

Agents and Evolution

Ling 496

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Spring, 2020

Office Hours: TTh: 9:15am - 10:30am

Course Description: Language is an example of a self-organizing biological system; its patterns emerge from the complex push and pull of a variety of social, psychological, biological and physical forces. In this course we will explore the hypothesis that languages are a population-level biological phenomena that has co-evolved with human culture. We will begin by surveying self-organization and evolution, then turn to the formal analysis of the cultural evolution with particular reference to the evolution of cooperative behavior and complex signaling behavior. After establishing a foundation in physics, biology and linguistics, we will explore a number of case studies. In the course of doing so, we will develop a set of interactive python notebooks that will be made available online.

Our main focus will be gene-culture coevolution: how culture influences our genes and how our genes influence our culture. To this end, we will read some of the primary literature in biology, anthropology and linguistics.

Grading: Grades will be based largely on a project. The idea will be as follows: The class will be broken into teams who will work on assembling a report on some large topic in cultural evolution. I will offer some sampling of topics from which a team can choose. The teams will turn in different parts of the report. The report itself can be thought of as a dossier on a topic. It will include bibliographies, summaries of evidence and questions, and so forth. At the end of the term, teams will assemble their reports, perhaps with a ten to fifteen minute presentation, and turn them in. At each phase, I will be available for consultation by the team or various members of the team.

Topics and Readings

Self-Organization and evolution

Scott Camazine, Jean-Louis Deneubourg , Nigel R. Franks, James Sneyd, Guy Theraulaz, and Eric Bonabeau. 2001. *Self-Organization in Biological Systems*. Princeton Studies in Complexity. Princeton University Press. (excerpts)

Charles L. Nunn (2011). *The Comparative Approach in Evolutionary Anthropology and Biology*. University of Chicago Press, Chicago, IL.
Chapter 5, “Modeling evolutionary change”

Alex Messoudi (2011). *Cultural Evolution*. The University of Chicago Press. Chicago, IL.
Chapter 2, “Cultural Evolution”

Richard McElreath and Robert Boyd (2007). *Mathematical Models of Social Evolution: A Guide for the Perplexed*. University of Chicago Press, Chicago, IL.
Chapter 1, “The theoretician’s laboratory”

An Evolutionary Theory of Language and Culture

Alex Messoudi (2011). *Cultural Evolution*. The University of Chicago Press. Chicago, IL.
Chapter 3, “Cultural Microevolution” Chapter 4, “Cultural Macroevolution I: Archaeology and Anthropology” Chapter 5, “Cultural Macroevolution II: Language and History”

Charles L. Nunn (2011). *The Comparative Approach in Evolutionary Anthropology and Biology*. University of Chicago Press, Chicago, IL.
Chapter 10, “Human cultural traits and linguistic evolution”

Gene-culture covariation: The basics

Charles L. Nunn (2011). *The Comparative Approach in Evolutionary Anthropology and Biology*. University of Chicago Press, Chicago, IL.
Chapter 6, “Correlated evolution and testing adaptive hypotheses”
Chapter 7, “Comparative methods to detect correlated evolutionary change”
Chapter 8, “Using trees to study biological and cultural diversification”

- Kevin N. Laland, John Odling-Smee and Sean Myles. 2010. "How culture shaped the human genome: bringing genetics and the human sciences together." *Nature Reviews: Genetics* 11: 137-148.
- Melissa A. Ilardo, Ida Moltke, Thorfinn S. Korneliussen, Jade Cheng, Aaron J. Stern, Fernando Racimo, Peter de Barros Damgaard, Martin Sikor, Andaine Seguin-Orlando, Simon Rasmussen, Inge C. L. van den Munckhof, Rob ter Horst, Leo A. B. Joosten, Mihai G. Netea, Suhartini Salingkat, Rasmus Hielsen, and Eske Willerslev. 2018. "Physiological and Genetic Adaptations to Diving in Sea Nomads," *Cell* 173, 569-580.
- Pascale Gerbault, Anke Liebert, Yuval Itan, Adam Powell, Mathias Currat, Joachim Burger, Dallas M. Swallow, and Mark G. Thomas. 2011. "Evolution of Lactase Persistence: an example of human niche construction." *Philosophical Transactions of the Royal Society B* 366: 863-877.
- Kara C. Hoover, Omer Gokcumen, Zoya Qureshy, Elise Bruguera, Aulaphan Savangsuksa, Matthew Cobb, and Hiroaki Matsunami. 2015. "Global Survey of Variation in a Human Olfactory Receptor Gene Reveals Signatures of Non-Neutral Evolution." *Chemical Senses* 40:481-488.
- Nathan Nunn and Leonard Wantchekon. 2011. "The Slave Trade and the Origins of Mistrust in Africa." *American Economic Review* 101:3221-3252.
- Blasi, D.E., Moran, S., Moisik, S.R., Widmer, P., Dediu, D., Bickel, B. (2019). "Human sound systems are shaped by post-Neolithic changes in bite configuration." *Science*, 363:1192.
- Chang, Will, Chundra Cathcart, David Hall, and Andrew Garrett. 2015. Ancestry-Constrained Phylogenetic Analysis Supports the Indo-European Steppe Hypothesis. *Language* 91 (1): 194244. doi:10.1353/lan.2015.0005.
- Fitch, W Tecumseh. 2011. Genes, Language, Cognition, and Culture: Towards Productive Inquiry. *Human Biology* 83 (2). Wayne State University Press: 32329.
- Grossman, Igor, Eibach, Richard P., Koyama, Jacklyn, Sahi, Qaisar B. (2020). "Folk standards of sound judgment: Rationality versus reasonableness." *Science Advances*. 6:1-14, eaaz0289
- Henn, Brenna M, L L Cavalli-Sforza, and Marcus W Feldman. 2012. The Great Human Expansion.. *Proceedings of the National Academy of Sciences of the United States of America* 109 (44). National Acad Sciences: 1775864. doi:10.1073/pnas.1212380109.
- Holden, C J. 2002. Bantu Language Trees Reflect the Spread of Farming Across Sub-Saharan Africa: a Maximum-Parsimony Analysis. *Proceedings of the Royal Society of London* 269 (1493): 79399. doi:10.1098/rspb.2002.1955.

Jackson, Joshua Conrad, Watts, Joseph, Henry, Teague R. List, Johann-Mattis, Forkel, Robert, Mucha, Peter J., Greenhill, Simon J., Gray, Russell D., Lindquist, Kristen A. (2019). "Emotion semantics show both cultural variation and universal structure" *Science*. 366: 1517-1522.

Mehr, Samuel A., Singh, Manvir, Knox, Dean, Ketter, Daniel M., Pickens-Jones, Daniel, Atwood, S., Lucas, Christopher, Jacoby, Nori, Egner, Alena A., Hopkins, Erin J., Howard, Rhea M., Hartshorne, Joshua K., Jennings, Mariela V., Simson, Jan, Bainbridge, Constance M., Pinker, Steven, O'Donnell, Timothy J., Krasnow, Max M., Glowacki, Luke (2019). "Universality and diversity in human song." *Science*, 366, eaax0868.

Reesink, G, R Singer, and M Dunn. 2009. Explaining the Linguistic Diversity of Sahul Using Population Models.

Scheinfeldt, L B, S Soi, and S A Tishkoff. 2010. Working Toward a Synthesis of Archaeological, Linguistic, and Genetic Data for Inferring African Population History. *Proceedings of the National Academy of Sciences* 107 (Supplement 2): 893138. doi:10.1073/pnas.1002563107.

Jonathan F. Schulz, Duman Bahrami-Rad, Jonathan P. Beauchamp, Joseph Henrich. 2019. "The Church, intensive kinship, and global psychological variation." *Science*, 366, eaau5141.