Outreach for the Cultural Evolution Society: Everybody Needs to Know a Little Bit About Cultural Evolution

Center for the Dynamics of Social Complexity and National Institute for Mathematical and Biological Synthesis Webinar Series on Cultural Evolution

September 29, 2020

Cultural Evolution Society

- Established 2016
  - With support from John Templeton Foundation grant to David Sloan Wilson
- 2 biennial Conferences, 3rd planned for Hokkaido University 2021
- About 300 paid-up members
- Join! https://culturalevolutionsociety.org/
- President Rachael Kendal, President Elect, Kevin Laland

Grand Challenges comment in Nature Ecology and Evolution 2017

- J. Brewer, M. Gelfand, J.C. Jackson, I.F. McDonald, P.N. Peregrine P.J. Richerson, P. Turchin, H. Whitehouse, and D.S Wilson (Steering Committee)
- Identified Knowledge Synthesis as an overarching theme
- Idenified 8 Challenges

Eight Challenges

Challenge

- Understanding the role of social adaptation in cultural evolution
- Understanding the role of cultural evolution in the context of organic evolution
- Modelling culture as a complex adaptive system
- Identifying processes of transmission and accumulation of cultural traits

Challenge

- Integrating methods, data, and results across disciplines
- Creating new organizational and funding structures that support interdisciplinary research and teaching
- Identifying cultural evolutionary processes that address significant social, economic, and political problems
- Educating policymakers and the public about cultural evolution

2nd Templeton Grant

- Sergey Gavrilets PI, Peter Richerson co-PI, submitted September 2018
- Dynamic Models for Basic Theory and Applications in Cultural Evolution
- Our argument
  - Dynamic systems theory a fundamental tool in the the natural sciences
    - Coupled differential or difference equations
    - Spread to ecology and evolution in the early 20th century
  - Human cultures, genes, and societies are dynamic!
  - Yet theory articulated in the form of coupled differential and difference equations are little used in the social sciences
  - Cultural evolution field an exception
  - Proposed to develop online educational materials showing how bring a dynamic perspective to social science issues and that otherwise show how to tools of cultural evolution can be used in social science and behavioral biology
- NIMBioS/DySoc had the right philosophy and infrastructure

Outreach: Teaching Modules on Cultural Evolution

Published http://www.dysoc.org/cesmodules/

Models of Social Dynamics: An Introductory Module (created by Paul E. Smaldino, Cognitive and Information Sciences, University of California, Merced). This module takes an interdisciplinary approach to modeling social behavior, drawing on insights from across the social sciences and evolutionary ecology. It focuses on constructing and analyzing simulations using the NetLogo programming language.

Animal Cultures: Core Discoveries and New Horizons (created by Andy Whiten, University of St Andrews, UK; Lucy Aplin, Max Planck Institute for Animal Behaviour, Germany; Nicolas Claidière, CNRS, Aix-Marseille University, France; Rachel Kendal, University of Durham, UK). This module offers an overview of core discoveries and new developments in the study of animal cultures. The significance of animal culture for evolutionary biology and ecology, understanding human cultural evolution, and conservation are highlighted.

The Neverending Story: Cultural Evolution and Narratives (created by Joseph Stubbersfield, Psychology Department, Heriot-Watt University, Edinburgh, UK; Jamie Tehrani, Anthropology Department, Durham University, Durham, UK; Oleg Sobchuk, Max Planck Institute the Science of Human History, Jena, Germany.) This module explores the universal and uniquely human behavior of narrative and how cultural evolution theory has provided vital insights into the transmission and evolution of narratives and why some become culturally successful.

Foundations of Cultural Evolution: A Question + Tools Approach (created by Adrian Bell, Department of Anthropology, University of Utah). An introductory guide to the body of formal theory in the study of the cultural evolution in humans and other animals, this module guides participants through the basic machinery of dynamic models and key results from a variety of cultural evolution topics.

Modeling the Dynamics of Cultural Diversification (created by Bernard Koch, UCLA; Erik Gjesfjeld, Cambridge University; Michael Alfaro, UCLA; Jacob Foster, UCLA; and Daniele Silvestro, University of Gothenburg, Sweden). This module helps you explore the concepts and methods used to examine the emergence, persistence, and extinction of population-scale cultural diversity through time.

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coming soon

Dynamic models of human systems (Created by Russell Genet, Cheryl Davidson, Diana Fisher, and Peter Richerson) This primarily non-mathematical introduction to dynamic models of human ecosystems describes Lotka-Volterra models of early hunter-gatherers, farming communities, agrarian civilizations, and runaway technical civilizations. Related models of socio-political dynamics, economic growth, and epidemiology are also presented.

Cultural Evolution of Dynamic Learning (Created by Erol Akçay and Marco Smolla) In order to better understand the complex interplay between culture and social network structure, this module introduces participants to the concept of cultural learning algorithms, fixed and dynamic social networks, and how to model the two components together.

How to create an interdiscipline: Biology 1950-1990

- My ringside seat
  - High School biology 1959, great teacher, natural historian no cellular or molecular biology, turned me into a pretty good invertebrate zoologist
  - Undergrad 1961-65, Berkeley and Davis Entomology, faculty mostly systematists, nossleheads
  - Grad school 1965-1969 Davis, limnology, senior faculty ecologists, systematists, junior faculty physiologists and biochemists, lots of tension! Good courses in genetics and evolution
  - Junior faculty 1971-1978, collaboration with physical oceanographer, atmospheric scientist on plankton ecology problems
  - First course assignment, Division of Environmental Studies: Principles of Human Ecology co-taught with sociologist. Gave primitive lecture on cultural evolution. Started talking to Rob Boyd, physics undergrad, essentially economics PhD, about cultural evolution

Biology 1950-1990

- A natural science, physics and chemistry acknowledged to be important
- Taxon based subdisciplines strong in 1950, botany, zoology, bacteriology
- Cross-cutting themes growing in importance, genetics, physiology, cell and molecular biology, ecology, evolution
- 1953: Watson (molecular biologist) and Crick (physicist) publish the structure of DNA
- Subdisciplinary structure and curriculum began to evolve rapidly

The argument against the *theoretical* importance of disciplines

- Let's grant the the *practical* importance of academic departments, scientific societies, specialized journals, grant programs, applied research programs, and the like
- Nature is more or less seamless and when we specialize to study it out of human necessity we should not forget that
- Donald T Campbell's fishscale model of omniscience: We want our specialties to cover nature completely, and overlap
  - Example: In the biochemist's view cells are bags of interesting chemistry, in the physiologist's view they are that are specialized parts reqiring coordination to produce functional tissues. Cell biologists sit in between these two views

The argument against the theoretical importance of disciplines

- A N-dimensional fish: you never know what fishscale you might need to overlap with
  - Example: ecologists depend heavily on the physical and chemical sciences
  - Never know when you might need some geology, physical oceanography, geochemistry, meteorology, and so on
  - Or some physiology, molecular genetics, evolution
  - Ecology is an interdiscipline not a discipline
- Many other inherently interdiscipline fishscales
  - Examples: Evolutionary biology, biophysics, biometeorology, paleontology
  - Applied interdisciplines like pomology, vegetable crops, agronomy, animal science, medicine and its myriad sub-subdisciplines
    - Postwar applied biology departments at UC Davis
  - Many interdisipline societies established in natural sciences 1920s-1950s

Transformation of biology departments 1950-1980 (UCD example)

- College of Agriculture:
  - After WWII philosophy was to hire the best scientists available, mostly basic scientists, and give them summer salary and a technician if they turned themselves into (partly) applied scientists
  - Led to interdiscipline departments (a geneticist, an ecologist, biochemist, and a physiologist in every department)
  - Led to the concept of Graduate Groups for training in fields like genetics and ecology

The Department of Plant Sciences engages in teaching, research and outreach in all aspects of agricultural and environmental plant science. Our programs cover the full spectrum of the land-grant university tradition of scholarship, ranging from fundamental discovery to application of research findings to delivery of research-based knowledge and new technology to end users. Through the integration of basic and applied sciences, our teaching, research and outreach programs are highly effective in training students and addressing theoretical and technological frontiers in plant sciences.

Our Core Disciplines: Genetics, Physiology, Ecology

Our Mission
Develop students into scholars, mentors, and responsible citizens of California, the United States and the world;
Advance, integrate, evaluate and communicate knowledge of plant sciences from lab to field, rangeland, forest, parks, waterways and beyond – using and improving plants to feed, clothe, fuel, restore and beautify the planet;
Seek out, anticipate and lead in addressing the agricultural, ecological and environmental needs of industry, governmental agencies, communities and people throughout our world.

Tags
Biomass and Biofuels, Biotechnology and Genomics Breeding and Genetics Climate change, Conservation, Restoration, and Rangeland Management, Crop production and Farming systems, Ecology, Ecosystems, and Evolution, Engineering and Technology, Extension Forestry and Trees, Human health and nutrition, International programs, Modeling Pests, Pathogens, and Weeds, Physiology, Plant nutrients, Plant stress, Postharvest biology and Food Safety, Seeds Soils, Roots, and Agroecology, Water, Irrigation, and Drought

Transformation of biology departments 1950-1980 (UCD example)

- College of Biological Sciences
  - Inherited traditional taxon based disciplinary departments of Bacteriology, Zoology and Botany formed in the 1920s
  - Genetics added in 1950, Biochemistry and Biophysics in 1958, and in Animal Physiology in 1964.
  - Younger faculty in the traditional departments struggled with the old guard
  - Division of Biology took in the more basic biology departments from the College of Agriculture and the College of Letters and Science in 1993. Became the College of Biology in 2005.
  - Departments of Evolution and Ecology, Microbiology, Molecular and Cell Biology, Neurobiology, Physiology, and Behavior, and Plant Biology

Key organizational innovations

- Career mobility
  - Francis Crick: physics to molecular genetics, biophysics, neurobiology
  - Zak Powell: Particle physics to biophysical limnology/oceanography
  - Rob Boyd: From physics, ecology, economics to anthropology, but had to teach a four fields intro anthro course to prove he could anthropology
- Interdiscipline scientific societies and their journals
  - Society for Human Ecology (around 1975)
  - Human Behavior and Evolution Society (1988)
  - Evolutionary Anthropology Society (2005)
  - European Human Behavior and Evolution Association (2008)

Key Organizational Innovations

- Funding sources
  - NSF one-off interdisciplinary initiatives
    - Traditional funding sources like Anthropology and Biological Anthropology poorly funded and politically beleaguered
  - Templeton Foundation a bright spot, but has had funding cutbacks
- Europe
  - UK: ESRC funds evolutionary social scientists
  - EU: ERC funds evolutionary social scientists
  - Germany Max Planck Society
    - 3 recent new directors at Leipzig, Institute for Science in Human History
    - 1 recent new director, Human Behavior, Ecology, and Culture in Institute for Evolutionary Anthropology
- Fair numbers of active researchers in Brasil, New Zealand, Australia and Japan

Key Undergraduate Curricular Innovations

- Teaching biology as a natural science
  - Already in place in 1961 at UCB and UCD at least
  - Expected to take year-long calculus, chemistry, and physics sequences in 1st and 2nd year in addition to year of introductory biology in your disciplinary major department
- Teaching a fishscale 4 course Introduction to Biology (ca. 1980)
  - Essentials of Life on Earth
  - Principles of Ecology and Evolution
  - Biodiversity & the Tree of Life
  - Principles of Cell Biology and Physiology
- Very hard to decide what to put into such a course
  - Biology is vast, complex, and growing
  - But faculty really believe in the need for it
  - You have to know a little about all of biology to do a competent job in your own fishscale

What we need to promote

- Evolution is a toolkit of concepts, methods, and empirical practices that every human scientist might find useful
  - Dynamic systems science for example
  - Tamp down the hegemonistic threat ("Evolution is the synthetic principle in biology and the social sciences." Not.)
- Need to teach an introductory "Humanology 1" course for 1st years
  - Faculty need to envision what all human scientists need to know
  - Get themselves and their student out of the 1900 era disciplinary silos
- Need to promote more and stronger interdisipline departments and funding programs (US)
  - More money
  - More flexible career paths
- Promote a certain bemused, but tolerant, contempt for the concept of disciplines

Comments and Discussion?