



Center for Arthropod Management Technologies

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camtech.ent.iastate.edu

Webinar – July 25, 2018

National Science Foundation

Industry / University Cooperative Research Center



UF | UNIVERSITY of
FLORIDA

UK
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KENTUCKY®





Established in 2013 with Iowa State University as lead site
Now in Phase II with University of Florida as lead site

Goals to address

- significant losses resulting from arthropod and nematode pests in agriculture
- the dramatic rise in public health pests and morbidity and mortality resulting from arthropod vectored disease



The Challenge

Global pesticide market

\$81 billion: Expected pesticide market by 2021

\$54 billion: Expected biopesticide market by 2022

Overall

20%: estimated loss of major crops to herbivorous arthropods

>\$100 billion: cost of arthropod related post-harvest losses

E.g.

\$1.5 billion: soybean cyst nematode damage in the U.S. p.a.

\$30 billion: cost of termite damage and management p.a.



The Challenge

Pest status changes with :

- climate
- alterations in agricultural practices
- introduction of new pest species
- development of resistance to existing pest management strategies





Center Vision

To leverage the efforts of industry, government and academia toward effective management of arthropod and nematode pests through

RESEARCH

1. Pre-competitive research prioritized by center members
2. Optimizing and extending the versatility of current technologies

TRAINING

3. Training of personnel for future employment within industry



University Sites

Both Land Grant Universities and Research I Institutions



Entomology & Nematology

- Top ranked
- 75 faculty members, 120 graduate and 40 undergraduate students
- Largest academic plant nematology program, only plant nematology graduate program in U.S.



Entomology

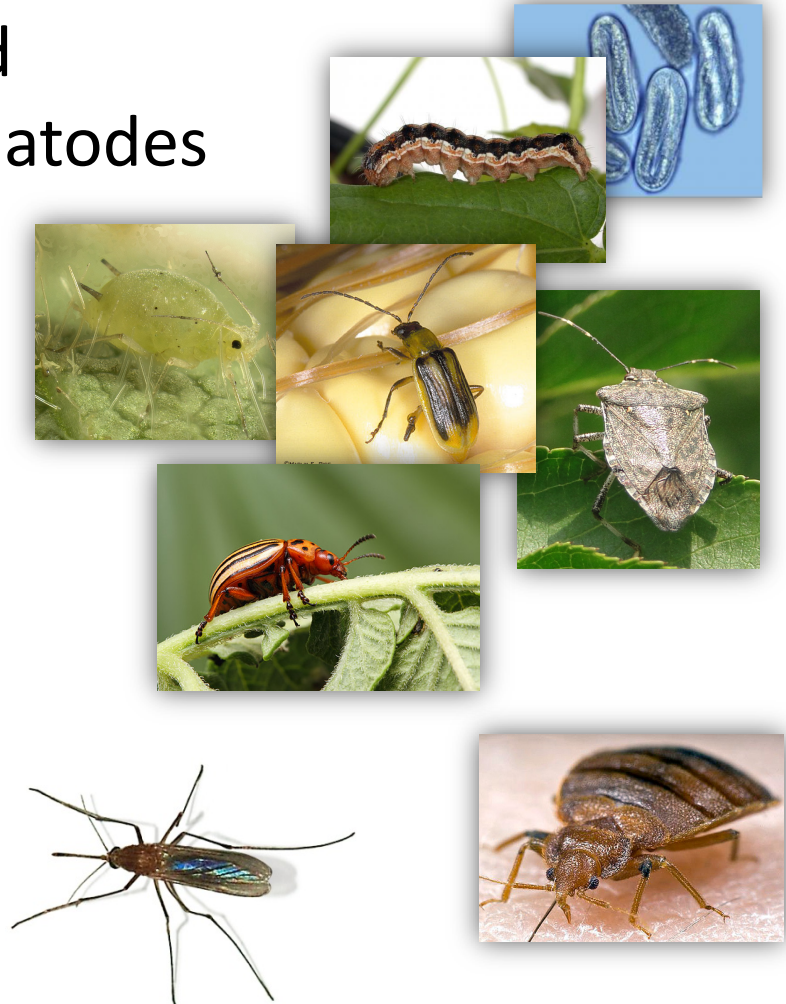
- 18 faculty members, 40 graduate students, 40 other staff
- Agricultural Biotechnology program



Thrust Areas

- Public health, urban, forest and agricultural pests, including nematodes
- Beneficial insects

1. Resistance management
2. Genomics
3. Physiology
4. Integrated pest management
5. Tools and methods



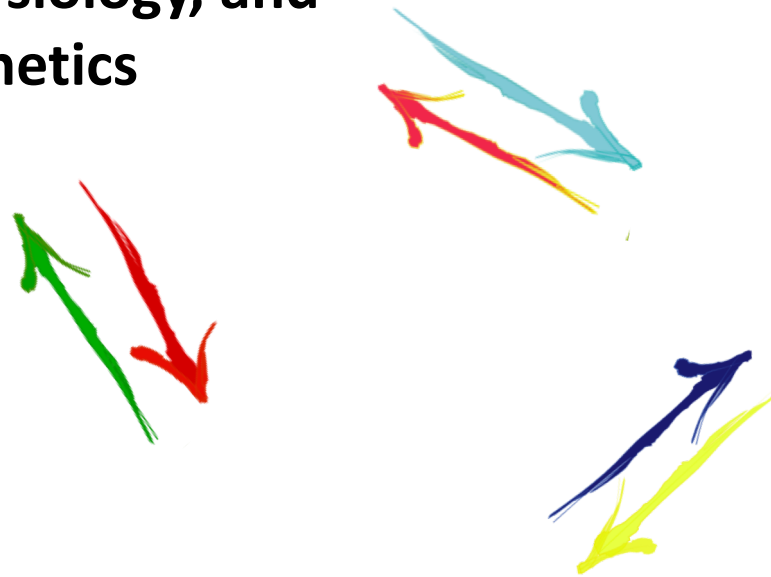


Integration of Approaches

**Molecular Biology,
Physiology, and
Genetics**

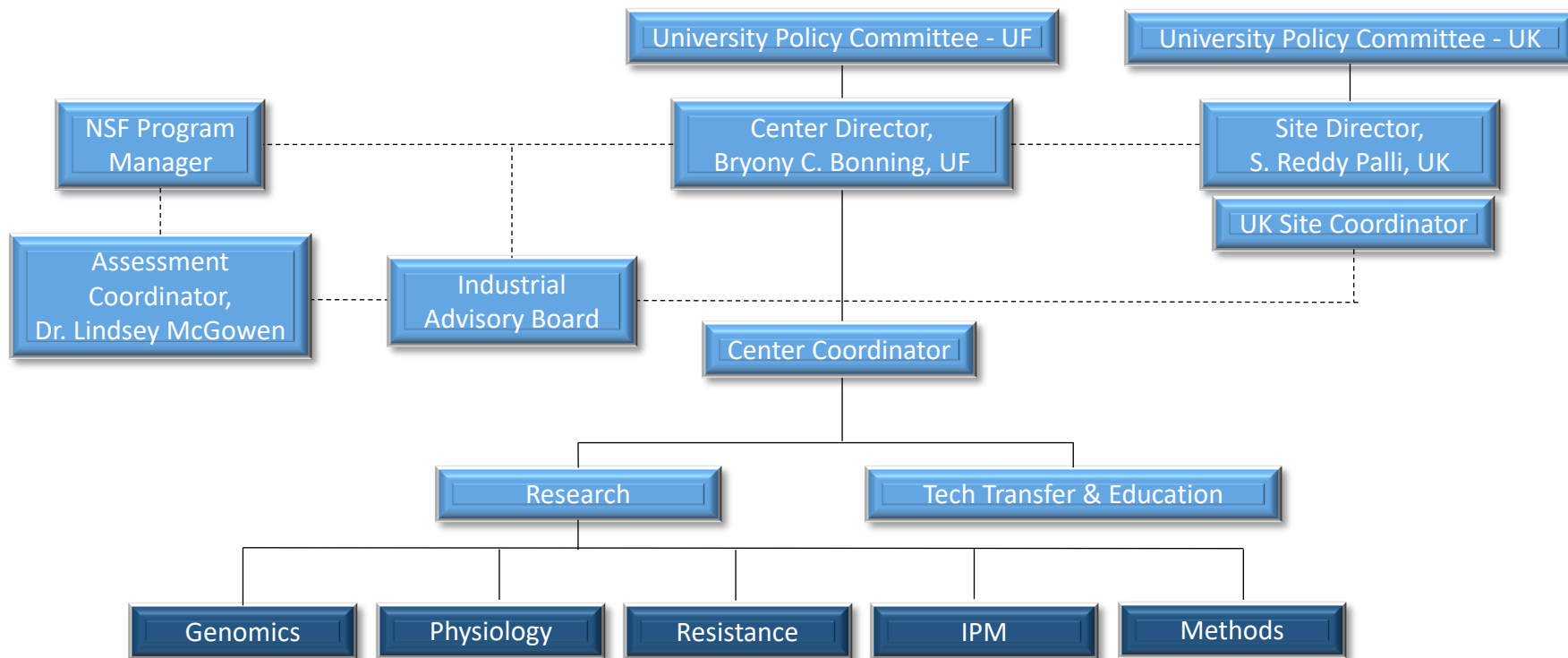
**Behavior, Ecology,
Evolution, and
Systematics**

**Pest Management
and Applied Ecology**





Center Organization



All memberships go to UF



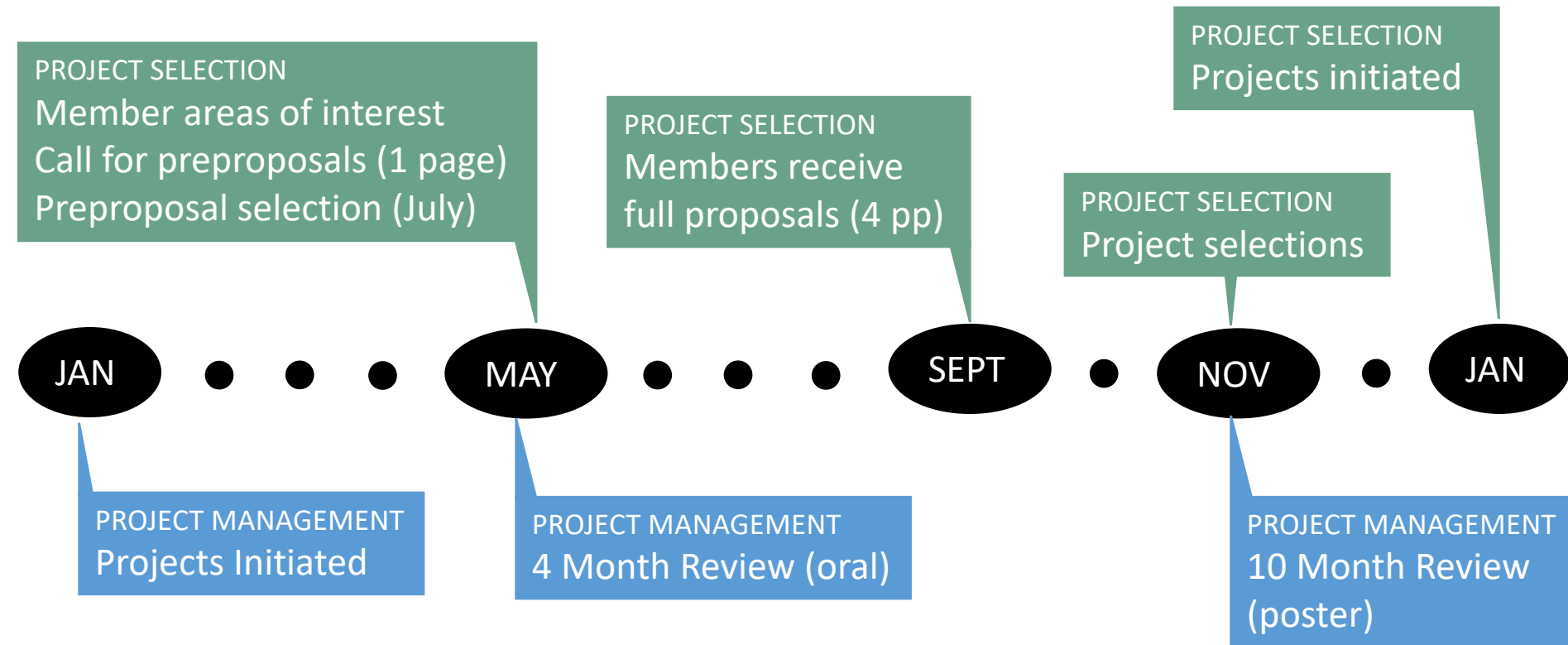
CAMTech members

Current 11 CAMTech members include:





CAMTech project selection and management



Quarterly comprehensive research updates
Quarterly mentor meetings for each project



CAMTech members

CAMTech is a dynamic and cohesive center

Member loyalty has been exceptional:

- CAMTech has never lost a member
- All members have been represented at all IAB meetings



Benefits of Membership

- Leveraged investment in strategic research for competitive advantage:

Current member \$ leverage 20:1

Membership: \$55,000 p.a. for industry

\$30,000 for non-government, non-profit agencies



Benefits of Membership

- Leveraged investment in strategic research for competitive advantage
- First rights to developments:
Tools / methods / publications / datasets / research leads
- Access to all project information
Project selection, quarterly reports, mentoring
- Access to large interdisciplinary research team
- Networking with peers
- Pipeline to outstanding, well trained future employees



Benefits of Membership

To date, 21 projects funded

- 5 to 15 running per year
- Interdisciplinary (incl. plant pathology, microbiology, engineering)

Trainee pipeline

- >30% of center alumni now work within industry

Deliverables have included

Datasets

- Soybean cyst nematode genomic data
- Multiple stink bug transcriptomic and proteomic datasets

Tools

- New cell lines derived from key insect pests
- Novel nematode visualization tool



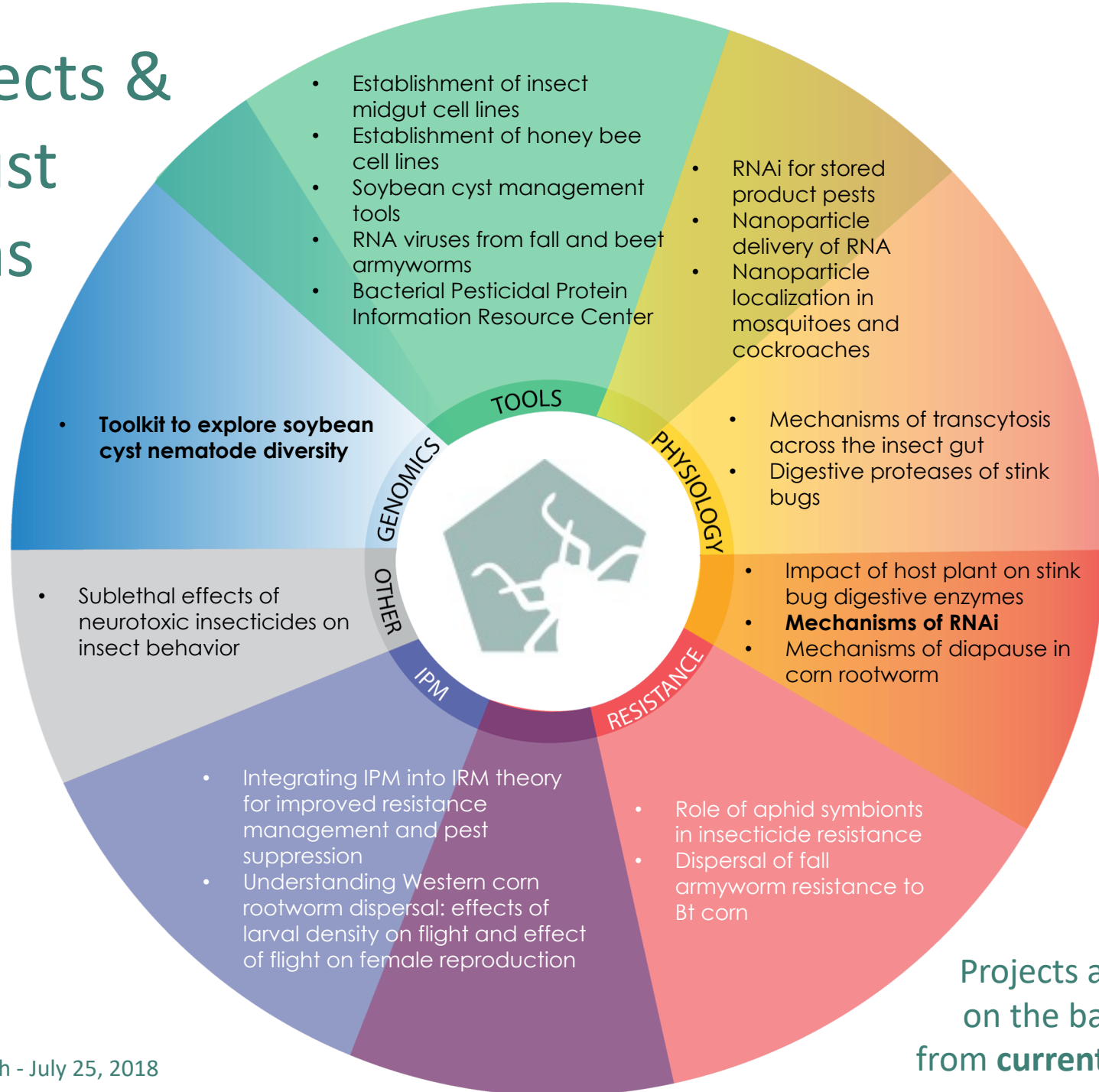
Intellectual Property

All research conducted within the center is precompetitive:
Members actively steer proposals away from IP.

In the event that a patentable discovery is made:

- University and members decide whether to pursue patent
- If pursued, the IP is shared among members, royalty free
- If one company wishes to be the sole funder of a particular project, spin-off projects with exclusive licensing agreements can be established.

Projects & Thrust Areas



Projects are selected on the basis of input from **current members**.



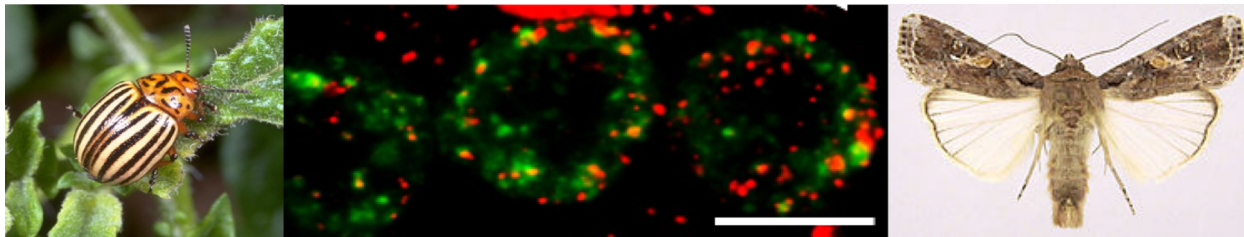
Mechanisms of RNAi

RNAi works well in Coleoptera, but not in other insects (e.g. Lepidoptera)

- primary reason for difference is inefficient escape of dsRNA from endosomes
- NOT from limited dsRNA uptake.

Member benefits:

- Methods to study differential efficiency of RNAi among insects.
- Information on mechanisms that govern differential RNAi efficiency with potential use for improving RNAi efficiency in Lepidoptera.
- The identity and expression of dsRNases involved in degradation of dsRNA and proteins involved in transport and processing of dsRNA.



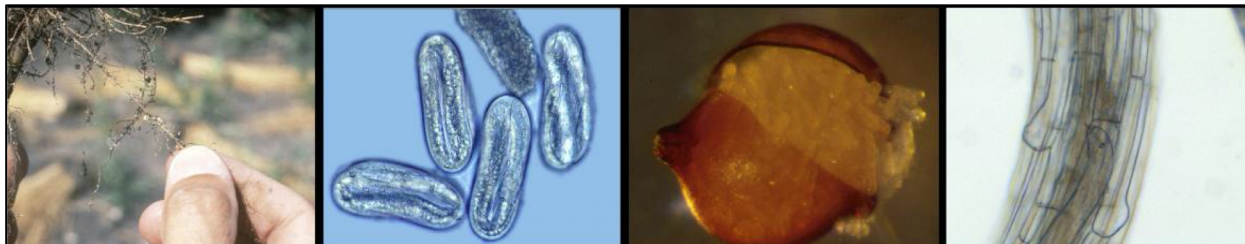


Soybean cyst nematode genomic toolkit

Soybean cyst nematodes (SCN) are among the most damaging plant parasites worldwide. PacBio sequencing allowed for significant improvement in the quality of genome assembly.

Member Benefits

- Improved understanding of the SCN genome, gene models and genetic diversity to better inform management of this devastating pest.
- New methods to overcome genomic heterozygosity during genome assembly.
- Access to the most complete genome assembly ever generated for a cyst nematode.
- Access to full-length transcriptomic data from a virulent and non-virulent population.
- Genetic diversity in HG typed SCN populations for development of a PCR-based marker test.





CAMTech meetings

Fall meeting:

Vancouver, Canada November 9-11, 2018

- prior to the Entomological Society of America meeting

There is opportunity for prospective members to attend

- If interested, please email camtech@ifas.ufl.edu
- A signed NDA is required

2019 meetings:

May 15-17, Gainesville, FL

Nov 15-17, St Louis, MO





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- includes all CAMTech-related documents



CAMTech

The Industry Advisory Board Perspective

John Dorsch, Global Insecticide Research, BASF

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About BASF

At BASF, we create chemistry for a sustainable future

- combine economic success with environmental protection and social responsibility
- global presence with approximately 114,000 employees in the BASF Group
- Portfolio has five segments:

Chemicals

Performance Products

Functional Materials & Solutions

Agricultural Solutions

Oil & Gas.

- BASF generated sales of about €58 billion in 2016.



About BASF

Crop Protection Division

With a rapidly growing population, the world is increasingly dependent on our ability to develop and maintain sustainable agriculture and healthy environments.

- work with farmers, agricultural professionals, pest management experts and others toward this goal
- sustain an active R&D pipeline, an innovative portfolio of products and services, and teams of experts in the lab and field to support customers in making their businesses succeed

In 2016, BASF's Crop Protection division generated sales of €5.6 billion.



Industry Benefits

Research Impacts

- CAMTech is recognized globally as a valuable asset to the advancement of entomology and nematology research
- Unique platform to fill basic research knowledge gaps
 - Address key industry needs
 - Accomplish research goals more appropriately done in academia
- Research projects developed to meet industry expectations
 - Reach critical project decisions
 - Generate new tools for future research pipelines
 - Significant direct cost saving



Industry Benefits

Human Resource Impacts

- Exchange among scientists from a diversity of training, backgrounds and experiences
 - Fosters research discussions and prioritization that benefits vested industry partners
- Contact with CAMTech university scientists
 - Identify partners for key project collaborations
 - Initiate discussions with university scientists not directly involved in the center
- Crop protection research is a highly competitive job market
 - Provides a pool of highly trained students that are in demand by industry



Industry Leveraged Resources

Industry Advisory Board (IAB)

12 companies

- Leverage pooled resources and \$ toward common precompetitive, basic, research
 - ~\$600,000 research operating budget
 - \$55,000/year investment (\$30,000/year non-government, non-profit agencies)
 - 14 ongoing projects
 - 21 projects since 2014
- Address basic research questions that would not be taken up in-house
- One-on-one interactions with key industry scientists
- Regular interactions with two entomology research universities
 - clear stake holders in successful pest management
- Project mentoring - employee development opportunities

University Research Sites

University of Florida
University of Kentucky



Thank you for participating!

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