

University of Colorado, Colorado Springs

Center for Cognitive Archaeology

ANTH 4200/5200 TDVANCED TOPICS IN ARCHAEOLOGY: SOCIAL LEARNING AND COGNITION

MEET PROFESSOR ROSENBERG-YEFET



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Tamar Rosenberg-Yefet is a prehistorian archaeologist. She received her Ph.D. from Tel Aviv University, Israel in 2023. Her research focuses on lithic technology, learning processes in the Paleolithic, cultural evolution theory and human-environment relations in the prehistoric world. She had been working on lithic analysis of Lower Paleolithic archaeological assemblages for many years and has participated in various excavations. Her research interests include the cognitive aspect of learning, decision-making through lithic reduction sequences, and other behavioral aspects that can be reflected from lithic assemblages. She is currently working with a team of researchers in South India on an experimental archaeology project on learning mechanisms. She is passionate advocate for making prehistory accessible to the public by giving popular lectures, including publishing a forthcoming children's book that introduces young readers to the prehistoric world.

COURSE OBJECTIVE

The introduction of social learning into the human learning system was a significant and revolutionary step in human evolution. The unique ability to teach another individual or a group of people allowed for the spread of technologies over a vast geographical range, eventually leading to the globalization we know in today's world.

The purpose of this course is to explore diverse learning mechanisms that have emerged throughout human evolution. We will dive deeply into various forms of learning and examine the minimal cognitive abilities required for them. We will question whether learning is an innate human characteristic, explore the role of language in teaching, and investigate

alternative modes of communication applied in the learning process. Additionally, we will explore how learning takes place in contemporary hunter-gatherer societies around the world.

We will also address the challenge of limited visibility of the learning processes in the archaeological record and explore ongoing research aimed at improving this visibility. Finally, we will take few archaeological examples of technological innovations that were found across a vast geographical range and ask whether they were learned through social learning and thus spread throughout the world or were invented separately in a model of individual learning by trial and error.

Books, Readings, and Topics

This course requires significant reading throughout the semester; selections were chosen from various journals and books and will be made available on Canvas.

- **Week 1: Introduction to the Learning System Throughout Human Evolution**
 - Kendal, R. L. et al. (2018). Social learning strategies: Bridge-building between fields. *Trends in Cognitive Sciences*, 22(7), 651–665.
 - Gopnik, A., Frankenhuis, W. E., & Tomasello, M. (2020). Introduction to special issue: "Life history and learning: How childhood, caregiving and old age shape cognition and culture in humans and other animals." *Philosophical Transactions of the Royal Society B: Biological Sciences*, 375(1803), 20190489.
- **Week 2: Dolphins, Handaxes and a Deserted Island: Individual Learning as a Mechanism**
 - Trial-and-error-based learning, "zone of latent solution" theory, the theoretical "island test," convergent evolution, and the Acheulian handaxe as an archaeological case study.
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 - Tennie, C. et al. (2017). Early stone tools and cultural transmission: Resetting the null hypothesis. *Current Anthropology*, 58(5), 652–672.
 - Corbey, R. et al. (2016). The Acheulean handaxe: More like a bird's song than a Beatles' tune? *Evolutionary Anthropology*, 25(1), 6–19.
- **Week 3: Social Learning**
 - The different definitions of social learning. Low- and high-fidelity social learning, imitation versus emulation, and stimulus enhancement. How social factors such as population size, density, structure, and level of mobility affect social learning. Transmission biases and how they affect who we copy, what we copy, and the circumstances under which we choose to copy.
 - Gärdenfors, P., & Högberg, A. (2017). The archaeology of teaching and the evolution of Homo docens. *Current Anthropology*, 58(2), 188–208.

- Maloney, T. R. (2019). Towards quantifying teaching and learning in prehistory using stone artifact reduction sequences. *Lithic Technology*, 44(1), 36–51.
- **Week 4: Social Learning in Non-Human Animals**
 - Evidence for social learning in other animals is increasing progressively. We will get to know the evidence for learning in fish, birds, insects, dolphins, and more.
 - Wild, S. et al. (2020). Integrating genetic, environmental, and social networks to reveal transmission pathways of a dolphin foraging innovation. *Current Biology*, 30(15), 3024–3030.
 - Botting, J. et al. (2018). Field experiments with wild primates reveal no consistent dominance-based bias in social learning. *Animal Behaviour*, 136, 1–12.
- **Week 5: Social Learning in Contemporary Hunter-Gatherer Societies**
 - While observing appropriate ethical considerations, we will try to see what modern hunter-gatherer societies can teach us about learning in these societies. How is social learning carried out, by whom (gender and age), are there special locations, and does it involve any ontological aspects? We will get to know stone knappers from Papua New Guinea, potters from India, and hunters from Congo.
 - Lew-Levy, S. et al. (2020). Where innovations flourish: An ethnographic and archaeological overview of hunter–gatherer learning contexts. *Evolutionary Human Sciences*, 2, e31.
 - Hewlett, B. S. et al. (2011). Social learning among Congo Basin hunter–gatherers. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 366(1567), 1168–1178.
- **Week 6: Social Learning in Paleolithic Archaeology**
 - We will get to know claims for the early appearance of social learning in flint tool knapping, shamanism, animal dissection, arts, and more.
 - Blasco, R. et al. (2013). Learning by heart: Cultural patterns in the faunal processing sequence during the Middle Pleistocene. *PloS One*, 8(2), e55863.
 - Nowell, A. (2023). Oral storytelling and knowledge transmission in Upper Paleolithic children and adolescents. *Journal of Archaeological Method and Theory*, 30, 9–31.
- **Week 7: The Role of Children in Social Learning Processes**
 - The processes of learning during the phase known as "childhood" hold immense significance in an individual's life, enabling the acquisition of physiological and social capabilities. Through exposure to various domains (economic, cultural, technological, etc.), children gain diverse skills, explore their self-identity, and integrate into the economic and cultural structure of their society.
 - Salali, G. D. et al. (2019). Development of social learning and play in BaYaka hunter-gatherers of Congo. *Science Reports*, 9, 11080.

- Assaf, E. (2021). Dawn of a new day: The role of children in the assimilation of new technologies throughout the Lower Paleolithic. *L'anthropologie*, 125(1), 102836.
- **Week 8: Is Learning a Human Trait? An Evolutionary Perspective**
 - Natural pedagogy theory; does social learning increase the individual's ability to survive?
 - Csibra, G., & Gergely, G. (2011). Natural pedagogy as evolutionary adaptation. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 366(1567), 1149–1157.
 - Boyd, R., Richerson, P. J., & Henrich, J. (2011). The cultural niche: Why social learning is essential for human adaptation. *Proceedings of the National Academy of Sciences*, 108(S2), 10918–10925.
- **Week 9: Cumulative Culture**
 - Different definitions for cumulative culture in various disciplines; how did this mechanism enable the development of complex technologies? We will see some archaeological examples for cumulative culture as early as the Acheulian cultural complex.
 - Van Schaik, C. P., Pradhan, G. R. & Tennie, C. (2019). Teaching and curiosity: Sequential drivers of cumulative cultural evolution in the hominin lineage. *Behavioral Ecology and Sociobiology*, 73, 1–11.
 - Rosenberg-Yefet, T., Shemer, M., and Barkai, R. (2021). Acheulian shortcuts: Cumulative culture and the use of handaxes as cores or the production of predetermined blanks. *Journal of Archaeological Science Reports*, 36, 102822.
- **Week 10: Learning and the Human Brain**
 - What neuroarchaeology can teach us regarding which parts of the brain are activated during teaching and learning. What are the minimal cognitive abilities required for learning to occur? What types of memory are involved in learning processes? We will get to know terms like "education of attention" and Theory of Mind.
 - Pargeter, J., Khreisheh, N., & Stout, D. (2019). Understanding stone tool-making skill acquisition: Experimental methods and evolutionary implications. *Journal of Human Evolution*, 133, 146–166.
 - Lombard, M., & Gärdenfors, P. (2021). Causal cognition and Theory of Mind in evolutionary cognitive archaeology. *Biological Theory*, 2021, 1–19.
- **Week 11: Is Language Necessary for Social Learning?**
 - We will get to know different modes of communication, from hand gestures to spoken language, and investigate the connections between language and learning from a cognitive perspective.
 - Cataldo, D. M., Migliano, A. B., & Vinicius, L. (2018). Speech, stone tool-making and the evolution of language. *PloS One*, 13(1), e0191071.

- Morgan, T. J. et al. (2015). Experimental evidence for the co-evolution of hominin tool-making teaching and language. *Nature Communications*, 6(1), 1–8.
- **Weeks 12+13: The Low Visibility of Learning Processes in the Archaeological Record**
 - We will get to know the challenge and ways by which research is trying to make learning processes more visible. Ways of studying learning in prehistory include identifying different knapping skill levels and teaching degrees in archaeological and experimental assemblages, theoretical models predicting the reflection of different learning mechanisms in the archaeological record, and more.
 - Assaf, E. et al. (2023). Learning by doing: Investigating skill through techno-functional study of recycled lithic items from Qesem Cave (Israel). *Journal of Archaeological Method and Theory*, 30(1), 64–102.
 - Pargeter, J. et al. (2023). Testing the effect of learning conditions and individual motor/cognitive differences on knapping skill acquisition. *Journal of Archaeological Method and Theory*, 30, 127–171.
 - Snyder, W. D., Reeves, J. S., & Tennie, C. (2022). Early knapping techniques do not necessitate cultural transmission. *Science Advances*, 8(27), eabo2894.10.1038/ncomms7029
 - Torres, C., & Preysler, J. B. (2020). Experts also fail: A new methodological approach to skills analysis in lithic industries. *Journal of Paleolithic Archaeology*, 3(4), 889–917.
- **Weeks 14+15: Social or Individual Learning?**
 - We will present a few archaeological examples of technological innovations that were found across a vast geographical range, including the domestication of fire, shamanism, knapping technologies, plant and animal domestication, and the beginning of pottery, and we will ask whether they were learned through social learning and thus spread throughout the world or invented separately in a model of individual learning by trial and error.
 - Altman, A., & Mesoudi, A. (2019). Understanding agriculture within the frameworks of cumulative cultural evolution, gene-culture co-evolution, and cultural niche construction. *Human Ecology*, 47, 483–497.
 - Winkelman, M. J. (2022). An ethnological analogy and biogenetic model for interpretation of religion and ritual in the past. *Journal of Archaeological Method and Theory*, 29(2), 335–389.
 - MacDonald, K. et al. (2021). Middle Pleistocene fire use: The first signal of widespread cultural diffusion in human evolution. *Proceedings of the National Academy of Sciences*, 118(31), e2101108118.

POLICIES (READ THE FINE PRINT!)

Assignments

There are 15 multiple-choice tests, a test for each week. Each question counts equally. The exams comprise all (100%) of the undergraduate grade in the course. For graduate credit, the exams count 75% and a 10–12 page (APA format) term paper, on a preapproved topic, counts 25%.

Grading Policy, Criteria, and Scale

Your grade will be determined by weekly exams, each of which will cover the primary reading material (15 short online overview lectures) plus additional readings expanding on the week's topic. Your final grade will be determined by the number of points you receive out of the possible total points.