

Annual Report - 2016

Award ID: 1068676

Institution: North Carolina State University

Title: IGERT- Genetic Engineering and Society: The Case of Transgenic Pests

Principal Investigator(s)

Name: Fred L. Gould

Project Years Active: 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016

Co-Principal Investigator(s) or Trainee/Associate Advisor(s)

Name: Andrew R. Binder

Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Matthew M. Booker

Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Zachary S. Brown

Project Years Active: 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Hannah J. Burrack

Project Years Active: 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Yasmin J. Cardoza

Project Years Active: 2013-2014, 2014-2015

Role in Project: Trainee/Associate Advisor

Name: Jason A. Delborne

Project Years Active: 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: John R. Godwin

Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Kevin Gross

Project Years Active: 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Nick Haddad

Project Years Active: 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016

Role in Project: Co-PI and Trainee/Associate Advisor

Name: Nora Haenn

Project Years Active: 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016

Role in Project: Co-PI

Name: William C. Kimler

Project Years Active: 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: William Kinsella

Project Years Active: 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016

Role in Project: Co-PI and Trainee/Associate Advisor

Name: Jennifer Kuzma

Project Years Active: 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Alun Lloyd

Project Years Active: 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016

Role in Project: Co-PI and Trainee/Associate Advisor

Name: Marce D. Lorenzen

Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Lisa McGraw

Project Years Active: 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Carolyn R. Miller

Project Years Active: 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Melinda S. Morrill

Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Nils Peterson

Project Years Active: 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Mitch A. Renkow

Project Years Active: 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Mark D. Robinson

Project Years Active: 2013-2014

Role in Project: Trainee/Associate Advisor

Name: Max J. Scott

Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Name: Walter N. Thurman

Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Role in Project: Trainee/Associate Advisor

Trainees

Name: Timothy D. Antonelli

Total number of months funded: 24

Project Years Active:

2012-2013 Project Year - Trainee supported for 11 months

2013-2014 Project Year - Trainee supported for 12 months

2014-2015 Project Year - Trainee supported for 1 months

2015-2016 Project Year - Trainee supported for 0 months

Name: Gregory A. Backus

Total number of months funded: 24

Project Years Active:

2013-2014 Project Year - Trainee supported for 11 months

2014-2015 Project Year - Trainee supported for 12 months

2015-2016 Project Year - Trainee supported for 1 months

Name: Jennifer F. Baltzegar

Total number of months funded: 24

Project Years Active:

2014-2015 Project Year - Trainee supported for 12 months

2015-2016 Project Year - Trainee supported for 12 months

Name: Jessica C. Barnes

Total number of months funded: 24

Project Years Active:

2014-2015 Project Year - Trainee supported for 12 months

2015-2016 Project Year - Trainee supported for 12 months

Name: Johanna E. Elsensohn

Total number of months funded: 24

Project Years Active:

2014-2015 Project Year - Trainee supported for 12 months

2015-2016 Project Year - Trainee supported for 12 months

Name: Nicole E. Gutzmann

Total number of months funded: 24

Project Years Active:

2014-2015 Project Year - Trainee supported for 12 months

2015-2016 Project Year - Trainee supported for 12 months

Name: Molly S. Hartzog

Total number of months funded: 36

Project Years Active:

2012-2013 Project Year - Trainee supported for 11 months

2013-2014 Project Year - Trainee supported for 12 months

2014-2015 Project Year - Trainee supported for 12 months

2015-2016 Project Year - Trainee supported for 1 months

Name: Michael S. Jones

Total number of months funded: 24

Project Years Active:

2014-2015 Project Year - Trainee supported for 12 months
2015-2016 Project Year - Trainee supported for 12 months

Name: Sheron N. King

Total number of months funded: 24

Project Years Active:

2014-2015 Project Year - Trainee supported for 12 months
2015-2016 Project Year - Trainee supported for 12 months

Name: William A. Klobasa

Total number of months funded: 18

Project Years Active:

2012-2013 Project Year - Trainee supported for 11 months
2013-2014 Project Year - Trainee supported for 7 months

Name: Caroline Leitschuh

Total number of months funded: 35

Project Years Active:

2013-2014 Project Year - Trainee supported for 11 months
2014-2015 Project Year - Trainee supported for 12 months
2015-2016 Project Year - Trainee supported for 12 months

Name: Andrew C. Ludvik

Total number of months funded: 13

Project Years Active:

2013-2014 Project Year - Trainee supported for 11 months
2014-2015 Project Year - Trainee supported for 2 months

Name: Elizabeth A. Pitts

Total number of months funded: 35

Project Years Active:

2013-2014 Project Year - Trainee supported for 11 months
2014-2015 Project Year - Trainee supported for 12 months
2015-2016 Project Year - Trainee supported for 12 months

Name: Megan E. Serr

Total number of months funded: 35

Project Years Active:

2013-2014 Project Year - Trainee supported for 11 months
2014-2015 Project Year - Trainee supported for 12 months
2015-2016 Project Year - Trainee supported for 12 months

Name: Jayce Sudweeks

Total number of months funded: 24

Project Years Active:

2014-2015 Project Year - Trainee supported for 12 months
2015-2016 Project Year - Trainee supported for 12 months

Name: Rene X. Valdez

Total number of months funded: 24

Project Years Active:

2013-2014 Project Year - Trainee supported for 11 months
2014-2015 Project Year - Trainee supported for 12 months
2015-2016 Project Year - Trainee supported for 1 months

Name: Amanda C. Walsh

Total number of months funded: 24

Project Years Active:

2012-2013 Project Year - Trainee supported for 11 months

2013-2014 Project Year - Trainee supported for 12 months

2014-2015 Project Year - Trainee supported for 1 months

2015-2016 Project Year - Trainee supported for 0 months

Name: Sophia H. Webster

Total number of months funded: 36

Project Years Active:

2012-2013 Project Year - Trainee supported for 11 months

2013-2014 Project Year - Trainee supported for 12 months

2014-2015 Project Year - Trainee supported for 12 months

2015-2016 Project Year - Trainee supported for 1 months

Name: Gabriel L. Zilnik

Total number of months funded: 36

Project Years Active:

2012-2013 Project Year - Trainee supported for 11 months

2013-2014 Project Year - Trainee supported for 12 months

2014-2015 Project Year - Trainee supported for 12 months

2015-2016 Project Year - Trainee supported for 1 months

Associates

Name: Maria E. Adonay

Project Years Active: 2015-2016

Name: Arun Babu

Project Years Active: 2014-2015, 2015-2016

Name: Sarah Barnhill

Project Years Active: 2014-2015, 2015-2016

Name: Sarah A. Cash

Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Name: Zachery DeVries

Project Years Active: 2014-2015, 2015-2016

Name: Rebecca M. Edman

Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Name: Dona Kanavy

Project Years Active: 2013-2014, 2014-2015, 2015-2016

Name: Rosemary Keane

Project Years Active: 2014-2015, 2015-2016

Name: Ashley R. Kelly
Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Name: Meagan Kittle Autry
Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Name: Arina Loghin
Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Name: Kate Maddalena
Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Name: Tina Ndoh
Project Years Active: 2014-2015, 2015-2016

Name: Michael A. Robert
Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Name: John P. Roberts
Project Years Active: 2015-2016

Name: Stacy Roberts
Project Years Active: 2012-2013, 2013-2014, 2014-2015, 2015-2016

Name: Lauren Roland
Project Years Active: 2014-2015, 2015-2016

Name: Katherine Swoboda-Bhattarai
Project Years Active: 2014-2015, 2015-2016

Name: Michael R. Vella
Project Years Active: 2015-2016

Accomplishments and Contributions of the IGERT

Interdisciplinary Research Achievements

First Achievement: Our second student cohort has published and is responsible for maintaining an active website presenting issues of invasive species, biodiversity, island conservation, and genetic engineering. In particular, they are examining genetically modifying house mice (*Mus musculus*) as an alternative to the current techniques for eradicating invasive populations from island ecosystems. They address the various complexities of ecology, history, governance, and society that arise when considering invasive species biology and management with the aim of providing clear answers for decision makers and the general public. Academically and professionally, they bring a variety of perspectives to the intersection of biotechnology and conservation biology. They do not share a unified view and cannot, and do not attempt to, account for every possible perspective; this website is the cumulation of their collaboration on this topic and can be viewed here: <http://research.ncsu.edu/islandmice/>.

Second Achievement: Through careful management of funds, we have been able to offer each of our 3 cohorts the opportunity for a 3rd year of IGERT funding. Each year, we have carefully refined the application criteria for these funds to ensure tangible returns. For each of our first two cohorts, half of the students were selected for additional funding with these funds

going toward additional dissertation research or educational initiatives. Collectively, they have produced interdisciplinary research preliminary findings related their dissertation work, novel interdisciplinary courses & large scale public outreach events. This February, for our third cohort, 6 out of 7 of our current students' applications were selected. All of them focus on dedicated research proposals that will serve as the foundation for their respective interdisciplinary dissertations. With a wide range of topics, international components, and ambitious project schedules, we expect their results to be just as high-impact.

Third Achievement: Our 2012 student cohort's group white paper has been published as the opening chapter entitled "Transgenic Pests and Human Health: A Short Overview of Social, Cultural and Scientific Considerations" in a compilation book by Dr. Zach Adelman entitled "Genetic Control of Malaria and Dengue". The white paper cum book chapter represents a significant achievement of our interdisciplinary research goals for our first cohort. The global problem of dengue fever is a multi-faceted complex issue that spans many different disciplines. Effective dengue control and prevention require integrated research from a multitude of disciplines in order to understand this problem from as many angles as possible within its social and cultural contexts. Through an integrative interdisciplinary approach, this chapter provides a comprehensive overview of current technologies used to control dengue fever and addresses the controversial question of whether transgenic technologies should be used.

Education Achievements

First Achievement: Our Colloquium has continued meeting weekly for the full duration of the 2015-2016 academic year. Our colloquia involve faculty, staff, students and postdocs from 4 different colleges at NCSU encompassing numerous disciplinary distinctions. We brought in multiple outside speakers to discuss topics, focusing this year on GM practitioners in response to feedback from our students. Exposure to the wide world of genetic modification has allowed us to elevate our conversation from genetic pest management as a focus to apply our discussion to a variety of fields. Also at the behest of our students, we expanded our focus to specific international experts, including Dr. Craig Yencho who does most of his work in sub-Saharan Africa, Dr. Javier Lezaun & Christiaan de Koning of Oxford, Dr. Gregor Wolbring from the University of Calgary & Dr. Laura Privalle from Bayer. These international scholars provided our students with unique insights into successful interdisciplinary international careers.

Second Achievement: Our IGERT has continued it's GES minor through the 2015-2016 academic year and has even expanded to include a 1 year funding award for minor participants who are accepted. Requirements for the award include: 1) Student has an excellent academic record 2) Student demonstrates interest in GES issues 3) Student proposes plan to complete GES minor 4) Student & thesis advisor commit to regularly attend GES Colloquium for 2 semesters 5) Student & faculty mentor register for GES relevant course outside their home discipline. By providing this opportunity, we have expanded our potential trainee pool beyond just the traditional 2 year fellowships and incentivized a wider student participation in the GES minor. By continuing to draw in new students from various disciplines, we keep our GES community exciting and diverse. New participants provide unique educational opportunities & continue to expand our growing impact on the NCSU campus.

Third Achievement: Our third cohort finished the last of their IGERT-specific courses this Spring. With their completion, we have successfully seen all of our IGERT fellows through all

four of the required GES courses: Special Topics in Pest Issues (Summer Course), Principles of Genetic Pest Management, Emerging Technologies and Society, & Governance, Systems and Modeling. In addition to our 19 IGERT fellows, we have had many IGERT associates and non-IGERT students complete the courses as well and have had several students finish the GES minor (completing two of the IGERT courses plus one additional course from outside their home discipline as well as including GES faculty member, from a discipline other than the student's major, on his or her committee. The three IGERT courses taught on campus will continue after this final cohort, with the GPM course planning to be taught again in Fall 2016.

Trainee Achievements

First Achievement: A team of our IGERT trainees consisting of Johanna Elsensohn (Cohort 3), Jen Baltzegar (Cohort 3), and Sophia Webster (Cohort 1) won the Entomological Society of America Student Debates at the annual ESA meeting in Minneapolis, MN, November 15-18, 2015. Their debate topic was: With the development of tools like RNAi, in the future we may be capable of eradicating species. If we can eradicate a species, should we? They were randomly assigned the Con Position. There were three topics and six universities competing. They were awarded Overall First Place for their performance and are currently writing up their position for publication. A summary of their arguments has been submitted to *American Entomologist*, a quarterly magazine published by the Entomological Society of America, for publication. Also 2 fellows from Cohort 1 graduated and have found full-time positions: Molly Hartzog was offered a faculty job at Frostburg State University, Amanda Walsh is a Senior Economist at RTI in RTP.

Second Achievement: Two of our Cohort 2 trainees, Megan Serr & Elizabeth Pitts, who were awarded a 3rd year of funding last year for this purpose, have successfully implemented their created course, Ethics of Biotechnical Communication (HON 296-006) this spring. This honors-level undergraduate course focuses on what it means to communicate ethically about emerging technologies and, throughout the semester, they integrate in-depth discussion of technical approaches to genome manipulation with humanistic inquiry into the ethical stances that guide approaches to communication. The course features a series of real-world case studies and students have frequent opportunities to refine their public speaking skills while engaging in discussion with scholars of science, communication, and ethics. This course has not only drawn a wide array of students from differing backgrounds, it has also provided a platform for other IGERT members to guest lecture. 3 IGERT faculty, 3 trainees & 1 associate have participated.

Third Achievement: 3rd Cohort trainee Johanna Elsensohn was appointed as a Science Policy Fellow for the Entomological Society of America in September 2015. She began her training at the annual ESA meeting in Minneapolis, MN, Nov., 2015, and will have her first trip as Science Policy Fellows to Washington DC in May, 2016. She will serve a two year term that involves speaking with policymakers and regulators in Washington D.C regarding entomological issues. Typical activities for an ESA Science Policy Fellow may include:
1) Attending science and policy workshops and networking events at ESA's Annual Meeting
2) Participating in teleconferences and webinars on federal science policy and budget development, as well as specific policy issues
3) Assisting in the development of policy statements
4) Participating in Washington DC-based meetings and events for hands-on experience with legislators, legislative staff, and agency leaders. Johanna's work with IGERT was instrumental her achieving this prestigious post.

International Opportunities: Achievements

Research/Educational Achievement 1: Due in part to her work with IGERT, Elizabeth Pitts, one of our Cohort 2 trainees, was awarded a NSF STS doctoral dissertation research improvement grant for \$18K, in March 2015. It has enabled her to do dissertation work in New York, Silicon Valley, and Copenhagen, Denmark. In October 2015, she completed the final phase of her fieldwork by returning to Copenhagen to conduct ethnographic research at Biologigaragen, a small DIY bio laboratory located inside of Labitat, a more traditional (i.e. non-biological) hackerspace. In addition, she interviewed academic and corporate affiliates of this lab, as well as people associated with formal governing bodies such as the Danish Board of Technology and more informal governing bodies such as the university laboratories that help define institutional norms of practice. As of January 2016, she has spent roughly 400 hours interviewing individuals involved in do-it-yourself biology, the iGEM competition, or participating in their work.

Research/Educational Achievement 2: Two Cohort 3 fellows, Mike Jones & Sheron King were able to expand their international networks by attending IGERT-supported international conferences. Mike participated in and presented at the The ADM Institute for the Prevention of Postharvest Loss at the University of Illinois at Urbana-Champaign's First International Congress for Postharvest Loss Prevention held October 4-7, 2015, in Rome, Italy. Sheron King participated in the 2015 Annual Conference of IASIA in Paris, France, which was held from 6 to 10 July 2015, and sponsored by The International Association of Schools and Institutes of Administration (IASIA) in close collaboration with the Centre National de la Fonction Publique Territoriale (CNFPT). At both conferences, the students presented IGERT-related papers and gained valuable insight into international collaboration.

Research/Educational Achievement 3: Molly Hartzog, a member of Cohort 1, was selected by our IGERT Executive Committee to receive travel funds to present her paper, "On the Origin of Evolutionary Tree Diagrams: The Role of Visualizations in Scientific Thinking," coauthored with Dr. Carolyn Miller at the Conference on Knowledge Design - Graphic Design in Science Communication, organized by the Rhetoric Department at the University of Tübingen, Germany, April 6th-8th, 2016. By attending this conference, Molly gained further experience presenting to international audiences and valuable insight into the European tradition in rhetorical studies. This directly addresses one of the goals of the IGERT program, which is to engage in international research and cultivate a global perspective on scientific issues. Given that many GPM technologies are being developed in European countries, it is important that Molly make connections with other rhetoricians in Europe working on similar issues.

Outreach Activities

Title: Advocacy 101

Media Outlet/Organization: Science Policy Advocacy Group (SPAG)

Activity Date: 02/01/2016

Description: Dr. Jennifer Kuzma, co-director of the GES Center and IGERT Executive Committee member, was a panelist for the Science Policy Advocacy Group (SPAG) at University of North Carolina, Chapel Hill, on "Advocacy 101".

Title: BugFest!

Media Outlet/Organization: North Carolina Museum of Natural Science

Activity Date: 09/19/2015

Description: Many of our faculty and fellows attended Raleigh's annual BugFest. Over 35,000 visitors annually interact with entomologists and other scientists. GES Fellows Johanna Elsensohn, Caroline Leitschuh, Jen Baltzegar & Nicole Gutzmann presented.

Title: Building with Biology, August

Media Outlet/Organization: Museum of Life and Science, Durham NC

Activity Date: 08/30/2015

Description: Building with Biology events emphasize multi-directional learning between scientists & the public regarding synthetic biology. GES fellows Caroline Leitschuh & Jen Baltzegar participated in this cross-boundary dialogue.

Title: Chem Engineering & News

Media Outlet/Organization: Chem Engineering & News

Activity Date: 10/19/2015

Description: Dr. Jennifer Kuzma, co-director of the GES Center and IGERT Executive Committee member, was quoted in Chem Engineering and News, on funding of synthetic biology and ethics and risk.

Title: Cub Scouts Meeting

Media Outlet/Organization: Boy Scouts of America

Activity Date: 10/15/2015

Description: GES fellow Nicole Gutzmann presented "Defense, habitat, and morphology of insects" to the Cub Scouts meeting advising them on how to use entomological tools during their outdoors excursions.

Title: Earth Day: Fun with bugs

Media Outlet/Organization: Heartwood Montessorri School

Activity Date: 04/22/2016

Description: GES Fellow Nicole Gutzmann presented to a group of students of about 30 about the importance of bugs in their daily lives and how agricultural pests affect us all.

Title: GE Day

Media Outlet/Organization: North Carolina Museum of Natural Science

Activity Date: 04/28/2016

Description: Genetic Engineering and You: GE Day, NC Museum of Natural Sciences: "CRISPy insects: Beetles engineered using the gene editing technology CRISPR" is organized by one of our GES fellows Caroline Leitschuh, involves GES fellow Nicole Gutzmann, and more

Title: Graduate Student Panel

Media Outlet/Organization: North Carolina University Undergraduate Honors Seminar

Activity Date: 09/30/2015

Description: GES fellow Caroline Leitschuh spoke to an honors undergraduate class about her experiences as a graduate student, especially as an interdisciplinary PhD student involved in the GES IGERT.

Title: Hopes and Fears

Media Outlet/Organization: HopesandFears.com

Activity Date: 09/22/2015

Description: Dr. Jennifer Kuzma, co-director of the GES Center and IGERT Executive Committee member, was quoted in & a story contributor to "Hopes and Fears: Life and Culture through a Global Lens" on ethics of engineering intelligence in humans. Available online

Title: Junior Master Gardener Meeting

Media Outlet/Organization: Wake County

Activity Date: 03/10/2016

Description: GES fellow Nicole Gutzmann presented "Beneficials and pests: Good and bad bugs for your garden" to a group of about 30 junior master gardeners at the Wake County Extension Office.

Title: Nature Biotech

Media Outlet/Organization: Nature Biotech

Activity Date: 12/09/2015

Description: Dr. Jennifer Kuzma, co-director of the GES Center and IGERT Executive Committee member, was quoted in Nature Biotech article, "A face lift for biotechnology rules begins".

Title: NSF Nanoscale Meeting

Media Outlet/Organization: National Science Foundation

Activity Date: 12/10/2015

Description: Dr. Jennifer Kuzma, co-director of the GES Center and IGERT Executive Committee member, was a moderator for panel at National Science Foundation Nanoscale Science and Engineering meeting on "Social Science".

Title: Pints of Science - Animal Response to Climate Change

Media Outlet/Organization: North Carolina Museum of Natural Science

Activity Date: 09/24/2015

Description: Spearheaded by GES fellow Gabriel Zilnik and supported by GES PI Dr. Andrew Binder, this is a joint effort between NC State University and the N.C. Museum of Natural Sciences. It is held the last Thursday of every month at a local bar, Tir Na Nog.

Title: Pints of Science - Artificial Intelligence Comes of Age

Media Outlet/Organization: North Carolina Museum of Natural Science

Activity Date: 10/29/2015

Description: Spearheaded by GES fellow Gabriel Zilnik and supported by GES PI Dr. Andrew Binder, this is a joint effort between NC State University and the N.C. Museum of Natural Sciences. It is held the last Thursday of every month at a local cafe, Berkeley Cafe

Title: Pints of Science - How Domesticated Are You?

Media Outlet/Organization: North Carolina Museum of Natural Science

Activity Date: 12/03/2015

Description: Spearheaded by GES fellow Gabriel Zilnik and supported by GES PI Dr. Andrew Binder, this is a joint effort between NC State University and the N.C. Museum of Natural Sciences. It is held the last Thursday of every month at the local Berkeley Cafe.

Title: Pints of Science - The Virtual Paul's Cross

Media Outlet/Organization: North Carolina Museum of Natural Science

Activity Date: 08/25/2015

Description: Spearheaded by GES fellow Gabriel Zilnik and supported by GES PI Dr. Andrew Binder, this is a joint effort between NC State University and the N.C. Museum of Natural Sciences. It is held the last Tuesday of every month at a local bar, Tir Na Nog.

Title: Science Explorers Club

Media Outlet/Organization: Dillard Drive Middle School

Activity Date: 12/15/2015

Description: GES fellow Johanna Elsensohn visited the club of 30 students to give a short presentation on how big a role entomology plays in their lives focusing on agriculture. They introduced them to live bugs, maggot art, & termite pheromone trails.

Title: The Science of Sour

Media Outlet/Organization: Museum of Life and Science, Durham NC

Activity Date: 07/23/2015

Description: GES fellows Johanna Elsensohn & Caroline Leitschuh were among the scientists presenting on friendly microorganisms' roles in creating fermented treats for citizens to try at a Science of Eats: Sour tasting.

Title: Unregulation of Biotech Crops

Media Outlet/Organization: The Scientist magazine

Activity Date: 11/26/2015

Description: Dr. Jennifer Kuzma, co-director of the GES Center and IGERT Executive Committee member, was quoted in The Scientist magazine, "Unregulation of Biotech Crops".

Title: Washington Post

Media Outlet/Organization: Washington Post

Activity Date: 01/04/2016

Description: Dr. Jennifer Kuzma, co-director of the GES Center and IGERT Executive Committee member, Quoted in Washington Post, "Around the country, organic farmers are pushing for 'GE-free' zones". free'

Title: Whole Foods Market Fall Festival

Media Outlet/Organization: Whole Foods

Activity Date: 09/12/2015

Description: GES Fellow Nicole Gutzmann presented on local insects at this local fair held by Whole Foods for neighboring families and their children. She spoke about the importance of being able to identify the helpful bugs from harmful pests.

Publications, Presentations, and Patents

Journal Articles in Refereed Publications

5a. Journal Articles in Refereed Publications

Achee, N.L., Gould, F., Perkins, T.A., Reiner, R.C. Jr., Morrison, A.C., Ritchie, S.A., Gubler, D.J., Teyssou, R., Scott, T.W. (2015) A Critical Assessment of Vector Control for Dengue Prevention. *PLoS Neglected Tropical Diseases*. 9(5): e0003655. doi:10.1371/journal.pntd.0003655

An, J., Gao, Y., Lei, C., Gould, F., Wu, K. (2015) Monitoring cotton bollworm resistance to Cry1Ac in two counties of northern China during 2009–2013. *Pest Management Science*. 71(3), 377-382. doi:10.1002/ps.3807

Brown, J, Fatehi, L, Kuzma, J. (2015) Altruism and Skepticism in public attitudes toward food nanotechnology. *Journal of Nanoparticle Research*. 17,122-140. Doi: 10.1007/s11051-015-2926-4

Burrack, H.J., Asplen, M., Bahder, L., Drummond, F., Gudot, C., Isaacs, R., Johnson, D., Kirk, A., Lee, J., Loeb, G., Rodriguez-Saona, C., Van Timmeren, S., McPhie, D.R. (2015) Multistate comparison of attractants for monitoring *Drosophila suzukii* (Diptera: Drosophilidae) in blueberries and caneberries. *Environmental Entomology*. DOI: 10.1093/ee/nvv022

Cammack, J.A., Cohen, A.C., Krietlow, K.L., Roe, R.M., Watson, D.W. (2015) Decomposition of Concealed and Exposed Porcine Remains in the North Carolina Piedmont. *Journal of Medical Entomology*. 1-9. doi: 10.1093/jme/tjv183

Campbell K.J., Beek, J., Eason, C.T., Glen, A.S., Godwin, J., Gould, F., Holmes, N.D., Howald, G.R., Madden, F.M., Ponder, J.B., Threadgill, D.W., Wegmann, A., Baxter, G.S. (2015) The next generation of rodent eradications: Innovative technologies and tools to improve species specificity and increase their feasibility on islands. *Biological Conservation*. 185, 47-58. doi:10.1016/j.biocon.2014.10.016

Carr, A.L., Roe, R.M. (2015) Acarine attractants: Chemoreception, bioassay, chemistry and control. *Pesticide Biochemistry and Physiology*. <http://dx.doi.org/10.1016/j.pestbp.2015.12.009>

Carr, A.L., Sonenshine, D.E., Strider, J.B., Roe, R.M. (2016) Evidence of female sex pheromones and characterization of the cuticular lipids of unfed, adult male versus female blacklegged ticks, *Ixodes scapularis*. *Experimental and Applied Acarology*. 68 (4). 519-538. DOI 10.1007/s10493-015-0009-y

Chitwood, M.C., Swingen, M., Lashley, M., Flowers, J., Palamar, M., Apperson, C., Olfenbittel, C., Moorman, C., DePerno, C. (2015) Parasitology and serology of free-ranging coyotes (*Canis latrans*) in North Carolina. *Journal of Wildlife Diseases*. 51, 664–669. doi: <http://dx.doi.org/10.7589/2015-01-002>

Diepenbrock, L.M., Rosentell, D.O., Sial, A., Hardin, J.A., Burrack, H.J. (2015) Season-long programs for control of *Drosophila suzukii* in southeastern U.S. blueberries. *Crop Protection*. 81, 76-84. DOI: 10.1016/j.cropro.2015.12.012

Edman, R.M., Linger, R.J., Belikoff, E.J., Li, F., Sze, S.-H., Tarone, A.M., Scott, M.J. (2015) Functional characterization of calliphorid cell death genes and cellularization gene promoters for controlling gene expression and cell viability in early embryos. *Insect Molecular Biology*, 24: 58-70. doi: 10.1111/imb.12135

Egekwa, N., Sonenshine, D.E., Garman, H., Barshis, D.J., Coxt, N., Bissinger, B.W., Zhus, J., Roe, R.M. (2016) Comparison of synganglion neuropeptides, neuropeptide receptors and neurotransmitter receptors and their gene expression in response to feeding in *Ixodes scapularis* (Ixodidae) vs. *Ornithodoros turicata* (Argasidae). *Insect Molecular Biology*. 25 (1), 72-92. doi: 10.1111/imb.12202

Garner, D., Kathariou., S. (2016) Fresh produce-associated listeriosis outbreaks, sources of concern, teachable moments and insights. *Journal of Food Protection*. 79(2):337-44. doi: 10.4315/0362-028X.JFP-15-387

Gulia-Nuss, M., Nuss, A.B., Meyer, J.M., Sonenshine, D.E., Roe, M.R., Waterhouse, R.M., Sattelle, D.B., De la Fuente, J., et. al. (2015) Genomic insights into the *Ixodes scapularis* tick vector of Lyme disease. *Nature Communications*. 7 (10507). 1-13. DOI: 10.1038/ncomms10507

Hardin, J.A., Kraus, D.A., Burrack, H.J. (2015) Diet quality mitigates larval competition in *Drosophila suzukii* (Matsumura). *Entomologia Experimentalis et Applicata*. 156(1), 59-65. DOI: 10.1111/eea.12311

Hayes, M.C., Peterson, M.N., Heinen-Kay, J.L., Langerhans, R.B. (2015) Tourism- related Drivers of Support for Protection of Fisheries Resources on Andros Island, The Bahamas. *Ocean & Coastal Management*. 106, 118-123. DOI: 10.1016/j.ocecoaman.2015.01.007

Heinen-Kay, J.L., Morris, K., Ryan, N., Byerley, S., Venezia, R., Peterson, M.N., Langerhans, B.R. (2015) A tradeoff between natural and sexual selection underlies diversification of a sexual signal. *Behavioral Ecology*. 26(2), 533-542. doi: 10.1093/beheco/aru228

Hess, G. R., Peterson, M.N. (2015) "Bicycles May Use Full Lane" Signage Communicates U.S. Roadway Rules and Increases Perception of Safety. *PLoS ONE* 10(8): e0136973. doi:10.1371/journal.pone.0136973.

Hofmann, J.N., Hoppin, J.A., Lynch, C.F., Poole, J.A., Purdue, M.P., Blair, A., Alavanja, M.C., Beane Freeman, L.E. (2016) Farm characteristics, allergy symptoms, and risk of non-Hodgkin lymphoid neoplasms in the Agricultural Health Study. *Cancer Epidemiology, Biomarkers & Prevention*. 24(3), 587-94. doi: 10.1158/1055-9965

Jukic, A.M., Calafat, A.M., McConnaughey, D.R., Longnecker, M.P., Hoppin, J.A., Weinberg, C.R., Wilcox, A.J., Baird, D.D. (2016) Urinary concentrations of phthalate metabolites and bisphenol-A and follicular 1 phase length, fecundability, and early pregnancy loss. *Environmental Health Perspectives*. 124(3), 321-328. doi: 10.1136/oemed-2014-102728.

Kirrane, E., Bowman, C., David, J.A., Hoppin, J.A., Blair, A., Chen, H., Patel, M., Sandler, D.P., Tanner, C.M., Vinikoor-Imler, Ward, M.H., Luben, T.J., Kamel, F. (2015) Associations of ozone and PM2.5 concentrations with Parkinson's disease among participants in the Agricultural Health Study. *Journal of Occupational and Environmental Medicine*. 57(5):509-17. doi: 10.1097/JOM.0000000000000451

- Kuzma, J. (2015) Translational Governance Research for Synthetic Biology. *Journal of Responsible Innovation*. 2(1),109-112.DOI:10.1080/23299460.2014.1002055
- Lee Jenni, G.D., Peterson, M.N., Cubbage, F.W., Jameson, J.K. (2015) Military perspectives on public relations related to environmental issues. *Journal of Public Relations Research*. 27,353-369. DOI: 10.1080/1062726X.2015.1027770
- Lee, J.C., Dalton, D.T., Swoboda-Bhattarai, K.A., Bruck, D.J., Burrack, H.J., Strik, B.C., Moltz, J.M., Walton, V.M. (2015) Characterization and manipulation of fruit susceptibility to *Drosophila suzukii*. *Journal of Pest Science*. 1-10. DOI 10.1007/s10340-015-0692-9
- Lin, C-Y., Wang, J.P., Li, Q., Chen, H.C., Liu, J., Loziuk, P., Muddiman, D.C., Sederoff, R.R. and Chiang, V.L. (2015) 4-Coumaroyl and Caffeoyle Shikimic Acids Inhibit 4-Coumaric Acid:Coenzyme A Ligases and Modulate Metabolic Flux for 3-Hydroxylation in Monolignol Biosynthesis of *Populus trichocarpa*. *Molecular Plant*. 8, 176-187. DOI: <http://dx.doi.org/10.1016/j.molp.2014.12.003>
- Linger, R.J., Belikoff, E.J., Scott, M.J. (2015) Dosage Compensation of X-Linked Muller Element F Genes but Not X-Linked Transgenes in the Australian Sheep Blowfly. *PLoS ONE* 10(10): e0141544. doi:10.1371/journal.pone.0141544
- Londono-Renteria, B., Patel, J., Vaughan, M., Funkhouser, S., Ponnusamy, L., Grippin, C., Jameson, B.S., Apperson, C., Mores, C.N., Wesson, D.M., Colpitts, T.M., Meshnick, S.R. (2015) Long-lasting permethrin-impregnated clothing protects against mosquito bites in outdoor workers. *American Journal of Tropical Medicine and Hygiene*. 92, 869-874. doi: 10.4269/ajtmh.15-0130
- Loziuk, P.L., Parker, J., Li, W., Lin, C-Y., Wang, J., Li, Q., Sederoff, R.R., Chiang, V.L., Muddiman, D.C. (2015) Elucidation of Cellulosic Transcription Factors in Stem Differentiating Xylem Tissue of *Populus trichocarpa*. *Journal of Proteome Research*. 14(10), 4158-4168. DOI: 10.1021/acs.jproteome.5b00233
- Marayati, B. F., Schal, C., Ponnusamy, L., Apperson, C.S., Rowland, T., Wasserberg, G.. (2015) Attraction and oviposition preferences of *Phlebotomus papatasi* (Diptera: Psychodidae), vector of Old-World cutaneous leishmaniasis, to larval-rearing media. *Parasites and Vectors*. 8(663). doi: 10.1186/s13071-015-1261-z
- McHale, M.R., Pickett, S., Barbosa, O., Bunn, D.N., Cadenasso, M.L., Childers, D.L., Gartin, M., Hess, G.R., Iwaniec, D., McPhearson, T., Peterson, M.N., Poole, A.K., Rivers, III, L., Shatters, S.T., Zhou, W. (2015) The New Global Urban Realm: Complex, Connected, Diffuse, and Diverse Social-Ecological Systems. *Sustainability*. 7(5), 5211-5240. doi:10.3390/su7055211
- Navarro Olmedo, S., Haenn, H., Schmook, B., Radcl, C. (2016) The Legacy of Mexico's Agrarian Counter-Reforms: Reinforcing Social Hierarchies in Calakmul, Campeche. *Journal of Agrarian Change*. 16(1): 145-167. DOI: 10.1111/joac.12095
- Perera, O.P., Shelby, K.S., Popham, H.J.R., Gould, F., Adang, M.J., Jurat-Fuentes, J.L. (2015) Generation of a Transcriptome in a Model Lepidopteran Pest, *Heliothis virescens*, Using Multiple Sequencing Strategies for Profiling Midgut Gene Expression. *PLoS ONE*. 10(6): e0128563. doi:10.1371/journal.pone.0128563

*Pitts, E. (2015) Review of Shaping Emerging Technologies: Governance, Innovation, Discourse. (Berlin: IOS Press/AKA, 2013), NanoEthics 9(1), 85-87. doi:10.1007/s11569-015-0221-6

Ponnusamy, L., Schal, C., Arellano, C., Wesson, D.M., Apperson, C.S. (2015) Oviposition responses of Aedes mosquitoes to bacterial isolates from attractive bamboo infusions. Parasites and Vectors. 8(486). DOI: 10.1186/s13071-015-1068-y

Serenari, C., Peterson, M.N., Clark, B. (2015) Theorizing logger religion within the Pacific Northwest timber conflict. Worldviews: Global Religions, Culture, and Ecology. 19(3), 265-282. DOI: 10.1163/15685357-01903004

Starling, A.P., Hoppin, J.A. Environmental chemical risk factors for type 2 diabetes: An update. (2015) Diabetes Management. 5(4), 285-299. DOI 10.2217/dmt.15.16

Taillie, P.J., Peterson, M.N., Moorman, C.E. (2015) The relative importance of multiscale factors in the distribution of Bachman's Sparrow and the implications for ecosystem conservation. The Condor. 117, 137-146. doi: <http://dx.doi.org/10.1650/CONDOR-14-137.1>

Taylor, S.V., Burrack, H.J., Roe, R.M., Bacheler, J.S., Sorenson, C.E. (2015) Systemic Imidacloprid Affects Intraguild Parasitoids Differently. Plos One. 1-13. DOI:10.1371/journal.pone.0144598

Treuren, W.V., Ponnusamy, L., Brinkerhoff, R.J., Gonzalez, A., Parobek, C.M., Juliano, J.J., Andreadis, T.G., Falco, R.C., Ziegler, L.B., Hathaway, N., Keeler, C., Emch, M., Bailey, J.A., Roe, R.M., Apperson, C.S., Knight, R., Meshnick, S.R. (2015) Variation in the Microbiota of Ixodes ticks with geography species and sex, Running Head: tick microbiota vary widely with geography. Applied and Environmental Microbiology. 81 (18), 6200-6209. doi:10.1128/AEM.01562-15

Van Turen, W., Ponnusamy, L., Brinkerhoff, R., Gonzalez, A., Parobek, C., Juliano, J., Andreadis, T., Falco, R., Beati-Ziegler, L., Hathaway, N., Keeler, C., Emch, M., Bailey, J., Roe, R.M., Apperson, C.S., Knight, R., Meshnick, S.R. (2015) Variations in the microbiota of Ixodes ticks with geography, species and sex. Applied and Environmental Microbiology. 81, 6200-6209. doi:10.1128/AEM.01562-15

Vogel, K.M. (2015) More socio-technical assessments of synthetic biology to inform security deliberations. Journal of Responsible Innovation. 2(1), 85-87. DOI:10.1080/23299460.2014.1002177

Wang, J.P., Chuang, L., Losiuk, P., Chen, H., Lin, Y-C., Shi, R., Muddiman, D.C., Sederoff, R.R., Chiang, V.L. (2015) Phosphorylation is an on/off switch for 5-hydroxyconiferaldehyde O-Methyltransferase activity in poplar monolignol biosynthesis. Proceedings of the National Academy of Sciences USA. 112(27), 8481-8486. doi: 10.1073/pnas.1510473112.

Yan, Y., Scott, M.J. (2015) A transgenic embryonic sexing system for the Australian sheep blow fly *Lucilia cuprina*. Scientific Reports. 5, 16090. doi:10.1038/srep16090

Yue, C. Shuoli, Z, Cummings, C., Kuzma, J. (2015) Investigating Factors Influencing Consumer Willingness to Buy GM Food and Nano-food: An Application of Structural Equation Modeling. Journal of Nanoparticle Research. 17(7), 283-302. DOI: <http://dx.doi.org/10.1007/s11051-015-3084-4>

Yue, C. Shuoli, Z, Kuzma, J. (2015) Heterogeneous Consumer Preferences for Nanotechnology and Genetic-Modification Technology in Food Products. *Journal of Agricultural Economics*. 66(2), 308-328. DOI: 10.1111/1477-9552.12090

Zhu, J., Khalil, S.M., Mitchell, R.D., Bissinger, B.W., Egekwu, N., Sonenshine, D.E., Roe, R.M. (2015). Mevalonate-Farnesal Biosynthesis in Ticks: Comparative Synganglion Transcriptomics and a New Perspective. *Plos One*. 11(3). e0141084. doi:10.1371/journal.pone.0141084

Journal Articles in Non-Refereed Publications

5b. Journal Articles in Non-Refereed Publications

*Baltzegar J. (2016) Genetic Basis for Behavioral Isolation Leading to Speciation. *The Open Reading Frame*. 2(2), 6-7.

https://genetics.sciences.ncsu.edu/images/uploads/Open_Reading_Frame_Volume_2_Number_2.pdf

*Baltzegar, J. (2015) Construction and Deconstruction in Education. *The Signal*. 17(2), 2.

<http://keck.sciences.ncsu.edu/wp-content/uploads/2015/09/The-Signal-17.2.pdf>

*Baltzegar, J., *Webster, S. (2015) The Science of Science Communication: What Roles Do Scientists and/or Policymakers Play in the Dissemination of Knowledge Concerning GMOs? *The DiGEST*(1), 3-4. <http://research.ncsu.edu/ges/>

Booker, M. (2015) What Should We Eat? In: *Think Global, Eat Local: Exploring Foodways*, Edited by Michel Pimbert, Rachel Shindelar, and Hanna Schsler, *RCC Perspectives*. 1, 45-50.

http://www.environmentandsociety.org/sites/default/files/seiten_aus_2015_i1_0-8_booker.pdf

Fritz, M., *Baltzegar, J. (2015) More Aedes Editing & More Insights. *Insect Genetic Technologies Research Coordination Network Blog*. <http://igtrcn.org/more-aedes-editing-more-insights/>

Roberts, J.P., Stauffer, S., Cummings, C., Kuzma, J. (2015) Synthetic Biology Governance: Delphi Study Workshop Report. *GES Center Report #2015.2*. Available at research.ncsu.edu/ges

Vogel, K.M. (2015) Does Chicken Little Always Have to Shape Bioterrorism Policy? *The Nonproliferation Review*. 22 (2), 121-122. DOI:10.1080/10736700.2015.1122934

Book Chapters

5d. Book Chapters

*Antonelli, T., *Clayton, A., *Hartzog, M., *Webster, S., *Zilnik, G. (2016) Transgenic Pests and Human Health: A Short Overview of Social, Cultural, and Scientific Considerations. In: Adelman, Z.N. (ed.), *Genetic Control of Malaria and Dengue* (1-30). Boston: Academic Press. ISBN 9780128002469

Scott, M.J., Benedict, M.Q. (2016) Concept and History of Genetic Control. In: Adelman, Z.N. (ed.), *Genetic Control of Malaria and Dengue* (31-54). Amsterdam: Elsevier. ISBN 9780128002469

Azizoglu R.O., Kathariou, S. (2016) *Listeria: Properties and Occurrences*. In: Caballero, B., Finglas, P., Toldr, F. (ed), *The Encyclopedia of Food and Health* vol. 3 (567-570). Oxford: Academic Press. ISBN-9780123849472

Li, Q., Yeh, T-F., Yang, C., Song, J., Chen, Z-Z., Sederoff, R.R., Chiang, V.L. (2015) *Populus trichocarpa* Transformation Using Stem Explants. In: Wang, K. (ed.), *Agrobacterium Protocols*, third edition. (357-364). New York: Springer. ISBN 978-1-4939-1694-8

Vogel, K.M. (2015) Project Jefferson: Technological Surprises and Critical Omissions. In: Rappert, B., Balmer, B. (ed.) *Absence in Science, Security and Policy: From Research Agendas to Global Strategies*. (114-131). Basingstoke: Palgrave. ISBN 978-1-137-49373-6

Conference Publications

5g. Conference Publications

Glenn, J.V., Cabbage, F., Myers, R., Peterson, M.N. (2015) Economic analysis of payments required to establish longleaf pine habitat on private lands to facilitate training on military installations. *Southern Silvicultural Research Conference* (467-472). Asheville, NC: U.S. Department of Agriculture, Forest Service.

Kuzma, J. (2015) Mental models & systems mapping for risk analysis of gene drives. *Society for Risk Analysis Annual Meeting (M2-C.2)*. Washington, DC: Society for Risk Analysis.

Kuzma, J. (2015) A Delphi Study: Risk Data and Governance Needs for Environmental Applications of Synthetic Biology (W2-C.2). *World Congress on Risk 2015*. Singapore: Society for Risk Analysis.

Roe, R.M, Kurtz, R.W., Dhammi, A., Reisig, D. (2015) Caterpillar Resistance to Transgenic Cotton: Impact of Increased Feeding Rates. *Beltwide Cotton Conferences* (831-840). San Antonio, TX: National Cotton Council.

Von Essen, E., Hansen, H.P., Kallstrom, H.N., Peterson, M.N., Peterson, T.R. (2015). Toward a critical and interdisciplinary understanding of illegal hunting: A synthesis of research workshop findings. *Swedish University of Agricultural Science: Urban and Rural Reports 2015:1* (ISBN: 978-91-85735-36-5, eISBN 978-91-85735-37-2)

Conference Presentations

5h. Conference Presentations

Adedipe, F., Lorenzen, M.D. (2015, August) Coupling transcriptomics and RNA interference to gain insight into Bt resistance in the Western corn rootworm. Poster presentation at the 9th Annual Arthropod Genomics Symposium, Manhattan, KS.

Adedipe, F., Lorenzen, M.D. (2015, September) Coupling transcriptomics and RNA interference to gain insight into Bt resistance in the Western corn rootworm. Poster presentation at the Genetic Engineering Research Symposium at NC-State, Raleigh, NC.

Apperson, C., Kakumanu, M., Ponnusamy, L., Sutton, H., Nicholson, W.L., Meshnick, S.R. (2015, September). Changing ecology of tick-borne diseases in the Southern US: A new paradigm. Invited oral presentation at the 46th Annual Conference of the Society for Vector Ecology, Albuquerque, NM.

*Baltzegar, J. (2015, August). Fine-scale Population Structure of the Dengue Fever Mosquito, *Aedes aegypti*. Oral Presentation at the Annual Genetic Program Retreat. Research Triangle Park, NC.

*Baltzegar, J., *Gutzmann, N. (2016, February). WTF is a GMO?. Oral Presentation at the Genetic Engineering and Society Center Colloquium. NC State, Raleigh, NC.

*Barnes, J.C. (2015, August). Neoliberalism and Narratives in the Landscape of Genetically Modified Trees. People's Choice Award for Best Paper Presentation at the MEAS/FER Symposium; Raleigh, NC.

*Barnes, J.C. (2015, September). Matters of Motive: Responsible Narratives in the Governance of Genetically Modified Trees. Paper presented at the Atlanta Conference on Science and Innovation Policy; Atlanta, GA.

*Barnes, J.C. (2015, November). The Wisdom of Crowds: Neoliberalism and the GM American Chestnut. Paper presented at the Society for Social Studies of Science (4S) Annual Meeting; Denver, CO.

*Barnes, J.C. (2016, March). Commodification and Conservation: A Political Ecology of Forest Tree Genomics. Paper presented at the American Association of Geographers Annual Meeting; San Francisco, CA.

Barnhill, S.K., *Barnes, J.C., Roberts, J.P., *Sudweeks, J. (2016, April). The Genetically Modified American Chestnut Tree and Surface Mine Reclamation: Modeling the Potential for Restoration. Paper presented at the International Society of Forest Resource Economics; Raleigh, NC.

Bearinger, K., *Serr, M., Bowman, T. (2015, June). Pathways to Successful Urban Biodiversity Conservation. Paper presented at the International Symposium on Society and Resource Management Conference, Charleston, SC.

Berry-James, R., *King, S. (2015, July). In God We Trust: Why We Don't Trust the Government with Our Food. Paper presented at the International Association of Schools and Institutes of Administration (IASIA), Paris, France.

Booker, M. (2016, March). A big question conversation on food, history, and the environment. Paper presented at the American Society for Environmental History, Seattle, WA.

Booker, M. (2016, March). Modifying tradition: Placing responsibility for food safety in U.S. History. Paper presented at Consuming the World workshop, Rachel Carson Center, Munich, Germany.

Burrack, H.J., *Elsensohn, J.E. (2015, July). *Drosophila suzukii* biology, ecology, management, and regulatory implications. Oral presentation during Webinar for USDA APHIS staff, Raleigh, NC.

Burrack, H.J., Hardin, J., Diepenbrock, L. (2015, June). Spotted wing *drosophila* management in southeastern blackberry and raspberry production: comparing management tools and developing strategy. Poster presented at the International Rubus and Ribes Symposium. Asheville, NC.

Choi, D. B., Grieco, J.P., Apperson, C.S., Schal, C., Ponnusamy, L., Wesson, D., Achee, N.L. (2015, October). Effect of spatial repellent exposure on *Aedes aegypti* attraction to oviposition

sites. Poster presented at the 64th Annual Meeting of the American Society of Tropical Medicine and Hygiene. Philadelphia, PA.

Chu, F. Gorski, S., Cardoza, Y., Lorenzen, M.D. (2015, September) The best of two worlds: the use of CRISPR/Cas9 and transposable elements to generate a genome-wide mutagenesis system for the Western corn rootworm, *Diabrotica virgifera virgifera*. Poster presentation at the Genetic Engineering Research Symposium at NC-State, Raleigh, NC.

Chu, F., Lorenzen, M.D. (2016, August). Development of transgenic helper/donor *Diabrotica virgifera virgifera* strains for use in genome-wide mutagenesis. Invited oral presentation at the Monsanto Corn Academic Summit, St. Louis, MO.

Chu, F. Gorski, S., Cardoza, Y., Lorenzen, M.D. (2015, August) The best of two worlds: the use of CRISPR/Cas9 and transposable elements to generate a genome-wide mutagenesis system for the Western corn rootworm, *Diabrotica virgifera virgifera*. Poster presentation at the 9th Annual Arthropod Genomics Symposium, Manhattan, KS.

Dipenbrock, L., Swoboda-Bhattarai, K.A., Burrack, H.J. (2015, June). Crop versus non- crop host choice by spotted wing drosophila (*Drosophila suzukii*). Poster presented at the International Rubus and Ribes Symposium. Asheville, NC.

Diepenbrock, L.D., Burrack, H.J. (2015, November). Spatial variation in host utilization by *Drosophila suzukii* in blackberry. Paper presented at the Entomological Society of America Annual Meeting. Minneapolis, MN.

Edminsten, K. (2015, August). New World screwworm genome project. Paper presented at the Insect Pest Genomics meeting, College Station, TX.

Edminsten, K. (2015, December). Understanding Biotech and GMOs. Paper presented at the North Carolina Cooperative Extension State Conference, Raleigh, NC.

Edminsten, K. (2015, December). Resources for Biotech and GMOs. Paper presented at the North Carolina Cooperative Extension State Conference, Raleigh, NC.

Edminsten, K. (2015, August). Transgenic sexing systems for genetic control of the New World screwworm and the Australian sheep blowfly. Paper presented at the First Research Coordination Meeting (RCM) on the FAO/IAEA Co-ordinated Research Project, Comparing Rearing Efficiency and Competitiveness of Sterile Male Strains Produced by Genetic, Transgenic or Symbiont-based Technologies, Vienna, Austria.

Edminsten, K. (2015, July). Genetic control of ectoparasite dipteran livestock pests. Invited plenary presentation at the American Association of Veterinary Parasitologists (AAVP) annual meeting, Boston, MA.

*Elsensohn, J. E. (2016, November). New kids on the block: regulatory issues around emerging pests and emerging technologies. Paper presentation at the International Congress of Entomology, Orlando, FL.

*Elsensohn, J.E., Burrack, H.J. (2015, November). Behavioral ecology and resource use by an invasive fly, *Drosophila suzukii*. Paper presented at the Entomological Society of America Annual Meeting, Minneapolis, MN.

*Elsensohn, J.E., Loeb, G.M. (2016, March). Non-crop host infestation by an invasive, polyphagous fly: seasonal dynamics and host preference. Paper presented at the Southeastern Branch of Entomological Society of America Annual Meeting, Raleigh, NC.

*Elsensohn, J., *Leitschuh, C., Kuzma, J. (2015, November). Genome Editing and Gene Drive: Technology Use, Regulations, & Inclusive Deliberation. Oral presentation at the Genetic Engineering and Society Colloquium, North Carolina State University, Raleigh, NC.

Grubbs, N., Chu, F., Lorenzen, M.D. (2015, September) Breaking down Medea: Using new genome editing tools to solve an old mystery. Poster presentation at the Genetic Engineering Research Symposium at NC-State, Raleigh, NC.

Grubbs, N., *Gutzmann, N., Lorenzen, M.D. (2015, August). CRISPR/Cas9 for homologous recombination. Invited oral presentation at the IGT-RCN workshop, Manhattan, KS.

Grubbs, N., Chu, F., Lorenzen, M.D. (2015, August) Breaking down Medea: Using new genome editing tools to solve an old mystery. Poster presentation at the 9th Annual Arthropod Genomics Symposium, Manhattan, KS.

*Gutzman, N.E. (2015, August). Designing CRISPR/Cas9 constructs for homology directed repair in red flour beetle. Poster presented at the Chemical and Biomolecular Engineering Biolunch CRISPR Poster Session, North Carolina State University, Raleigh, NC.

*Gutzman, N.E. (2015, June). Coleopteran Cadherins: Critical to Cry Toxins? Poster presented at the 9th Annual Arthropod Genomics Symposium, Kansas State University, Manhattan, KS.

*Gutzmann, N.E., Oppert, B.S., Lorenzen, M.D. (2015, September) Coleopteran Cadherins: Critical to Cry Toxicity? Using CRISPR/Cas9 to determine the functional domains of a coleopteran cadherin. Poster presentation at the Genetic Engineering Research Symposium at NC-State, Raleigh, NC.

*Gutzmann, N.E., Oppert, B.S., Lorenzen, M.D. (2015, August) Coleopteran Cadherins: Critical to Cry Toxicity? Using CRISPR/Cas9 to determine the functional domains of a coleopteran cadherin. Poster presentation at the 9th Annual Arthropod Genomics Symposium, Manhattan, KS.

Hoppin, J. (2016, January). Pesticides and Respiratory Outcomes: Implications for Human Health. Oral presentation at the ITEHP Seminar Series, Duke University, Durham, NC.

Hoppin, J, LePrevost, C. (2015, November). Protecting the Pesticide Applicators: What Health Centers Need to Know. Oral presentation for the Webinar for Farmworker Justice, Raleigh, NC.

Jahanafroozi, M., Fan, S., V. O., Parsons, C., Kathariou, S. (2016, May). Characterization of the genetic basis and stability of tetracycline resistance in an outbreak strain of *Listeria monocytogenes*. Paper presented at the Annual conference for the International Association for Food Protection, St. Louis, MO.

Jayeola, V. O., Parsons, C., Miller, G. W., Gorski, Kathariou, S. (2016, May). Ampicillin selection of *Listeria monocytogenes* mutants unable to replicate on rind of fresh cantaloupe. Paper presented at the Annual conference for the International Association for Food Protection, St. Louis, MO.

Jayeola V. O., C. Parson, M. R. Martinez, S. Kathariou. (2016, March). Persistence of *Listeria monocytogenes* on Fresh Produce. Oral presentation at the NC Governors Food Safety Task Force Meeting. Salisbury, NC.

KC, B., Morais, D.B., Smith, J.W., Seekamp, E., Peterson, M.N. (2015, June). We fish in the same hole: Characterizing networks of wildlife tourism micro-entrepreneurs. Paper presented at the 21st International Symposium on Society and Resource Management (ISSRM), Charleston, SC.

KC, B., Morais, D.B., Smith, J.W., Seekamp, E., Peterson, M.N. (2015, June). Examining social networking and social capital among wildlife tourism micro-entrepreneurs from North Carolina's Pamlico Sound Region. Paper presented at the Southeastern Recreation Research Conference, Asheville, NC.

Kuzma, J. (2016, January). GMOs and the Future of the Global Food Supply and Medical Innovations. Oral presentation at the CATO Institute debate with Robert Fraley CTO and VP of Monsanto, Washington, DC.

Kuzma, J. (2015, December). Is regulatory harmonization desirable for gene edited animals? Paper presented at the National Academy of Sciences, A Workshop of the Roundtable on Science and Welfare in Laboratory Animal Use Gene Editing to Modify Animal Genomes for Research - Scientific and Ethical Considerations. Washington, DC.

Kuzma, J. (2015, October). Designing a Regulatory System that Adapts to Emerging Risks, Technologies. Paper presentation at the Leadership in a Time of Rapid Change: Envisioning Solutions to Environmental Challenges. Duke University Nicholas School 10th Anniversary Forum, Durham, NC.

Kuzma, J. (2015, October). Genetic Engineering: A New Phase of Policy and Perception. Paper presented at the Population Medicine Seminar, Vet School, NCSU/UNC/Duke, Raleigh, N.C.

Kuzma, J. (2015, June). No Hands at the Wheel? Gene Drives, Genetic Engineering, and Society. Oral presentation at the Duke University, Periodic Tables, Durham's Science Caf, Durham, NC.

Kuzma, J. (2015, June). Risk and Media. Plenary panel presentation at the Biotechnology Literacy Project Boot camp. Academics Review, U of FL, and Genetic Literacy Project workshop, University of CA-Davis, Davis, CA.

*Leitschuh, C. (2016, February). Eradicating invasive rodents from islands: An assessment of current and future Technologies. Paper presentation at A Roadmap for Gene Drives: A Deliberative Workshop to Develop Frameworks for Research and Governance, North Carolina State University, Raleigh, NC.

*Leitschuh, C., *Serr, M. (2015, October). Genetic and Behavioral Comparisons of Wild and Lab Mice. Oral presentation at SRY Mice: An International Workshop on Invasive Rodents, National Wildlife Research Center, Fort Collins, CO.

Londono, B. L., Patel, J., Vaughn, M., Funkhouser, S., Ponnusamy, L., Grippin, C.G., Jameson, S., Apperson, C., Mores, C.N., Wesson, D.W., Colpitts, T.M., Meshnick, S.R. (2015, October). Poster presented at the 64th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Philadelphia, PA.

Lorenzen, M.D. (2016, May). Progress towards genome-wide insertional mutagenesis of the Western corn rootworm. Invited Oral Presentation at the Bayer CropScience Seminar, Research Triangle Park, NC.

Lorenzen, M.D. (2015, August). How do you solve a problem like Medea? Invited oral presentation at the USDA-ARS-CGAHR Seminar, Manhattan, KS.

Marayati, B.F., Apperson, C., Schal, C., Ponnusamy, L., Kakumanu, M., Wasserberg, G. (2015, October). Identifying oviposition attractants from the larval rearing medium of *Phlebotomus papatasi*, the vector of Old-World zoonotic cutaneous leishmaniasis. Poster presented at the 64th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Philadelphia, PA.

McPhie, D., Burrack, H.J. (2015, November). Assessment of simulated damage by *Anthonomus signatus* (Say) in southeastern plasticulture strawberry production. Paper presented at the Entomological Society of America Annual Meeting. Minneapolis, MN.

Meshnick, S. R., Van Treuren, W., Ponnusamy, L., Gonzalez, A., Parobek, C., Juliano, J., Andreadis, T., Falco, R., Brinkerhoff, J., Beati Ziegler, L., Hathaway, N., Keeler, C., Emch, M., Bailey, J., Roe, M., Apperson, C., Knight, R. (2015, October). Geographic variation in the microbiota of Ixodes ticks from the Eastern United States. Poster presented at the 64th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Philadelphia, PA.

Merchan, H.A., Burrack, H.J. (2015, November). Testing the robustness of GLM Bayesian GLM, and Maximum Likelihood for the estimation of LC50 in different experimental setups using simulations. Paper presented at the Entomological Society of America Annual Meeting. Minneapolis, MN.

Meshnick, S. R., Wallace, J., Vaughn, M., Funkhouser, S., Lee, S., Kakumanu, M., Ponnusamy, L., Apperson, C. (2015, October). Incidence of tick-borne infections in a cohort of North Carolina outdoor workers. Poster presented at the 64th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Philadelphia, PA.

Niedermeyer, J., Foster, D., Kirchner, M., Bolinger, H., Miller, W.G., Kathariou, K. (2016, May). Impact of enrofloxacin treatment on fecal populations of *Campylobacter* spp. in calves. Paper presented at the IAFP European Symposium on Food Safety, Athens, Greece.

Nowell, B., Velez, A., Hano, M., *Sudweeks, J., Albrecht, K. (2015, June). Investigating Network Boundaries in Complex Problem Domains: A Tale of Three Networks. Paper presented at the Public Management Research Association (PMRA) Conference, Minneapolis, MN.

Peterson, M.N. (2015, November). The Housing Bomb: Challenges and Solutions for Landscape Scale Wildlife Conservation Posed by Housing. Oral presentation at the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies, Asheville, NC.

*Pitts, E.A. (2016, March). *Techne* as Discursive/Material Communication: An Ethnographic Approach. Paper presented at the Qualitative Research in Management and Organization Conference, Albuquerque, NM.

*Pitts, E.A. (2015, October). Ethics of Biotechnical Communication. Paper presented at the International Communication Association Nordic Regional Conference: Responsible

Communication and Governance, Copenhagen, Denmark.

*Pitts, E., *Serr, M., *Leitschuh, C., Godwin, J. (2015, September). Of Mice and Reagents: Standardization, Variation, and Quality of Care. Paper presentation at the Atlanta Conference on Science and Innovation Policy, Georgia Tech University, Atlanta, GA.

Serenari, C., Peterson, M.N. (2015, June). Why North Carolina hunters and anglers illegally take wildlife: A sociopolitical perspective. Paper presentation at the 21st International Symposium on Society and Resource Management (ISSRM). Charleston, SC.

*Serr, M. *Valdez, R. *Backus, G, *Leitschuh, C. *Pitts, E. (2015, June). Interdisciplinary perspectives on evaluating new technologies for invasive species management. Paper presented at the International Symposium on Society and Resource Management Conference, Charleston, SC.

Shi, Q., McCord, M., Roe, R., Apperson, C. (2015, October). Non-insecticidal bite-proof textiles for military and personal protection clothes. Oral presentation at The Fiber Society 2015 Fall Meeting and Technical Conference, Raleigh, NC.

Silvy, E., Peterson, M.N., Heinen, J., Langerhans, R.B. (2015, August). Illegal Harvest of Marine Resources on Andros Island and the Legacy of Colonialism. Paper presented at the 145th Annual Meeting of the American Fisheries Society, Portland, OR.

Swoboda-Bhattarai, K., Burrack, H.J. (2015, November). *Drosophila suzukii* infestation in commercial blackberry fields in North Carolina. Paper presented at the Entomological Society of America Annual Meeting. Minneapolis, MN.

Toennisson, T.A., Burrack, H.J., Klein, J. (2015, November). Evaluating the efficacy of non-crop flowering plants for conservation biocontrol in an organic field cropping system. Paper presented at the Entomological Society of America Annual Meeting. Minneapolis, MN.

*Valdez, R.X., Peterson, M.N. (2015, June). Content analysis of media articles for rodent eradications: from poison to gene modification. Oral presentation at the 21st International Symposium on Society and Resource Management (ISSRM), Charleston, SC.

Vogel, K.M. (2015, September). Biotechnology and Bioterrorism: Re-Conceptualizing Bioweapons Threats. Paper presented at the Center for Global Security Research, Lawrence Livermore National Laboratory, Livermore, CA.

Vogel, K.M. (2015, June). Biological Warfare and Terrorism. Paper presented at the 7th Annual Center on Irregular Warfare and Armed Groups (CIWAG) Symposium, Irregular Warfare and Armed Groups: Retrospect and Prospect, United States Naval War College, Newport, RI.

Vogel, K.M. (2015, November). Interdisciplinary Teams for Intelligence Analysis: An Experiment at NC State. Paper presented at the 2015 Society for Social Studies of Science, Denver, CO.

Vogel, K.M. (2015, September). Creation of Multidisciplinary Teams for Improving Intelligence Analysis: A Natural Experiment at NC State. Paper presented at the 2015 American Political Science Association, San Francisco, CA.

Partnerships/Collaborations

Academic Partner 1

Active Status

Yes

Partner Name

University of Adelaide

Type of partner

Ph.D.-granting institution

Funding arrangement for this partner

Other :In development

Activities for this partner/institution

Facilities: IGERT trainees or faculty use a partner organization's facilities for project activities.

Collaborative Research/Teaching: Partner organization's personnel work with IGERT project staff on collaborative research/teaching.

Personnel Exchange: IGERT Trainees, faculty and/or partner organization personnel use each other's facilities or work at each other's sites on an ad hoc or as-needed basis.

Activities for this partner/institution

Joint research project on insect genomics

Government Partner 1

Active Status

Yes

Partner Name

U.S. Naval Medical Research Unit - 6 Peru (NAMRU-6)

Type of government agency

U.S. Federal **laboratory or research facility**

Funding arrangement for this partner

Other :A separate NIH funded project on Dengue provides a CRADA contract to partner for the purposes of providing services or support of IGERT research related to the NIH project

Activities for this partner/institution

Facilities: IGERT trainees or faculty use a partner organization's facilities for project activities.

Collaborative Research/Teaching: Partner organization's personnel work with IGERT project staff on collaborative research/teaching.

Personnel Exchange: IGERT Trainees, faculty and/or partner organization personnel use each other's facilities or work at each other's sites on an ad hoc or as-needed basis.

Activities for this partner/institution

We have a joint research project in Iquitos Peru on Dengue epidemiology and potential for use of transgenic mosquitoes

Government Partner 2

Active Status

Yes

Partner Name

Centro Regional de Investigación en Salud Pública, INSP, Mex

Type of government agency

Foreign institution or foreign government/agency :
Mexico

Funding arrangement for this partner

Other :In development

Activities for this partner/institution

Facilities: IGERT trainees or faculty use a partner organization's facilities for project activities.

Collaborative Research/Teaching: Partner organization's personnel work with IGERT project staff on collaborative research/teaching.

Personnel Exchange: IGERT Trainees, faculty and/or partner organization personnel use each other's facilities or work at each other's sites on an ad hoc or as-needed basis.

Activities for this partner/institution

Two Cohort 3 fellows, Jennifer Baltzegar & Mike Jones, will be helped by INSP while working in Mexico this summer on the maize weevil per their 3rd year funding proposal (see Research Achievements). They will spend 3 weeks in Mexico gathering economic and biological data from local farms. Janine Ramsey (Instituto Nacional de Salud Pública) has already assisted them with site selection locales and will provide logistical support in country. Jen & Mike will also co-author an interdisciplinary paper describing the bio-economic landscape of the maize weevil in this region and will aim for publication in a journal such as the Journal of Economic Entomology or Journal of Stored Products Research. In addition, Jen will use genetic data collected with previous work to publish a paper on the genetic structure of MW populations in Oaxaca and Chiapas. Mike will use economic data gathered as preliminary data in a future proposal, which will encompass the majority of his dissertation.

Other Partner 1

Active Status

Yes

Partner Name

CIMMYT - International Maize and Wheat Improvement Center

Funding arrangement for this partner

Other :In development

Activities for this partner/institution

Facilities: IGERT trainees or faculty use a partner organization's facilities for project activities.

Collaborative Research/Teaching: Partner organization's personnel work with IGERT project staff on collaborative research/teaching.

Personnel Exchange: IGERT Trainees, faculty and/or partner organization personnel use each other's facilities or work at each other's sites on an ad hoc or as-needed basis.

Activities for this partner/institution

Two of our fellows from Cohort 3, Jennifer Baltzegar & Mike Jones, will be helped by CIMMYT when they work in Mexico this summer on the maize weevil per their 3rd year funding proposal (see Research Achievements). They will spend 3 weeks in Mexico gathering economic and biological data from local farms in preselected field sites. Martha Willcox (CIMMYT) has already assisted them with site selection locales and will provide logistical support in country. Jen & Mike will also co-author an interdisciplinary paper describing the bio-economic landscape of the maize weevil in this region and will aim for publication in a journal such as the Journal of Economic Entomology or Journal of Stored Products Research. In addition, Jen will use genetic data collected with previous work to publish a paper on the genetic structure of MW populations in Oaxaca and Chiapas. Mike will use economic data gathered as preliminary data in a future proposal, which will encompass the majority of his dissertation.

Other Partner 2

Active Status

No

Partner Name

UN FAO Food and Agriculture Organization

Funding arrangement for this partner

No funding/direct financial interaction is involved in this partnership.

Activities for this partner/institution

Collaborative Research/Teaching: Partner organization's personnel work with IGERT project staff on collaborative research/teaching.

Personnel Exchange: IGERT Trainees, faculty and/or partner organization personnel use each other's facilities or work at each other's sites on an ad hoc or as-needed basis.

Internships: IGERT Trainees or faculty work in a partner's facilities specifically as interns.

Activities for this partner/institution

Other Partner 3

Active Status

Yes

Partner Name

OECD France

Funding arrangement for this partner

Partner provides funding to the IGERT project for research, curriculum, or other project activities, but not directly for trainees.

Activities for this partner/institution

Collaborative Research/Teaching: Partner organization's personnel work with IGERT project staff on collaborative research/teaching.

Activities for this partner/institution

co-sponsoring symposium on developing a regulatory structure for gene drive in pest species

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