ontario** Annual Meeting, jointly with the Entomological Society Of Canada, Guelph, Ontario Info: Nicole.McKenzie@hc-sc.ca http://www.entsocont.ca

17-20 November **Entomology 2013, the 61st Annual Meeting of the Entomological Society of America,** Austin, Texas. Email Meet@entsoc.org http://www.entsoc.org