"I, Microbiologist" Workshop (Drexel University, August 14, 2015)
Location: To Be Announced

Presenters:

Erin R. Sanders, Ph.D.
Director, Center for Education Innovation in Life Sciences
Assistant Adjunct Professor, Department of Microbiology, Immunology & Molecular Genetics
University of California, Los Angeles

Jordan Moberg Parker, Ph.D.
Lecturer and Academic Coordinator for Instructional Laboratories, Department of Microbiology, Immunology & Molecular Genetics
University of California, Los Angeles

Workshop description:

The process of scientific inquiry, the excitement felt by genuine scientific discovery, and the accomplishment realized after completing morphological, molecular, and computational analyses of self-generated data can best be realized by undergraduates in the context of an authentic research experience. Course-based research experiences, or CREs, have arisen in recent years as effective means to engage large numbers of undergraduates in research projects – a scale of exposure not typically achieved by the customary apprenticeship model (e.g., one faculty mentor for one or two undergraduate mentees). The "I, Microbiologist" research project is designed specifically as a CRE, involving student teams in multiple complementary steps of a biodiversity study focused on terrestrial microbiomes. In this hands-on workshop, the presenters will provide the audience an overview of the research project, demonstrate critical wet-lab techniques

required for collection of sequence data, and introduce how to analyze datasets comprised of hundreds to thousands of 16S ribosomal RNA genes representing the diverse microbial inhabitants of a single soil sample. This one-day workshop is intended for instructors who have already adopted "I, Microbiologist" and wish to update their course with the contemporary methodologies being used by the authors, new instructors interested in adopting "I, Microbiologist" or designing and implementing their own CRE, and working scientists who need to learn techniques necessary for diversity studies of any microbiome.

Tentative schedule:

9 AM – 10 AM	Overview of the "I, Microbiologist" project
10 AM – 12 PM	Extracting DNA from soil microbiomes
12 PM – 1 PM	Lunch Break
1 PM – 4 PM	Introduction to 16S rRNA datasets and options for computational analysis ranging from phylogenies to OTU binning

Bio for Dr. Erin Sanders:

Dr. Sanders received her B.S. in 1998 from DePaul University in Chicago, Illinois, where she worked with Dr. Richard McCourt, investigating the molecular phylogeny of Charophycean green algae using the plastid-encoded gene, *matK* (Sanders et al. 2003). She earned her Ph.D. in 2005 from the University of California, Los Angeles (UCLA), where she studied the molecular components of a bacterial recombination system with Dr. Reid Johnson (Sanders and Johnson 2004).

Since 2005, Dr. Sanders has been involved in teaching and curriculum development in STEM courses in Life Sciences at UCLA. Her most recent experiences include designing, implementing, and evaluating laboratory and seminar courses for an interdepartmental, research-based undergraduate STEM curriculum (Sanders and Hirsch 2014). This education project required development of new instructional materials (Sanders 2012a, 2012b); integration of new technology, including online assessment systems, course-specific databases, and comparative genome analysis software; partnerships with faculty to design team-based research projects and integrate bioinformatics experiences promoting scientific inquiry; and incorporation of evidence-based learning into teaching practices. To support this and other STEM initiatives, Dr. Sanders has developed successful proposals and served as PI, Co-PI or Co-Director on funded education projects supported by HHMI, NSF, NIH, and the Doris Duke Foundation. She has been a participant in numerous STEM education conferences, contributing to the national conversation involving educators interested in using

assessment and evidence-based pedagogies to improve student learning, persistence, and engagement in STEM disciplines.

As a discipline-based education research scholar, she has co-authored papers describing instructional materials and strategies that promote computational competency among undergraduates (Shapiro et al. 2013, Ditty et al. 2010). She co-authored the textbook called "I, Microbiologist: A Discovery-based Undergraduate Research Course in Microbial Ecology and Molecular Evolution" (Sanders and Miller, 2010). As a result of completing this and other course-based research experiences, hundreds of the undergraduates that Dr. Sanders has mentored in recent years have become authors on Genbank submissions, some of whom also are contributing authors on articles published related to their research projects (Pope et al. 2014, Schwartz et al. 2013).

As the Director of the Center for Education Innovation in Life Sciences (CEILS), she now leads campus-wide efforts to improve teaching and learning in STEM by promoting faculty development and training in student-centered, evidence-based instructional approaches. Specifically, she facilitates the training of current and future STEM instructors through webinars, workshops, peer observations and consultations, and imparting resources for effective instruction in STEM. Her efforts to engage diverse and talented STEM faculty in educational innovation is central to the mission of CEILS, which is to create a collaborative community of instructors committed to advancing teaching excellence, assessment, diversity, and scholarship. Dr. Sanders is a long-time member of the American Society for Microbiology, a National Academies Education Fellow in the Life Sciences, and recent winner of the UCLA Life Sciences Award for Educational Innovation.

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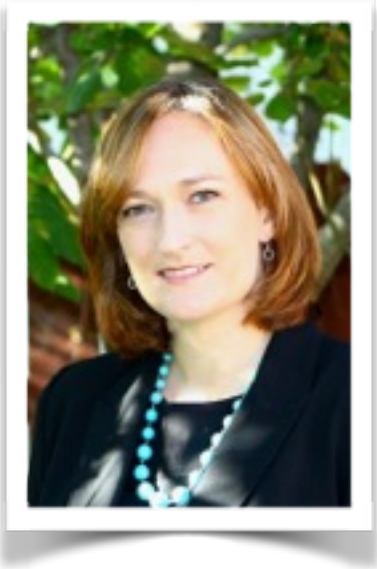
Bio for Dr. Jordan Moberg-Parker:



Dr. Parker received her B.S. in Microbiology from California Polytechnic State University, in San Luis Obispo (Cal Poly, SLO), in 2003. She earned her Ph.D. in Molecular Biology from the University of California, Los Angeles (UCLA) in 2012 for her work with Dr. Arnold J. Berk on viral model systems for gene delivery and transcriptional control. Dr. Parker was a 2014 ASM Biology Scholar, an NSF sponsored program to advance the scholarship of teaching and learning in biology, where she participated in a year-long Assessment Residency devoted to developing measurable student learning outcomes. She has been selected as a facilitator for the 2015 Biology Scholars cohort and has presented her work at national science education conferences.

Dr. Parker first began working in microbial ecology in 2003 at the Lawrence Berkeley National Laboratory under the direction of Drs. Gary L. Andersen and Todd Z. DeSantis, the researchers responsible for the development of Greengenes, a 16S rRNA gene sequence repository and online toolset. She used microarrays for quantification and taxonomic classification of environmental DNA samples from urban aerosols (Brodie et al. 2007). As the Academic Coordinator for the Instructional Laboratories in the UCLA Department of

Microbiology, Immunology, and Molecular Genetics (MIMG), Dr. Parker has spent the last three years developing a contemporary extension of the "I, Microbiologist" research project (Sanders and Miller, 2010). Recent advances in sequencing technology have reduced the cost of next generation sequencing such that performing metagenomic 16S community profile analysis is accessible even in undergraduate laboratory courses.

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