



TIPS AND EXAMPLE NSF SYNERGISTIC ACTIVITIES

As of January 2020, NSF no longer accepts biographical sketches with multiple synergistic activities “bundled” together as one activity.

 Non-compliant with multiple courses	 Single course as one synergistic activity
Developed four new graduate and undergraduate courses in <i>Principles and Practices of Gene Therapy, Stem Cell Therapeutics, Epigenetic Expression and Microbiomics in Precision Health</i> , and <i>Comparative Genetics</i> .	Developed several new courses including <i>Comparative Genomics</i> , which is designed for incoming graduate students as well as undergraduates with previous research experience. In this course, students are encouraged to apply evolutionary/comparative principles to their own research questions.

Tips:

1. Do not just name the journal where you served as editor or conference committee you chaired. Provide text that adds relevance and context.

Associate Editor for *Global Ecology and Biogeography*, the leading international journal in macroecology and biogeography (Journal Impact Factor: 5.667).

Founding member of organizing committee for the 1st Chemistry High School Symposia at Kansas State University (spring 2007) open to high school students throughout Kansas, including many students from inner-city Kansas City and rural communities. I planned activities, seminars, and lab tours for high school students; over-saw student registration and communication; and presented on undergraduate research.

Co-coordinated an international conference *Bridging the Great Divide: Advancing the Science of Multiteam Systems through International Collaboration*” (Lake Como, Italy, October 2012) to integrate multiteam systems perspectives and develop new ideas. Conference was co-sponsored by The European Association of Work and Organizational Psychology (EAWOP), NSF, and INGRoup. <http://www.delta.gatech.edu/EAWOP.php>

Chair of the XD Service Provider Forum, the representative body of federated providers of advanced HPC resources and digital services under the NSF XD program (2011-2013). I coordinated regular conference calls, the annual meeting, and communications with the XSEDE project and among the service providers and engaged new and potential service providers for the national cyberinfrastructure.

2. Include significance of your research-related activity rather than just naming the activity.

Serve as team member in the novel training and research project *Global Temperature Goals to Avoid Climate Tipping Points: A Serious Game to Support Serious Decisions* supported by Andrew F. Mellon Foundation through the Purdue Public Policy Institute. This effort explores a combination of ‘smart games,’ climate science fiction, and virtual reality to enhance science-policy engagement, educate decision-makers about climate tipping points, and learn how decision makers use this information. The first deployment of this approach has been endorsed by the UNFCCC Secretariat and the IPCC and took place on Sunday, May 6, 2018 (48th Session of the UNFCCC Subsidiary Bodies) in the Bonn Workshops held at AGU Fall meeting 2019. Founder and coordinator of *LUCKINet (Land Use Change Knowledge Integration Network, www.luckinet.org)*, an international network committed to the collaborative development of open data products on global land-use dynamics for applications in food security, climate change, biodiversity, and other issue areas in sustainable development. *LUCKINet* will soon publish (led

by the Meyer lab) consistent data products capturing three decades of global changes in multiple cropping, livestock, and forestry variables at high resolution.

Designed and wrote open-source software packages (e.g., `g_spec`, available at github.com/mreppert) for structure-based simulations of linear and 2D Amide I vibrational spectra. The software has subsequently been developed and maintained in collaboration with Chi-Jui Feng at the University of Chicago.

3. Include details on broadening participation aspects and educational impacts as much as possible in your student-focused activity descriptions.

Mentoring undergraduate laboratory project researchers at Purdue and Vanderbilt Universities. Students learn bioinformatic/genomic methods and pursue their own research projects. Two undergraduates have been co-authors on publications.

Faculty mentor for interdisciplinary The Data Mine Living Learning Communities that introduces undergraduate students to concepts in Data Science through participation in seminars, independent research, and courses on topics such as R, data visualization, bash, regular expressions, pattern matching, SQL databases, XML scraping, and parsing. The broadening participation in the Data Mine includes student representation that is nearly 70% female and 20% Black.

Developed a hands-on curriculum for a graduate chemistry course (CHM676) in *Molecular Spectroscopy*, featuring weekly Python-based coding activities and molecular dynamics simulations for visualizing spectroscopic response. Lecture notes and open-source simulation modules are available at my website mreppert.github.io/education for public use.

Supported and mentored >40 graduate students on federally funded projects, Purdue's Women in HPC initiatives, and at the XSEDE, PEARC and Supercomputing (SC) conferences and successfully recruited women graduates into Purdue's research computing center.

Mentoring high school students in Old Town, ME, on Global Learning and Observations to Benefit the Environment (GLOBE) science protocols, including participation in 2019 GLOBE Northeast/Mid-Atlantic Regional Student Research Symposia at Boston University.

4. Include publication impact details when describing authorship.

Co-Authored (with E. Gundlach) *Introduction to Probability* textbook published by W. H. Freeman (654 pages, 1st edition, June 2015) and developed a series of 237 video modules to accompany textbook. The video series is publicly accessible on the Internet.

Co-authored with L. De Marco (now at UC Boulder) an online textbook *Nonlinear Spectroscopy: Fundamentals and Applications*. The text was originally developed for instructing junior graduate students during my doctoral research and was used as the basis for a weekly lecture series in July 2015 in the Department of Chemistry at the University of Chicago. The text continues to be actively developed and is available at my website mreppert.github.io/education.

4. Consider including a topical subheading for each synergistic activity.

- **Service to Research Community:** Regular (co-/main) organizer of international conferences, sessions, and workshops. Most recently, chair of 'Essential Climate Change Variables' world café session at the 2018 open science meeting of the Global Land Programme (GLP), to kick-start a GLP working group on developing 'essential variables' for climate change science.
- **Development of global economic model and databases:** Developed the GTAP framework that has garnered more than 4,000 Google Scholar citations and the associated database, now

available as version 9.1, is used by thousands of researchers around the world for analysis of global economic policy and has been published by Cambridge University Press. The GTAP land use and GHG emissions databases were developed under an inter-disciplinary USEPA project led by Prof. Hertel. These databases are now widely used by the Integrated Assessment Modeling community to assess climate impacts and the potential for land-based mitigation policies.

- **Conference Chair:** Served as Chair of the annual Gordon Research Conference “Gaseous Ions: Structures, Energetics & Reactions” in 2015. In this role, I initiated the first Power Hour, an informal session during which the participants discussed challenges that women and other minorities face during their careers in science. I also initiated the first Gordon Research Seminar conducted in conjunction with this GRC Conference. GRS is a student led meeting that was very well-attended and provided unique networking experience for students and postdocs prior to the main GRC meeting.
- **Editor:** Associate Editor for *Global Ecology and Biogeography*, the leading international journal in macroecology and biogeography (Journal Impact Factor: 5.667).
- **Editor:** Actively involved in shaping scientific publishing by serving as an editor of the *American Journal of Mass Spectrometry* (2015–present), one of the major journals serving the mass spectrometry community, and as a board member of seven peer-reviewed journals.
- **URM Outreach:** Member of the Tecumseh Project (organized Spring 2005) comprised of Purdue University faculty and staff dedicated to building a cohort that will result in the successful recruitment and retention of Native American students into Purdue University’s Science, Technology, Engineering and Mathematics graduate programs. This program morphed into the Sloan Indigenous Graduate Program at Purdue University. As a former co-PI and student mentor, I recruited indigenous students into Purdue’s STEM graduate programs and mentored students through their M.S. and Ph.D. work.
- **High School Outreach:** As a founding member of the organizing committee for the Biology High School Symposia at Arkansas State University, I planned and organized activities, seminars, and lab tours for high school students; over-saw student registration and communication; and presented on undergraduate research. The symposium was open to high school students throughout the state of Arkansas, including many students from rural and inner-city areas.
- **K-12 Outreach:** I have performed STEM outreach through the mentorship of pre-college students, organization of science research day (2014), and judging of pre-college science fairs.
- **Student Mentor:** Mentored high school students in New Town, PA, on Global Learning and Observations to Benefit the Environment (GLOBE) science protocols, including participation in 2018 GLOBE Northeast/Mid-Atlantic Regional Student Research Symposia at Boston University.
- **Undergraduate Mentor:** I have a strong track record of engaging undergraduate and URM students in my research. During my tenure at Colorado State, I mentored 19 undergraduate students, most of whom continued their education in graduate programs, and three received NSF Graduate Fellowships. More than 50% of the interns were female and URM students. At Purdue, I have been mentoring undergraduate students through the different programs including a special program for URM undergrads from across the country. I am passionate about providing research opportunities to students from different backgrounds, different majors, and stages of their education.
- **Tool Developer:** I have led the development of several data acquisition, analysis, and/or visualization tools, including tools for high-resolution mass spectrometry data of complex mixtures (e.g. atmospheric aerosols, petroleum, and dissolved organic matter) and have trained graduate students and postdocs at collaborating institutions on how to use these tools. Currently, these tools are being used by at least 10 groups from the atmospheric chemistry and geochemistry community.
- **Instrumentation Development & Dissemination:** Working through the Center for Analytical Instrumentation Development, my group designed and built a series of miniature mass

spectrometers and sought to develop interest in on-site mass spectrometry by supplying these novel instruments at-cost to 15 laboratories.

- **Industrial Development:** I have facilitated the launch of several start-up companies, including Merlin Analytical Technologies, Inc., based on technology contained in some 40 US patents that I have been awarded.
- **Curriculum Development:** Developed an interdisciplinary graduate course for *Sustainably Feeding a Growing Planet* (<http://web.ics.purdue.edu/~hertel/courses/global-land-use-to-2050/>) featuring guest lecturers from key disciplines spanning the sustainability community, as well as structured labs, and a class project in which students use the SIMPLE model to explore the long run sustainability issues within an economic framework. The course was initially developed, and taught, jointly by Professors Hertel and David Lobell during Hertel's sabbatical at Stanford University. It is now a permanent offering at Purdue University.
- **Undergraduate Laboratory Exercises:** I developed six new undergraduate laboratory activities based on novel mass spectrometry experiments discovered or invented at Purdue. These laboratory exercises were implemented in undergraduate classes at Purdue and, in five cases, were subsequently published in J. Chem. Educ. and other journals.