"The Future of Systematics in Data-Centric Biology"

Dates: October 26-27, 2017

PIs: Beckett Sterner (Arizona State University), Nico Franz (Arizona State University), David Remsen (Marine Biological Laboratory)

Cost: $14, 333.77

This workshop was conceived and run by an historian and philosopher of science (Sterner), a entomologist and taxonomist (Franz), and a bioinformatician (Remsen). The workshop brought together a total of eighteen individuals (see chart below), representing history and philosophy of science, bioinformatics, and practitioners from a range of biological fields that face unique issues in taxonomy (i.e. the application of Linnaean taxonomy is insufficient, especially cumbersome, or impossible). This group included a mix of graduate and early career scholars, as well as established faculty. The motivation for discussion centered around the messy ways that data-centric biology both challenge and provide opportunities for the traditionally empirically and descriptively-driven field of systematics. How can we retain details about differences in organism types in a world of data points and computational models?

Over the course of two days, the group came together for a series of presentations and discussion sessions that addressed the following driving questions:

- How do scientists parse the world into natural units? How do practices and principles of taxonomy differ across fields? What conceptual foundations, or pragmatic choices, underlie the adoption of different practices and principles of taxonomy?
- Historical/philosophical questions: How have these practices and principles changed over time, and what has caused them to change? What has been the impact of these changes on the ways in which taxonomy has been done in practice, and how have these changes altered our perspectives on biodiversity?

The goal of this workshop was to bring together historians and philosophers of science, along with informaticians and practicing life scientists in order to begin to answer the driving questions and, through this diverse collective of perspectives, begin to understand what underlying aspects of taxonomic systems are necessary and/or sufficient to parse the natural world.

As a result of the discussions and presentations, participants began to vocalize their surprise at how different taxonomic systems had been adopted and adapted over the course of history and throughout different fields. For example, virologist Jens Kuhns expressed amazement at how restrictive the taxonomic laws were for microbiology, after hearing microbiologist Ramon Rossello-Mora speak. Just as the practicing life scientists showcased examples of problems and roadblocks in their respective fields, the historians and philosophers of science highlighted historical examples of similar problems and, in some cases, showed how they were resolved over time. While the discussions sometimes veered into the technical language of specific disciplines, the group responded by asking for clarification on specific terms and keeping jargon in check. The diversity of perspectives and willingness to say "I don't understand what you are saying" helped promote communication of concepts, problems, and principles in digestible language.

The final discussion, led by organizer Beckett Sterner, made clear that each participant came away with an enriched understanding of broader applications of taxonomic principles. Both the historians and philosophers of science and the practicing scientists were challenged by and mutually benefited from the diverse perspectives that the range of participants offered on the workshop's driving questions. By the end of the second day, participants had begun engaging in

side conversations across disciplines about their taxonomic practices and how understanding more about the work that has been and is being done by others could benefit them.

One immediate product of this workshop is a piece written by historian and philosopher of science Betty Smocovitis for the History of Science Society newsletter. We anticipate several additional products from the smaller follow-up workshop scheduled for spring 2018.

Participant List (18 people)

Last Name	*First Name*	*Institution*	*Area of Expertise*	*Position*
Beiko	Robert	Dalhousie	bioinformatics	Faculty
Cohmer	Sean	ASU	HPS	Grad student
Franz	Nico	ASU	entomology	Faculty
Hibbett	David	Clark U.	mycology	Faculty
Huang	Jen-Pan	U. Michigan	entomology	Post doc
Hunter-Cevera	Kristen	MBL	microbial ecology	Fellow
Kuhn	Jens	NIH/NIAID	virology	Faculty
MacCord	Kate	MBL	HPS	Fellow
Maienschein	Jane	ASU/MBL	HPS	Faculty/Fellow
Matlin	Karl	U. Chicago	cell bio/HPS	Faculty
Morgan	Gregory	Stevens Institute	HPS	Faculty
Muller-Wille	Staffan	U. Exeter	HPS	Faculty
Remsen	David	MBL	bioinformatics	Staff
Rossello-Mora	Ramon	CSIC-UIB	microbiology	Faculty
Smocovitis	Betty	U. Florida	HPS	Faculty
Sterner	Beckett	ASU	HPS	Faculty
Varsani	Arvind	ASU	virology	Faculty
Witteveen	Joeri	U. Utrecht	HPS	Post doc