

National Workshop on
The Future of Education in Plant Pathology and Related Disciplines
19-20 March 2009, Washington, DC

Opportunities in Education in Entomology Departments

Ernest S. Delfosse
Vice-President-Elect
Entomological Society of America

Professor and Chairperson
Department of Entomology
Michigan State University
East Lansing, Michigan

www.entsoc.org



Entomological Society of America
Celebrate Entomology: Colleagues, Science, and Ideas

Workshop Goals

- 30 Identify key educational challenges; and
- 30 Develop strategies for working together to address those challenges.



Agenda

- 30 **Role of the Council of Entomology Department Administrators (CEDA; 74 groups);**
- 30 **CEDA Initiatives in Insect Science;**
- 30 **Current *Topics in Insect Science*, including Entomology & Science Education;**
- 30 **Key education challenges for Entomology Departments;**
- 30 **Many opportunities in entomological education; and**
- 30 **Strategies for collaboration with other scientific disciplines to ensure availability of strong science-based educational opportunities.**



Council of Entomology Department Administrators (CEDA)

[Home](#) [Officers](#) [Membership](#) [Initiatives](#) [Priorities](#) [Meeting Minutes](#) [Contact](#)

The Council of Entomology Department Administrators (CEDA) was established to promote the science of entomology in the United States and Canada. Membership in CEDA is automatic for all academic entomology administrators.

The administrators and entomology national program leaders within the various units of the Cooperative State Research, Education, and Extension Service (CSREES) along with the Executive Director of the Entomological Society of America are ex officio members of CEDA.

CEDA members meet once a year during the annual meeting of the [Entomological Society of America](#). In addition, CEDA members whose institutions are constituents of regional associations of experiment stations meet annually in regional settings. Such meetings allow the opportunity to discuss issues of mutual interest and to promote the science of entomology.

CEDA is a member of [Co-FARM](#), an organization whose role is to promote agricultural research mission. CEDA developed a one-page response to the call from CSREES for [priorities](#). Also, CEDA has developed white papers on [initiatives in insect science](#).

Department of Entomology
North Carolina State University
Box 7613
Raleigh, NC 27695-7613
Tel: 919-515-2746
Fax: 919-515-7746

Department of Entomology
Purdue University
901 W. State St
West Lafayette, IN 47907
Tel: 765-494-4554
Fax: 765-494-0535

www.entsoc.org



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CEDA Initiatives in Insect Science

- ☞ **CEDA met in 2003 to discuss important initiatives in insect science for the next five years.**
- ☞ **Consensus reached around four general priority areas:**
 - **Protecting U.S. security;**
 - **Human, plant and animal health;**
 - **Economy; and**
 - **Enhancing science literacy in the general population.**
- ☞ **Priority areas should be linked to consideration by entomologists, policy-makers, and funding agencies.**
- ☞ **All of these areas offer opportunities to continue education in traditional areas, and to develop new areas of focus.**

CEDA Initiatives in Insect Science

- 30 **Homeland security;**
 - 30 **Safe and Sustainable food supply;**
 - 30 **Human and animal health;**
 - 30 **Environmental stewardship;**
 - 30 **Invasive species;**
 - 30 **Genomics:**
 - o **Sequencing of high priority insect models;**
 - o **Bioinformatics;**
 - o **Systems biology; and**
 - o **Genomic improvements.**
 - 30 **Biobased products:**
 - o **Bio-prospecting; and**
 - o **Bio-processing**
- 30 **Science literacy.**

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CEDA Current Topics

 Once the CEDA Initiatives were defined, four “Current Topics in Insect Science” were developed:

- ◉ **Entomology & Science Education;**
- ◉ **Human & Animal Health;**
- ◉ **Safe & Sustainable Food; and**
- ◉ **Environmental Stewardship.**

CEDA Current Topics in Insect Science:

Entomology & Science Education

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Current Topics in Insect Science

Entomology & Science Education

By the time they reach high school, American students in grades K-12 perform below average in both science and mathematics compared with students in other developed nations. Today's high school graduate knows less science than did his or her counterparts 30 years ago. Levels of achievement in some ethnic minorities are even more disturbing. For example, only 3% of African-American students achieve at or above proficiency, compared with an already unacceptably low 23% of white students.



Students on a field trip at the Illinois Natural History Survey

Many teachers are uncomfortable teaching science because of the inadequacy of their own science literacy. The result is a populace that is poorly prepared to understand and participate in the increasingly science- and technology-based society we live in. This hurts the United States because our prosperity, security, and health depend on the educational achievements of the general population, not just those in science and engineering. Science continues to fall out of favor with the public, and this creates a potential disaster for our science-based needs and enterprises.

Challenges

Teachers and scientists have the responsibility of educating and training the next generation of both scientists as well as the general public. Science education must begin in early childhood, and be sustained and supported throughout life. The 2000 National Assessment of Educational Progress report on science assessment identified the following science education challenges: clear learning goals; well designed local curricula; curricula and assessments aligned with learning goals; teacher training; and a commitment to long-term



Elementary students piece together a butterfly life cycle puzzle



Science educators participate in a teacher training seminar

reform. To amplify several of these challenges, the U. S. Department of Education's Office of Educational Research and Improvement indicates that educators must generate better and different instructional materials, and the entire education system must undergo significant transformation, including a better definition of learning outcomes and how they are assessed.

Opportunities

Entomology must continue to be a leader in science education and outreach to enhance science literacy. Entomology outreach programs provide an opportunity to educate the public on: 1) the wonder of insects and their relatives; 2) the impacts of insects on our health and economic prosperity; and 3) the contribution of insects to scientific knowledge in fields beyond entomology. Insects are an ideal medium for demonstrating many life science principles: they are easy to work with and readily captivate the public's attention. Entomologists working with science educators need to exploit these attributes and develop science education and outreach programs for youth in K-16 and 4-H, science teachers, and the general public. Programs can be delivered directly through on-campus and distributed-learning school programs and scheduled public events, as well as indirectly through teachers and other educators interested in insect science outreach. Informal science education and outreach is an emerging area drawing new students with an interest in developing and delivering science education to a variety of audiences to traditional graduate programs. Networks of science teachers interested in insects can provide the topics and "laboratories"



Middle school students identify insects in the field

Entomology & Science Education

Issue 1: *Context*

- 30 K-12 students perform below-average in science and mathematics;
- 30 Backsliding of science-literacy of high school graduates compared to counterparts 30-years ago;
- 30 **Minority involvement in science must be increased;**
- 30 Many teachers are uncomfortable teaching science because of their own lack of science literacy;
- 30 Results in a populace poorly prepared to understand and participate in our science- and technology-based society;
- 30 Science continues to fall out-of-favor with the general population; and
- 30 Ultimately prosperity, security and health are affected.

Entomology & Science Education

Issue 2: *Challenges Across Disciplines*

- 30 How do teachers and scientists meet their responsibility of educating and training the next generation of scientists and the general public?
- 30 How can the system be changed so that science education begins in early childhood?
- 30 How can science education be sustained and supported throughout life?
- 30 Teaching at universities must be valued, new faculty members should have a teaching component in their appointment, and teaching should count significantly in reappointment, promotion and tenure.

Entomology & Science Education

Issue 2: *Challenges* identified in the 2000 *National Assessment of Educational Progress*:

- 30 Clear learning goals;**
- 30 Well-designed local curricula;**
- 30 Curricula and assignments aligned with learning goals;**
- 30 Teacher training; and**
- 30 Commitment to long-term reform.**



Entomology & Science Education

Issue 2: *Challenges* identified by the U.S. Department of Education's Office of Educational Research and Improvement:

30 Educators must generate better and different instructional materials;

30 The entire education system must undergo significant transformation; and

30 This must include a better definition of learning outcomes and how they are assessed.

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Key Challenges: 2008 CEDA

- 30 Convincing university administrations that what we do is necessary, significant, and important.
- 30 Defining what it means to be an entomology program (not necessarily an entomology department, since many are not stand-alone any longer).
- 30 The upper-administrative push to hire faculty working below the organismal level has had tremendous negative impacts on entomology's traditional Land Grant mission (not just an entomology issue), and entomological work in biodiversity.
- 30 Student recruiting at the graduate level is becoming difficult as there are fewer faculty working in the areas of pest management and biodiversity.
- 30 The latter is where almost 90% of our graduate student applicants would like to work.

Key Challenges: Research

- 30 **Balancing opportunities in basic science with Land Grant Mission responsibilities;**
- 30 **Training students for careers in industry and government;**
- 30 **Hiring faculty with expertise to participate in interdisciplinary/big science initiatives (e.g., bioenergy, human nutrition, environmental sustainability); and**
- 30 **Attracting scientists who can apply and teach modern molecular biology to address pressing practical issues (translational research).**

Key Challenges: Extension

- 30 Expand capabilities in non-production areas (e.g., urban environments, natural resource management, conservation);
- 30 Develop institutional expertise in impact assessment, distance education, and online information delivery;
- 30 Increase commitment to science education; and
- 30 Encourage Spanish language capabilities.

Key Challenges: Teaching

- 30 Recruit students at every level into the discipline;
- 30 Support a flexible curriculum that addresses evolving student needs;
- 30 Provide opportunities in undergraduate research, inquiry & experiential learning;
- 30 Include problem-solving, teamwork & people skills as part of our training;
- 30 Encourage students to become part of a common undergraduate life science and environmental science curriculum;
- 30 Develop modern regulatory science courses/curriculum; and
- 30 Increase commitment to online and distance education.

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Key Opportunities: 2008 CEDA

- 30 Biodiversity research (including invasive species & impacts of climate change);
- 30 Redefine thresholds in relation to shifting pest complexes that occur with genetically modified crops (e.g., cotton insects and Roundup-resistant weeds);
- 30 **Develop pest management plans for small acre, high value, locally grown, niche market crops (including organic production);**
- 30 Include medical, veterinary & forensic entomology;
- 30 Emphasize urban pest management (from bedbugs to urban farms); and
- 30 Develop management strategies based on incorporating biotech and molecular findings.

Entomology & Science Education

Issue 3: *Opportunities* -- Enter the World of Social Media:

- 30 25% increase in visitors on social networking sites from June 2007 to June 2008;
- 30 FaceBook-- >250 million active users (153% increase in unique visitors from June 2007 to June 2008);
- 30 My Space--253 million active users;
- 30 LinkedIn--34 million members;
- 30 YouTube-- increasing in use; and
- 30 Twitter- >6 million users.
- 30 ESA has a FaceBook page, is developing YouTube and Blogger material, and is moving to the Socius software platform.

Entomology & Science Education

Issue 3: *Opportunities*- **Few neutral views of critters!**

 **Insects are the ideal medium to demonstrate many life science principles:**

- 1.Many are easy to work with;**
- 2.Incredible diversity of size, color, behavior, ecology, physiology, etc.;**
- 3.Fascination with insects easily attracts and captivates the public's attention; and**
- 4.Offers tremendous opportunities to work with K-12, 4-H, science teachers, and other groups to inspire geeks for life!**

Entomology & Science Education

Issue 3: *Opportunities in Delivery of Information*

- 30 On-campus instruction;
- 30 Distributed- and long-distance learning;
- 30 Public events;
- 30 Field days; and
- 30 Informal science education and outreach through social networks.

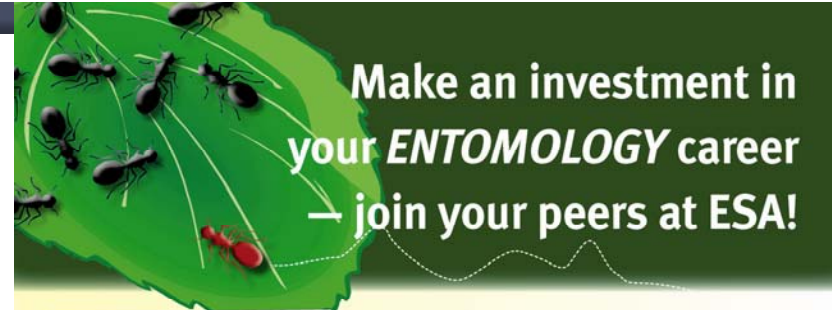
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Strategies for Collaboration

- 30 Meetings like this one are important;
- 30 Share successful outcomes;
- 30 Identify areas of mutual need or common understanding between disciplines;
- 30 Develop frontier techniques, particularly where there are areas of mutual need or understanding;
- 30 Develop the scholarship of teaching and learning;
- 30 Take advantage of the expanding world of social media to reach students; and
- 30 Enlist students to involve students.

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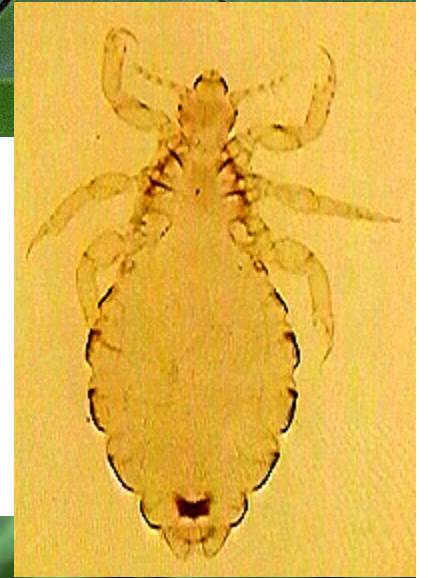
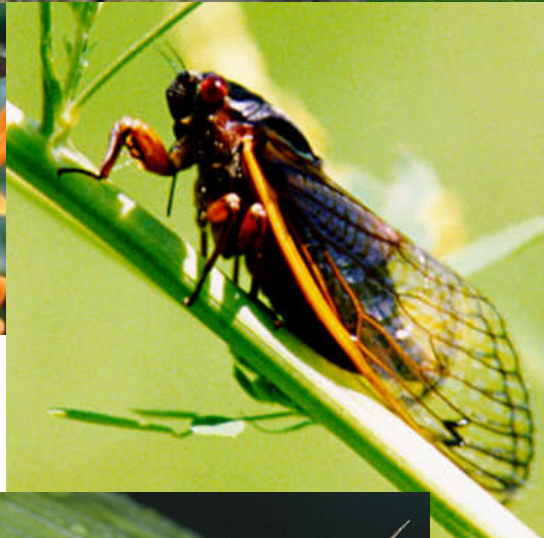
10001 Dereewood Lane, Suite 100 | Lanham, MD 20706-4876

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Questions?



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