

Annual Report - 2015

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

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

Name: Andrew R. Binder

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

Role in Project: Trainee/Associate Advisor

Name: Matthew M. Booker

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

Role in Project: Trainee/Associate Advisor

Name: Zachary S. Brown

Project Years Active: 2013-2014, 2014-2015

Role in Project: Trainee/Associate Advisor

Name: Hannah J. Burrack

Project Years Active: 2014-2015

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

Role in Project: Trainee/Associate Advisor

Name: John R. Godwin

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

Role in Project: Trainee/Associate Advisor

Name: Kevin Gross

Project Years Active: 2013-2014, 2014-2015

Role in Project: Trainee/Associate Advisor

Name: Nick Haddad

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

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

Name: Nora Haenn
Project Years Active: 2011-2012, 2012-2013, 2013-2014, 2014-2015
Role in Project: Co-PI

Name: William C. Kimler
Project Years Active: 2013-2014, 2014-2015
Role in Project: Trainee/Associate Advisor

Name: William Kinsella
Project Years Active: 2011-2012, 2012-2013, 2013-2014, 2014-2015
Role in Project: Co-PI and Trainee/Associate Advisor

Name: Jennifer Kuzma
Project Years Active: 2013-2014, 2014-2015
Role in Project: Trainee/Associate Advisor

Name: Alun Lloyd
Project Years Active: 2011-2012, 2012-2013, 2013-2014, 2014-2015
Role in Project: Co-PI and Trainee/Associate Advisor

Name: Marce D. Lorenzen
Project Years Active: 2012-2013, 2013-2014, 2014-2015
Role in Project: Trainee/Associate Advisor

Name: Lisa McGraw
Project Years Active: 2013-2014, 2014-2015
Role in Project: Trainee/Associate Advisor

Name: Carolyn R. Miller
Project Years Active: 2013-2014, 2014-2015
Role in Project: Trainee/Associate Advisor

Name: Melinda S. Morrill
Project Years Active: 2012-2013, 2013-2014, 2014-2015
Role in Project: Trainee/Associate Advisor

Name: Nils Peterson
Project Years Active: 2013-2014, 2014-2015
Role in Project: Trainee/Associate Advisor

Name: Mitch A. Renkow
Project Years Active: 2013-2014, 2014-2015
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
Role in Project: Trainee/Associate Advisor

Name: Maxwell J. Scott

Project Years Active: 2014-2015
Role in Project: Trainee/Associate Advisor

Name: Walter N. Thurman
Project Years Active: 2012-2013, 2013-2014, 2014-2015
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

Name: Gregory A. Backus
Total number of months funded: 23
Project Years Active:
2013-2014 Project Year - Trainee supported for 11 months
2014-2015 Project Year - Trainee supported for 12 months

Name: Jennifer F. Baltzegar
Total number of months funded: 12
Project Years Active:
2014-2015 Project Year - Trainee supported for 12 months

Name: Jessica C. Barnes
Total number of months funded: 12
Project Years Active:
2014-2015 Project Year - Trainee supported for 12 months

Name: Amanda C. Clayton
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

Name: Johanna E. Elsensohn
Total number of months funded: 12
Project Years Active:
2014-2015 Project Year - Trainee supported for 12 months

Name: Nicole E. Gutzmann
Total number of months funded: 12
Project Years Active:
2014-2015 Project Year - Trainee supported for 12 months

Name: Michael S. Jones
Total number of months funded: 12

Project Years Active:

2014-2015 Project Year - Trainee supported for 12 months

Name: Sheron King

Total number of months funded: 12

Project Years Active:

2014-2015 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: 23

Project Years Active:

2013-2014 Project Year - Trainee supported for 11 months

2014-2015 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: 23

Project Years Active:

2013-2014 Project Year - Trainee supported for 11 months

2014-2015 Project Year - Trainee supported for 12 months

Name: Megan E. Serr

Total number of months funded: 23

Project Years Active:

2013-2014 Project Year - Trainee supported for 11 months

2014-2015 Project Year - Trainee supported for 12 months

Name: Molly S. Storment

Total number of months funded: 35

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

Name: Jayce Sudweeks

Total number of months funded: 12

Project Years Active:

2014-2015 Project Year - Trainee supported for 12 months

Name: Rene X. Valdez

Total number of months funded: 23

Project Years Active:

2013-2014 Project Year - Trainee supported for 11 months

2014-2015 Project Year - Trainee supported for 12 months

Name: Sophia H. Webster

Total number of months funded: 35

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

Name: Gabriel L. Zilnik

Total number of months funded: 35

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

Associates

Name: Arun Babu

Project Years Active: 2014-2015

Name: Sarah Barnhill

Project Years Active: 2014-2015

Name: Sarah A. Cash

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

Name: Zachery DeVries

Project Years Active: 2014-2015

Name: Rebecca M. Edman

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

Name: Dona Kanavy

Project Years Active: 2013-2014, 2014-2015

Name: Rosemary Keane

Project Years Active: 2014-2015

Name: Ashley R. Kelly

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

Name: Meagan Kittle Autry

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

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

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

Name: Tina Ndoh
Project Years Active: 2014-2015

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

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

Name: Lauren Roland
Project Years Active: 2014-2015

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

Accomplishments and Contributions of the IGERT

Interdisciplinary Research Achievements

First Achievement: Our 2012 student cohort's group white paper has been accepted for publication 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 of current technologies used to control dengue fever and addresses the controversial question of whether transgenic technologies should be used.

Second 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/>

Third Achievement: Under the auspices of the GES Center, we have been able to make significant advancements in expanding our interdisciplinary research and scholarship resulting in the submission of 3 NSF grant proposals (all currently under review) by GES faculty based on preliminary data accumulated through these collaborations. Dr. Jennifer Kuzma (GES Center Co-Director, Public Administration) is the head PI on 2 of the grants: Comparing Meanings of Responsible Innovation across Bioengineering Communities, and Gene Drives: A Deliberative Workshop to Develop Frameworks for Research and Governance. Dr. Matthew Booker, (GES Advisor, History), is heading the third grant titled "Archiving Agricultural Genetic Engineering and Society". This grant is based on the preliminary data gathered during the GES Oral History Project begun in Spring 2014 that focuses on preserving the contributions and experiences of the first generation of genetic engineering pioneers.

Education Achievements

First Achievement: In our third GES course over Summer 2014 students engaged with local researchers, university students and faculty, policy makers, NGOs, and citizens in Mexico City and Oaxaca, Mexico, on topics associated with the genetic engineering of agricultural plants and pests. This began with their participation in a symposium in Mexico City at CIMMYT cosponsored with NCSU and CIBIOGEM, which included Mexican students, faculty & officials. The course aimed to provide students with an experiential introduction to the topic's various complexities. At the same time, the course established intellectual and social foundations for students' participation in the Genetic Engineering and Society program throughout their doctoral studies. Students also engaged in team-building activities that probed the nature of inter-disciplinary collaboration. Students participated in reading and discussion on ethical decision-making and began to create their own ethical framework in respect to the genetic engineering.

Second Achievement: This academic year was the first year that all three of our GES courses have been taught concurrently and they all were very successful. Our newest student cohort (Cohort 3) began by taking Principles of Genetic Pest Management this past Fall at the same time that our second cohort (Cohort 2) embarked upon Governance, Systems and Modeling. Cohort 3 then moved into Emerging Technologies and Society for the Spring 2015 semester. All three of these courses are team taught by at least 3 faculty members and provide intensive instruction and discussion. Having all three courses run this year was an achievement in planning, communication, and institutional logistics. Providing such high quality courses to our cohorts is a product of faculty commitment and student feedback and the general community engagement that have come to characterize our IGERT.

Third Achievement: Our Colloquium began meeting weekly for the full duration of the 2013-2014 academic year. Our colloquia involved faculty, staff, students and postdocs from 4 different colleges at NCSU encompassing numerous disciplinary distinctions. We brought in multiple outside speakers to discuss a wide array of topics. 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. Our

colloquia have also given our GES fellows an opportunity to present multiple times as cohort teams in a generalized academic setting. The Colloquia have also given them a platform by which to receive a wide variety of input on their cohort projects at various stages as their White Paper and Cohort Website have progressed. The incoming cohort will have the same opportunity once they come to that point.

Trainee Achievements

First Achievement: Elizabeth Pitts: NSF has funded a Dissertation Improvement Grant for Elizabeth, with one of our IGERT Co-PIs, William Kinsella, as Principal Investigator and Elizabeth as Co-Investigator. The grant title is “Do-It-Yourself Biology, Deliberation, and Democracy,” Award #1456974. She is funded at \$18,000 from 15 March 2015 through 29 February 2016. This dissertation project will develop a case study of citizen deliberations about the governance of science by focusing on Do-It-Yourself Biology, a form of amateur science that makes relatively simple biotechnology practices accessible to individuals who are not affiliated with academic or corporate laboratories. Issues to be explored include how the network relates to academic and corporate scientists and other stakeholders, how US and EU regulatory structures inform and respond to the network, and the consequences these negotiations pose for genetically modified organisms and the future of genetic sciences.

Second Achievement: Jen Baltzegar, Johanna Elenshon, Sheron King, Elizabeth Pitts, Jayce Sudweeks, Sophia Webster, Rene Valdez: In collaboration with several other graduate students, this group comprised of trainees from all three cohorts presented "Mapping Responsible Innovation: A First Principles Approach" at the International Genetic Engineering Machines (iGEM) Competition in Boston, MA, October 30 – November 3. They won Best Policy and Practices Project as well as an iGEM Silver Award for this project. This project explores the research question, How can we act responsibly with respect to genetic engineering? Specifically, they developed an iterative concept mapping tool that prompts people to articulate the values that guide their own definitions of responsible innovation, and to consider their values in relation to other people's. This first version focuses on values associated with genetically engineered plants, but over time, this tool will also become relevant to other emerging technologies.

Third Achievement: Tim Antonelli: Tim has been offered a full-time tenure-track faculty position in Statistics and Probability in the math department at Worcester State University, in Worcester, MA, beginning September 2015. This is a teaching position with a full teaching load of 4 courses per semester that Tim is excited to accept. He will be our first IGERT fellow to graduate with his PhD and the GES minor. He is currently finalizing a resubmission of his first dissertation chapter on how density-dependent population dynamics affect predictions for the spread of Wolbachia in an insect host population. He is also beginning the writing stages of a parameter estimation chapter that will use data from Iquitos, Peru and several statistical techniques to estimate larval growth and mortality in the field. He collected the data in the summer of 2013, the entirety of which he spent in Iquitos, thanks to the collaborations he was able to make through IGERT.

International Opportunities: Achievements

Research/Educational Achievement 1: Amanda Clayton: Amanda's dissertation involves continuous collaboration with our governmental partner, NAMRU-6 in Iquitos, Peru. Her continued interaction with Dr. Amy Morrison to access NAMRU's dengue fever transmission control compliance records is essential to the completion of her PhD thesis. Together with with Amy Morrison and Tom Scott, she has identified several areas in which NAMRU-6 is missing important information about household behavior in terms of the impacts of dengue on the household and in terms of NAMRU survey methods in general. She will traveling to Iquitos and Lima in June and July of this coming summer (2015) to collect survey data necessary to fill those knowledge gaps.

Research/Educational Achievement 2: Tim Antonelli: Tim is currently finalizing a resubmission of the first chapter of his dissertation on how density-dependent population dynamics affect predictions for the spread of Wolbachia in an insect host population. He is also beginning the writing stages of a parameter estimation chapter that will use data from Iquitos, Peru and several statistical techniques to estimate larval growth and mortality in the field. He collected the data in the summer of 2013, the entirety of which he spent in Iquitos, thanks to the collaborations he was able to make through IGERT. He plans to use these data to make inferences regarding the variance of mosquito habitability across Iquitos, and to use synthetic data generation to answer important experimental design questions, in order to optimize the power of future experiments.

Research/Educational Achievement 3: Megan Serr & Caroline Leitschuh: In November 2013, two of our students from the 2013 Cohort returned to the Farallon Islands off the cost of San Francisco to catch wild mice to study for rodent eradication purposes. This past year has been a huge success for our wild mouse colony. They are finishing construction on sheltered housing with plans to move the mice into a more natural environment to explore their behavior. This knowledge is a vital piece of the puzzle as the group is exploring the use of biotechnology for rodent eradication. This involves constructing a genetically engineered mouse that doesn't produce female offspring. As only males are produced, it drives the population extinct. As the plan for eradication is to release genetically engineered males who will mate with the island females, they performed a proof of concept to ensure that our wild mice will indeed mate with lab males. This was a successful event with all females mating and producing offspring with lab males.

Outreach Activities

Title: Bald Head Island Conservancy

Media Outlet/Organization: Bald Head Island Conservancy

Activity Date: 06/12/2014

Description: Dr. Kevin Gross and IGERT trainee Greg Backus went to visit and collaborate with researchers and community members at the Bald Head Island

Conservancy on Bald Head Island, on the outer banks of North Carolina.

Title: BugFest!

Media Outlet/Organization: North Carolina Museum of Natural Sciences

Activity Date: 09/20/2014

Description: Many of our faculty and fellows attended and exhibited at Raleigh's annual BugFest. Over 35,000 visitors annually interact with entomologists and other scientists. Again this year, Tim Antonelli presented on "Using Math to Help Control Mosquitoes!".

Title: Chef's Collaborative

Media Outlet/Organization: Chef's Collaborative

Activity Date: 09/29/2014

Description: Dr. Jennifer Kuzma was an expert panelist for a discussion at the Chef's Collaborative, a national conference for over 300 chefs. She participated in a panel that discussed public policy and genetic engineering & society.

Title: Living in a Genetically Engineered World

Media Outlet/Organization: North Carolina School of Science and Math

Activity Date: 03/27/2015

Description: Dr. Fred Gould met with local middle school and high school students at the North Carolina School of Science and Math in a statewide science competition to discuss the current state of genetic engineering and society.

Title: Making Pests Nicer

Media Outlet/Organization: Entomological Society of America

Activity Date: 11/19/2014

Description: Dr. Fred Gould met with local undergraduates in Portland, OR, during the Entomological Society of America's annual meeting to discuss the current state of genetic engineering as regards agricultural pests.

Title: Millennium Scholars Recruitment

Media Outlet/Organization: Gates Foundation

Activity Date: 03/02/2015

Description: Dr. Fred Gould gave a presentation to and engaged in discussion with Gates Foundation funded under-represented minority college students about careers in Genetic Engineering and Entomology.

Title: Pints of Science - Artificial Intelligence Comes of Age

Media Outlet/Organization: North Carolina Museum of Natural Sciences

Activity Date: 02/24/2015

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 Tuesday of every month at a local bar, Tir Na Nog.

Title: Pints of Science - City Ants & Junk Food

Media Outlet/Organization: North Carolina Museum of Natural Sciences

Activity Date: 01/27/2015

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: Pints of Science - Epidemiology: Defending Observation

Media Outlet/Organization: North Carolina Museum of Natural Sciences

Activity Date: 03/24/2015

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 Tuesday of every month at a local bar, Tir Na Nog.

Title: Pints of Science - Fear and Loathing in La Cocina

Media Outlet/Organization: North Carolina Museum of Natural Sciences

Activity Date: 08/26/2014

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: Pints of Science - Genetically Modified Harvest

Media Outlet/Organization: North Carolina Museum of Natural Sciences

Activity Date: 11/25/2014

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: Pints of Science - True Stories of a Pollster: Survey's Darkest Secrets

Media Outlet/Organization: North Carolina Museum of Natural Sciences

Activity Date: 10/28/2014

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: Pints of Science - When Local Food Left the City

Media Outlet/Organization: North Carolina Museum of Natural Sciences

Activity Date: 09/23/2014

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: University Scholars Program

Media Outlet/Organization: N. C. State University

Activity Date: 11/10/2014

Description: Dr. Jennifer Kuzma gave two lectures for 300 students each for the University Scholars Program at N.C. State University regarding public policy and genetic engineering & society.

Publications, Presentations, and Patents

Journal Articles in Refereed Publications

5a. Journal Articles in Refereed Publications

Bouchev, M., & Delborne, J. (2014). Redefining safety in commercial space: Understanding debates over the safety of private human spaceflight initiatives in the United States. *Space Policy*. 30(2), 5361. doi:10.1016/j.spacepol.2014.03.002

Bradbury, M., Peterson, M.N., & Liu, J. (2014). Long-term dynamics of household size and their environmental implications. *Population and Environment*. 36, 7384.

Brown, J., Fatehi, L., & Kuzma, J. (2015). Altruism and Skepticism in public attitudes toward food nanotechnology. *Journal of Nanoparticle Research*. 17,122-140.

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.S., & 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.

Chen, H.C., Song, J., Ducoste, J., Shuford, C.M., Liu, J., Li, Q., Shi, R., Nepomucino, A., Isik, F., Muddiman, D.C., Williams, C., Sederoff, R.R. & Chiang, V.L. (2014). Systems Biology of Lignin Biosynthesis in *Populus trichocarpa*: Heteromeric 4-Coumaric acid: CoA Ligase (4CL) Protein Complex Formation, Regulation and Numerical Modeling. *Plant Cell*. 26, 876-893.

Colwell, R.K., & *Elsensohn, J.E. (2014). EstimateS turns 20: statistical estimation of species richness and shared species from samples, with non-parametric extrapolation. *Ecography*. 37(6), 609-613. DOI: 10.1111/ecog.00814

Cowles, R.S., Rodriguez-Saona, C.R., Holdcraft, R., Loeb, G.M., *Elsensohn, J.E., & Hesler, S.P. (2014). Sucrose improves insecticide activity against *Drosophila suzukii* (Diptera: Drosophilidae). *Journal of Economic Entomology*. doi:10.1093/jee/tou100

Egkwu, N., Sonenshine, E.B, Bissinger, B.W., & Roe, R.M. (2014). Transcriptome of the female synganglion of the black-legged tick *Ixodes scapularis* (Acari: Ixodidae) with comparison between Illumina and 454 systems. *PlosOne*. 9:e102667.

Evans, S. W., Jasanoff, S., Calvert, J., Delborne, J., Doubleday, R., Frow, E., Funtowicz, S., Green, B., Guston, D.H., Hurlburt, B., Irwin, A., Joly, P., Kuzma, J., Palmer, M., Race, M., Stilgoe, J., Stirling, A., Wilsdon, J., Winickoff, D., Wynne, B., & Zoloth, L. (2014). CORRESPONDENCE: Synthetic biology: Missing the point. *Nature*. 510(7504), 218. doi:10.1038/510218b.

Fatal, S. & Thurman, W.N. (2014). The Response of Corn Acreage to Ethanol Plant Siting. *Journal of Agricultural and Applied Economics*. 46, 157-171.

Garabedian, J. E., McGaughey, R.J., Reutebuch, S.E., Parresol, B.R., Kilgo, J.C., Moorman, C.E., & Peterson, M.N. (2014). Quantitative analysis of woodpecker habitat using high-resolution airborne LiDAR estimates of forest structure and composition. *Remote Sensing of Environment*. 145, 6880.

Garabedian, J. E., Moorman, C.E., Peterson, M.N, & Kilgo, J.C. (2014). Systematic review of the influence of foraging habitat on red-cockaded woodpecker reproductive success. *Wildlife Biology*. 20, 3746.

Grubbs, N., Haas, S., Beeman, R. & Lorenzen, M.D. (2015). The ABCs of Eye Color in *Tribolium castaneum*: Orthologs of the *Drosophila* white, scarlet, and brown Genes. *Genetics*. 199, 749759.

Guerra, C.A., Reiner, R.C., Perkins, T.A., Lindsay, S.W., Midega, J., Brady, O.J., Barker, C.M., Reisen, W.K., Harrington, L.C., Taken, W., Kitron, U., Lloyd, A.L., Hay, S.I., Scott, T.W. & Smith, D.L. (2014). An assembly of adult female mosquito mark-release-recapture data to inform vector-borne pathogen transmission models. *Parasites and Vectors*. 7(276). doi:10.1186/1756-3305-7-276

Hollingsworth, T.D., Pulliam, J.R.C., Funk, S., Truscott, J.E., Isham, V. & Lloyd, A.L. (2014). Seven challenges for modelling indirect transmission: vector-borne diseases, macroparasites and neglected tropical diseases. *Epidemics*. doi:10.1016/j.epidem.2014.08.007

Jacobs, K.L., Thurman, W.N., & Marra, M.C. (2014). The Effect of Conservation Priority Areas on Bidding Behavior in the Conservation Reserve Program. *Land Economics*. 90, 1-25.

Kuzma, J. (2015). Translational Governance Research for Synthetic Biology. *Journal of Responsible Innovation*. DOI: 10.1080/23299460.2014.1002055

Kokotovich, A. & Kuzma, J. (2014). Anticipatory governance and contested futures: Insights from the next generation of genetic engineering. *Bulletin of Science, Technology and Society* 34(4): 108-120.

Li, F., Wantuch, H.A., Linger, R.J., Belikoff, E.J., & Scott, M.J. (2014). Transgenic sexing system for genetic control of the Australian sheep blow fly *Lucilia cuprina*. *Insect Biochemistry and Molecular Biology*. 51: 80-88. doi: 10.1016/j.ibmb.2014.06.001

- Li, Q., Song, J., Peng, S., Wang, J. P-Y., Guanzheng Qu, G., Sederoff, R.R., & Chiang, V.L. (2014) Plant biotechnology for lignocellulosic biofuel production. *Plant Biotechnology*. 9, 1174-1192.
- Li, W., Lin, Y-L., Li, Q., Shi, R., Lin, C-Y., Chen, H., Chuang, L., Qu, G., Sederoff, R.R., & Chiang, V.L. (2014). A robust chromatin immunoprecipitation (ChIP) protocol for studying transcription factor (TF)-DNA interactions and histone modifications in wood forming tissue. *Nature Protocols*. 9, 2180-2193.
- Lin, C-Y., Wang, J.P., Li, Q., Chen, H.C., Liu, J., Loziuk, P., Muddiman, D.C., Sederoff, R.R. & Chiang, V.L. (2014). 4-Coumaroyl and Caffeyoyl 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(1), 176-187.
- Lin, Y-L., Li, W., Chen, H., Li, Q., Sun, Y-H., Shi, R., Lin, C-Y., Wang, J.P., Chen, H-C., Chuang, L., Qu, G., Sederoff, R.R., & Chiang, V.L. (2014). A simple high throughput xylem protoplast system for studying wood formation. *Nature Protocols*. 9, 2194-2205.
- Losiuk, P., Sederoff, R.R., Chiang, V.L., & Muddiman, D.C. (2014). Establishing ion ratio thresholds based on absolute peak area for absolute protein quantification using protein cleavage isotope dilution mass spectrometry. *The Analyst*. 139, 5439-5450.
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- Okamoto, K.W., Robert, M.A., Gould, F. & Lloyd, A.L. (2014). Feasible introgression of an anti-pathogen transgene into an urban mosquito population without using gene-drive. *PLoS Neglected Tropical Diseases* 8(7), e2827. doi:10.1371/journal.pntd.0002827
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Yue, C. Shuoli, Z, & Kuzma, J. (2014). Heterogeneous Consumer Preferences for Nanotechnology and Genetic-Modification Technology in Food Products. *Journal of Agricultural Economics*. DOI: 10.1111/1477-9552.12090.

Journal Articles in Non-Refereed Publications

5b. Journal Articles in Non-Refereed Publications

*Pitts, E.A. (2015). Review of Shaping Emerging Technologies: Governance, Innovation, Discourse. *NanoEthics*. 9(1). doi:10.1007/s11569-015-0221-6

Vogel, K.M., Ouagrham-Gormley, S.B., Grunberg, S. & Paperno, S. (2014). A Man Named Guenna. *Cultures*. 1(4), 76-85.

Books

5c. Books

McCleery, R.A., Moorman, C., & Peterson, M.N. (2014). *Urban Wildlife Conservation: Theory and Practice*. Gainseville: Springer. ISBN 978-1-4899-7500-3

Book Chapters

5d. Book Chapters

Delborne, J.A. (2014). Navigating Controversies in Search of Neutrality: Analyzing Efforts by Public Think Tanks to Inform Climate Change Policy. In Crow, D.A. & Boykoff, M. (Eds.), *Culture, Politics, and Climate Change: How Information Shapes our Common Future* (163179). New York, NY: Routledge/Earthscan. IBSN 978-0-415-66149-2.

Harremoës, P. & revised by Delborne, J. (2015). Precautionary Principle, in J.

B.Holbrook (Ed.), Ethics, Science, Technology, and Engineering: A Global Resource (2nd ed., Vol. 3, 449455). Farmington Hills, MI: Macmillan Reference USA. ISBN 978-0-028-66213-8.

Hoopes, J. & Delborne, J. (2015). HeLa Cells, in J. B. Holbrook (Ed.), Ethics, Science, Technology, and Engineering: A Global Resource (2nd ed., Vol. 2, 446448). Farmington Hills, MI: Macmillan Reference USA. ISBN 978-0-028-66213-8.

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 Agrobacterium Protocols, third edition. Ed. K. Wang, (357-364). Gainseville: Springer. ISBN 978-1-59745-131-4.

Conference Presentations

5h. Conference Presentations

*Antonelli, T. (February, 2015). Population Biology of Gene Drive Strategies for Pest Management. Symposium at the IGERT Colloquium, Raleigh, NC.

*Antonelli, T. (January, 2015). The effect of assuming a constant population size in models for the spread of Wolbachia. Paper presentation at the Joint Mathematics Meetings, San Antonio, TX.

*Antonelli, T. (November, 2014). Keeping the Population in Population Genetics: The effect of assuming a constant population size in models for the spread of Wolbachia. Paper presentation at the 10th Annual UNCG Regional Mathematics and Statistics Conference, Greensboro, NC.

*Antonelli, T. (September, 2014). Using Math to Help Control Mosquitoes! Poster presentation at BugFest. Raleigh, NC.

*Antonelli, T., Gould, F., Lloyd, A.L. (August, 2014). Estimating Larval Development and Mortality Rates for *Ae. aegypti* in Iquitos, Peru. Poster presentation at the Workshop on Parameter Estimation and Uncertainty Quantification, Raleigh, NC.

*Antonelli, T., Gould, F., Lloyd, A.L. (June, 2014). Estimating Larval Development and Mortality Rates for *Ae. aegypti* in Iquitos, Peru. Poster presentation at the Ecology and Evolution of Infectious Disease 12th Annual Conference. Fort Collins, CO.

*Backus, G., *Leitschuh, C., *Ludvik, A., *Pitts, E., *Serr, M., & *Valdez, R. (September, 2014). Conserving Island Biodiversity: Genetic Engineering and Invasive Rodents. Symposium at the Genetic Engineering and Society Fall Colloquium, North Carolina State University, Raleigh, NC.

*Backus, G., *Leitschuh, C., *Pitts, E., *Serr, M., & *Valdez, R. (July, 2014). Interdisciplinary Graduate Education and Research: Students Perspectives. Paper presentation for the Interdisciplinary Network for Group Research Conference. Raleigh,

NC.

*Baltzegar, J., *Elsenshon, J., *King, S., Ndoh, C., Nwakpuda, E., Peddycord III, B., *Pitts, E., *Sudweeks, J., *Webster, S., & *Valdez, R.X. (October, 2014). Mapping Responsible Innovation: A First Principles Approach. Oral and Poster Presentation. International Genetic Engineering Machine Competition. Boston, MA.

*Baltzegar, J. (January, 2015). Transgenic Corn and the Monarch Butterfly. Oral Presentation at the When Science and Citizens Connect: Public Engagement on Genetically Modified Organisms meeting of the National Academy of Sciences, Washington, DC.

Berry-James, R.M. (March, 2015). Social Equity, Democratic Values and the Ethic of Getting Things Done. Symposium at ASPA 2015 Annual Conference, Building a Stronger and More Equitable Society, Chicago, IL.

Berry-James, R.M., *King, S., & Riester, M. (February, 2015). Public Trust and Legitimacy: Cultural Perceptions regarding Genetically Modified Foods. Paper presentation at 2015 National Conference of Minority Public Administrator (COMPA), Philadelphia, PA.

Berry-James, R.M. (September, 2014). Promising Practices and Coordinated Approaches to End and Prevent Homelessness. Paper presentation at the 2014 SECOPA Conference on Social Welfare Policy track, Atlanta, GA.

Berry-James, R.M. (November, 2014). Winning the Race. Invited Keynote Speaker for United Nations Day of Tolerance. Co-sponsored by the Office of Multicultural Affairs and the Phi Theta Kappa International Honor Society, Raritan Valley Community College, Somerville, NJ.

Berry-James, R.M. (November, 2014). Using Alternative Resources to Help Develop a Climate of Inclusiveness and Cultural Competency in MPA Programs at Predominately White Universities. Paper presentation at the 2014 NASPAA Annual Conference, Albuquerque, NM.

Berry-James, R.M. (November, 2014). Beyond an Internship: Securing Professional Development Experiences for Early Career Students. Paper presentation at the 2014 NASPAA Annual Conference, Albuquerque, NM.

Berry-James, R.M. (October, 2014). Cultural Attitudes toward Genetically Modified (GM) Foods: Examining Trust in the NC African American Community. Symposium speaker at Genetic Engineering and Society Symposium, North Carolina State University, Raleigh, NC.

Booker, M.M. (July, 2014). Why did 20th-century Americans lose their faith in local food? Paper presentation at the Rachel Carson Center, LMU, Munich, Germany.

Carrier, S.J., Stevenson, K.T., & Peterson, M.N. (January, 2015). Supporting

environmental literacy in elementary classrooms: Obstacles and solutions. Paper presentation at the Association for Science Teacher Education (ASTE), Portland, OR.

Chu F. & Lorenzen, M.D. (November, 2014). Genetics and Genomics of *Tribolium Medea* Elements. Paper presentation at the 11th International Working Conference on Stored Product Protection, Chiang Mai, Thailand.

Chu, F. and Lorenzen, M.D. (January, 2015). Development of transgenic helper/donor *Diabrotica virgifera virgifera* strains for use in genome-wide mutagenesis. Paper presentation at the Monsanto Corn Academic Summit, St. Louis, MO.

Chu F., & Lorenzen, M.D. (November, 2014). Genetics and Genomics of *Tribolium Medea* Elements. Paper presentation at the 11th International Working Conference on Stored Product Protection, Chiang Mai, Thailand.

Chu, F., Gorski, S., Cardoza, Y., & Lorenzen, M.D. (November, 2014) Germlinetransformation of the Western corn rootworm. Paper presentation at the 62nd Annual Entomological Society of America meeting, Portland, OR.

Chu, F., Gorski, S., Cardoza, Y., & Lorenzen, M.D. (September, 2014) Germline transformation of the Western corn rootworm. Paper presentation at the 26th Annual North American Agricultural Biotechnology Council Meeting, Ithaca, NY.

Cummings, C. and J. Kuzma. (December, 2014). Multidimensional risk profiling: A scenario-based evaluation of synthetic biology applications from a multidisciplinary expert Delphi study. Paper presentation at the Society for Risk Analysis Annual Meeting, Denver, CO.

Delborne, J. (December, 2014). Anticipatory Translation: Genetically Modified Trees and Conceptualizations of Technological, Regulatory, and Cultural Futures. Seminar for Science, Technology, and Society. North Carolina State University, Raleigh, NC.

Delborne, J. (November, 2014). Biofuels, Biodiversity, and Responsible Innovation: The Case of Genetically Engineered Trees. Symposium speaker for Energy and Society Lecture Series, Consortium for Science, Policy, and Outcomes. Arizona State University, Tempe, AZ.

Delborne, J., Rivers, L., & Robinson, M. (October, 2014). Anticipating Futures in Forest Biotechnology. Symposium speaker for the Genetic Engineering and Society Colloquium. North Carolina State University, Raleigh, NC.

Delborne, J.A. (July, 2014). Transgenics & Society: Towards a Productive Dialogue. Symposium speaker for the Transgenics and Society Symposium. International Center for the Improvement of Maize and Wheat (CIMMYT). Texcoco, Mexico.

Delborne, J., Rivers, L., & Robinson, M. (August, 2014). Doubling Back on Risk Perception: Scientists, Genetically Modified Trees, and the Risks of Technological Rejection. Paper presentation at the Annual Meeting of the Society for Social Studies of

Science. Buenos Aires, Argentina.

Delborne, J.A. (August, 2014). Natural Resources: Socio-Ecological Systems and Policy. Symposium conducted at the Gordon Research Conference on Science and Technology Policy. Waterville Valley, NH.

Delborne, J. (November, 2014). Grasping Synthetic Biology. Paper presentation for circulation prior to the Workshop on Research Agendas in the Societal Aspects of Synthetic Biology. Arizona State University, Tempe, AZ. Available: <https://cns.asu.edu/synbio/papers>.

Frew, K. N., K. T. Stevenson, & Peterson, N.M. (September, 2014) Are we working to save the kinds of species our children want to protect? Evaluating biodiversity conservation preferences among children. Paper presentation at the 3rd Annual Southeastern Environmental Education Alliance (SEEA) Conference. Asheboro, NC.

Foster, M.O., Cabbage, F., McMahon, G., & Peterson, M.N. (October, 2014). Understanding the decision context for landscape scale conservation: the case of longleaf pine restoration. Paper presentation at the Society of American Foresters National Convention. Salt Lake City, UT.

Garabedian, J.E., Moorman, C.E., Peterson, M.N., & Kilgo, J.C. (October, 2014). Modeling red-cockaded woodpecker reproductive success using LiDAR-derived estimates of forest structure at the Savannah River Site, SC. Paper presentation at the 21st Annual Meeting of The Wildlife Society, Pittsburgh, PA.

*King, S. Cummings, C., Ndo, C., Stauffer, S., & Kuzma, J. (November, 2014). Synthetic Biology Policy Delphi: When Expert Opinion Meets Public Engagement. Poster presentation at the NSF-funded Workshop on the Research Agendas of the Societal Implications of Synthetic Biology, Arizona State University, Tempe, AZ.

*King, S., Reister, M., & Williams, T. (March, 2015). Genetically Modified Foods: The Good, The Bad and the Trustworthy. Poster presentation at the North Carolina State University Graduate Student Research Symposium. North Carolina State University, Raleigh, NC.

Lee, G.D., Peterson, M.N., Foster, M., & Cabbage, F.W. (July, 2014). Barriers to informed conservation decision-making. Paper presentation at the 2nd North American Congress for Conservation Biology, Missoula, MT.

*Leitschuh, C., *Serr, M., McGraw, L., & Godwin, J. (June, 2014). Island Invaders: How Island Conditions Alter the Reproductive Dynamics of Wild House Mice. Poster presentation at the Evolution Conference, Raleigh, NC.

Lloyd, A.L. (July, 2014). Modeling Novel Strategies for Controlling Mosquito-Borne Diseases. Paper presentation at the University of Pretoria, South Africa.

Lloyd, A.L. (October, 2014). Modeling Novel Strategies for Controlling Mosquito-Borne

Diseases. Oral presentation at UNC Greensboro, Greensboro, NC.

Lorenzen, M.D., Chu F., *Klobasa, W.A., & Grubbs, N. (March, 2015). Meeting Expectations: Confirming Phenotypes with RNAi. Paper presentation at the NCB-ESA Symposium: Potential of RNAi Technology in Entomology, Manhattan, KS.

Lorenzen, M.D. (January, 2015). CRISPR/Cas9-mediated Genome Engineering. Paper presentation at the Genetic Engineering and Society (GES) Colloquium. Raleigh, NC.

Ndoh, T., Kuzma, J., Cummings, C., Stauffer, S., & *King, S. (August, 2014). Regulatory Case-Study Analysis of a Synthetic Biology Application: Nitrogen fixation in rice crops through symbiosis with *Mesorhizobium loti*. Poster presentation at the Gordon Research Conference on Science and Technology Policy, Waterville Valley, NH.

Oppert, B., Perkin, L. & Lorenzen, M.D. (March, 2015). RNAi to Evaluate Targets for Stored Product Insect Control. Paper presentation at the NCB-ESA Symposium: Potential of RNAi Technology in Entomology, Manhattan, KS.

Peterson, M.N. (October, 2014). Unintended Consequences: Challenges of Exotic and Over-abundant Species. Paper presentation at the 2014 Annual Conference of the Southeastern Association of Fish and Wildlife Agencies, Destin, FL.

Peterson, M.N. (September, 2014). The Housing Bomb. Paper presentation at the Activate 14 Urban Housing Conference of the American Institute of Architects, North Carolina, Raleigh, NC.

*Pitts, E. (November, 2014). Warrior Ethos and Vernacular Memory in Facebook Memorials Honoring SEAL Team Six. Poster presentation at the National Communication Association 100th annual conference, Chicago, IL.

*Pitts, E. (July, 2014). DIY, Deliberation and Democracy. Paper presentation at the Science and Democracy Network 13th Annual Meeting, Vienna, Austria.

Robert, M.A., Okamoto, K.W., Gould, F., & Lloyd, A.L. (2014, June). Anti-pathogen genes and the replacement of populations of disease vectors: a model-based evaluation of hybrid strategies. Poster presentation at EEID 2014, Fort Collins, CO.

Robinson, M., Delborne, J., & Rivers, L. (November, 2014). Does Anticipating Futures Shape Governance? How One NGO Hopes to Predict and Shape Global Regulatory and Commercial Futures in the Creation of Genetically Modified Trees. Poster presentation for the Democratizing Technologies: Assessing the Roles of NGOs in Shaping Technological Futures Conference. University of California, Santa Barbara, CA.

Scott, M. (October, 2014). Status of Developing the Genetically Modified Screwworm Strain(s). Paper presentation at the XIV COPEG commissioners meeting, Washington, DC.

Scott, M. (August, 2014). Transgenic sexing systems for genetic control of the New

World screwworm *Cochliomyia hominivorax*. Paper presentation at the 10th European Congress of Entomology in York, England.

Scott, M. (June, 2014). Development and evaluation of male-only transgenic strains of the New World screwworm. Poster presentation at the Project Directors meeting for the Biotechnology Risk Assessment Grants (BRAG) Program, Riverdale, MD.

*Serr, M., *Leitschuh, C., McGraw, L., & Godwin, J. (February, 2015). City mouse meets country mouse: mating of wild and laboratory mouse strains. Paper presentation at the Sixteenth Annual Student/Postdoc Symposium of the W.M. Keck Center for Behavioral Biology. North Carolina State University, Raleigh, NC.

*Serr, M. & McGraw, L. (July, 2014). Choosy Females: Does Mate Choice influence the propensity to form Pair Bonds? Poster presentation at Collaborative Biomedical Research Conference on the Vole Animal Model. Oregon Health and Science University. Portland, OR.

*Serr, M., *Leitschuh, C., McGraw, L., & Godwin, J. February, 2015. City mouse meets country mouse: mating of wild and laboratory mouse strains. Paper presentation at the Sixteenth Annual Student/Postdoc Symposium of the W.M. Keck Center for Behavioral Biology. North Carolina State University, Raleigh, NC.

Silvy, E., Peterson, M.N., Heinen, J., & Langerhans, R.B (August, 2014). Deterrents and drivers of poaching in a natural resource dependent Bahamian Community. Paper presentation at the 144th Annual Meeting of the American Fisheries Society, Québec City, Quebec, Canada.

Stevenson, K. T., Carrier, S.J., & Peterson, M.N. (October, 2014). What can we learn from significant life experience research? Paper presentation at the 11th North American Association for Environmental Education Research Symposium, Ontario, Canada.

Stevenson, K. T., Frew, K., & Peterson, M.N. (October, 2014). Fostering support for EE through service learning. Paper presentation at the 43rd North American Association for Environmental Education Conference, Ontario, Canada. 2014.

Stevenson, K.T., Carrier, S.J., & Peterson, M.N. (September, 2014). What can we learn from significant life experience research? Paper presentation at the 3rd Annual Southeastern Environmental Education Alliance, Asheboro, NC.

Stevenson, K.T., Frew, K., & Peterson, M.N. (September, 2014). Fostering support for EE through service learning. Paper presentation at the 3rd Annual Southeastern Environmental Education Alliance, Asheboro, NC.

Thurman, W.N. (July, 2014). Welfare Impacts of Pollinator Health Challenges. Paper presentation at AAEE pre-conference workshop, Economics of Pollinator Health, Minneapolis, MN.

Vogel, K.M. (September, 2014). Revolution versus Evolution?: Understanding Scientific

and Technological Diffusion in Synthetic Biology and its Implications for Biosecurity Assessments. Paper presentation at the Institute for Conflict and Security Studies, Elliott School of International Affairs, George Washington University, Washington, DC.

Vogel, K.M. (August, 2014). How to Analyze and Weigh the Validity of Information Generated by Insider Accounts: Open Source Tools for the Assessment of Compliance with the Biological Weapons Convention. Paper presentation at the Expert workshop organized by the Research Group for Biological Arms Control, University of Hamburg, Geneva, Switzerland.

Vogel, K.M. (July, 2014). What is the role of tacit knowledge in what malevolent actors could achieve? Paper presentation to National Ground Intelligence Center, Charlottesville, VA.

Yue, C., Shuoli, Z, & Kuzma, J. (July, 2014). Heterogeneous Consumer Preferences for Nanotechnology and Genetic-Modification Technology in Food Products. Poster presentation at the Agricultural & Applied Economics Associations 2014 AAEA Annual Meeting, Minneapolis, MN.

Partnerships/Collaborations

Government Partner 1

Active Status

No

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

Continued involvement with the NAMRU-6 research center in Iquitos, Peru, has been critical to the success of two of our students' dissertations. Two fellows from our first cohort, Tim Antonelli and Amanda Clayton, have returned to Peru numerous times to interface with NAMRU-6 personnel in pursuit of field data relevant to their dissertation research.

Other Partner 1

Active Status

No

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

Researchers and administrators at CIMMYT interfaced via phone, email and in person with a group of our IGERT faculty to help build the framework for the 2014 Summer Course in Mexico as well as future more formal collaborations. Four of our faculty visited CIMMYT over spring break and participated in a two-party dialogue about approaches to address societal issues related to their activities in developing transgenic maize. Students and faculty will visited CIMMYT again during the summer course for further discussions and as a means to develop a more detailed plan for collaboration. In the 2015 spring semester, the director of CIMMYT visited NCSU and talked with students, faculty and administrators about opportunities for collaborations between the university and CIMMYT.

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

FAO personnel helped with the teaching of our summer 2014 IGERT course. In the future we hope to have students do internships with FAO and we also are planning to work with FAO on development of policies on GMOs. We have had correspondence and skype conversations with FAO personnel. From there we had the Chancellor of N.C. State send a letter to the Director General of FAO requesting development of a formal collaboration. This has initially enabled one FAO researcher to be given leave time in order to teach in our summer course. We expect this to lead to further formal interactions.

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