

Conservation Paleoecology at the La Brea Tar Pits, Los Angeles, CA.

Course ID: ARCH 300K

June 25-July 20, 2017

FIELD SCHOOL DIRECTOR:

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INTRODUCTION

Between approximately 50,000 and 10,000 years ago, the vast majority of large mammals on earth became extinct during a time of rapid climate warming and sharply increasing human populations — global changes similar to, but less extreme than, those prevailing today. These extinctions coincided with, and may have contributed to, significant reorganizations in vegetational and small mammal communities around the world. As scientists today seek to predict the effects of climate change and human activities on plant and animal communities, many are looking to the past to understand how these factors have impacted ecosystems at previous times in earth’s history.

One of the best places on earth for investigating these questions is the La Brea Tar Pits, a late-Quaternary paleontological locality in Southern California, USA that preserves the remains of countless plants, mammals, birds, fish, reptiles, amphibians, and invertebrates in asphalt-saturated sediments. More than a century of fieldwork at the site has unearthed more than four million fossils, allowing researchers unparalleled insight into intraspecific evolution and ecosystem change over the past 50,000 years. The La Brea Tar Pits are also unique in being the only active, urban Ice Age paleontological excavation in the world, and their location in the middle of North America’s third-largest city provides an opportunity to communicate the process of paleontology and the scientific method both at the publicly viewable excavations and through the on-site Museum and “fishbowl” Fossil Lab.

In this field school, students will excavate and prepare material from La Brea’s current year-round

excavation, Project 23, a pre-LGM (MIS 3) locality that contains hundreds of thousands of plant and animal remains. The main research focus currently at this site is a project aimed at reconstructing ancient food webs from the plant and mammal fossil assemblages and investigating whether properties of these webs allow predictions of food web stability and species persistence across periods of major environmental change. During the 2018 field season, IFR students will begin excavation of a new Project 23 deposit, Box 9, that has yielded radiocarbon dates ranging from 30,000 to > 50,000 years Before Present. Students will excavate fossils of dire wolves, saber-toothed cats, and other large, extinct Pleistocene mammals, as well as small- and medium-sized animals and plants still living in the Los Angeles region today. In addition to the active food webs research project, data collected during this field season will be integrated with the > 4 million specimen collection at the Tar Pits Museum to be used by researchers at the Tar Pits and around the world to understand and predict long-term biotic response to environmental changes past, present, and future.

COURSE OBJECTIVES

Students will practice paleontological field techniques including excavation in a grid system, collection of three-dimensional positional data on fossils, fossil identification, and data recording. They will also gain experience with the specific tools, techniques, and chemicals particular to excavation in asphaltic sediments, and with technologies such as photogrammetry and 3D scanning that are being used to activate new research projects focused on the deposits. Inside the Museum, students will learn laboratory techniques including asphalt removal, bone preparation and restoration, and sorting and identification of microfossils. Finally, students will be instructed in museological topics through hands-on training in Collections Management and lectures on Museum education programming, exhibit design, and scientific communication. Students will have the opportunity to practice these skills through public engagement inside the Museum and at the excavation site.

Through readings, lectures, and discussions, students will learn about the wealth of scientific information that the La Brea Tar Pits have produced over the past century, and how new fields and technologies are spawning new avenues of investigation on topics from microbial biology to climate change. Students will also be instructed in research design and will produce model research proposals as part of their final project. Course participants who wish to continue involvement with the Tar Pits after completion of the field school by conducting thesis projects under the supervision of museum researchers using data from the excavations and/or collections will be considered on an individual basis.

ACADEMIC CREDIT UNITS & TRANSCRIPTS

Credit Units: Attending students will be awarded 8 semester credit units (equivalent to 12 quarter credit units) through our academic partner, Connecticut College. Connecticut College is a private, highly ranked liberal arts institution with a deep commitment to undergraduate education. Students will receive a letter grade for attending this field school (see grading assessment and matrix). This field school provides a minimum of 160 direct instructional hours. Students are encouraged to discuss the transferability of credit units with faculty and registrars at their home institutions prior to attending this field school.

Transcripts: An official copy of transcripts will be mailed to the permanent address listed by students on their online application. One additional transcript may be sent to the student's home institution at no additional cost. Additional transcripts may be ordered at any time through the National Student Clearinghouse: <http://bit.ly/2hvrkl>.

PREREQUISITES

There are no prerequisites for participation in this Field School. Students should come prepared for physically demanding, outdoor work in high temperatures. Students should be able to follow directions and adhere to safety standards and excavation protocols including the use of personal protective equipment. Most of the excavation and laboratory work takes place on public view at the Museum, which receives upwards of 400,000 visitors per year, largely during the summer; there will be ample opportunities to interact with the public, and it is therefore important that students possess good communication skills. Good interpersonal skills and an ability to work productively in teams is imperative.

DISCLAIMER – PLEASE READ CAREFULLY

All fieldwork carries certain risks, including physical injury, illness, animal bites and stings, and exposure to the elements. Paleontology in asphaltic deposits entails the additional risk of chemical exposure to petrococarbons as well as the solvents used to counteract them. While precautions will be taken to minimize contact with these substances, it is impossible to prevent all exposure and the long-term effects of these compounds are largely unknown. Field school participants will be required to use Personal Protective Equipment and follow proper handling procedures as instructed by Tar Pits Staff.

Los Angeles is a major urban center that has associated risks, including vehicle collisions, pollution, and petty or violent crime. Students are advised to use caution in their travels about the city.

The La Brea Tar Pits is a high-profile institution that generates substantial media interest, and most activities, including excavation and laboratory work, will be conducted in public view. All participants will be required to sign a media waiver.

GRADING MATRIX

75%: Participation – Participation in all scheduled activities (excavation, Fossil Lab work, and lectures) and mastery of fossil excavation and preparation techniques.

10%: Mid-term exam – A written exam covering both lecture topics and field, lab, and collections methods, will be given at the end of the first two weeks.

10%: Research Proposal – During the latter part of the field school, students will write a research proposal (5-pages maximum) for a project based on La Brea Tar Pits fossil material.

5%: Lightning Presentation—Students will present their proposed research project to the class on the penultimate day of the field school

TRAVEL & MEETING POINT

Students are responsible for their own travel to and within Los Angeles, and are expected to arrive at the La Brea Tar Pits by 8:00am each morning, Monday – Friday. The La Brea Tar Pits is centrally located in a residential area and is serviced by several bus lines. Students using their own vehicles will be provided with parking passes for the Museum parking lot.

If your travel plans change unexpectedly or you are delayed, please call, text or email project director immediately. A local emergency cell phone number will be provided to all enrolled students.

VISA REQUIREMENTS

The La Brea Tar Pits are located in the United States. Citizens of other countries are asked to check the U.S. Embassy website page at their home country for visa requirements.

ACCOMMODATIONS

Students will be responsible for their own accommodations. An online forum will be established in the spring for field school participants to help find and coordinate housing with other students. Students will also be responsible for providing their own food, including lunches. Students should plan to bring a bag lunch to the field site each day (refrigerator and microwave are available in the staff kitchen), or may purchase food at local restaurants, food trucks or the weekly farmers' market during their lunch hour.

COURSE SCHEDULE

Monday, June 25

8:00 a.m. Students assemble at La Brea Tar Pits Museum staff entrance
8:30 a.m. - 12:00 p.m. Project overview, Lab and Collections orientation
12:00-1:00 p.m. Lunch
1.00-5:00 p.m. Excavation site orientation and safety training

Tuesday, June 26 – Friday, July 20

Tuesdays and Thursdays

8:00 – 9:30 a.m. Lecture and Discussion in Tar Pits Museum Education Classroom
9:45 a.m. – 12:00 p.m. Excavation and Lab work
12:00 – 1:00 p.m. Lunch
1:00 – 5:00 p.m. Excavation and Lab work, and Collections overview

Mondays, Wednesdays, and Fridays

8:00 a.m. – 12:00 p.m. Excavation and Lab work
12:00 – 1:00 p.m. Lunch
1.00 p.m. – 5:00 p.m. Excavation and Lab work

Saturdays and Sundays

Break*

Lecture & Discussion Schedule

Tuesday, June 26: Geology and Paleontology of Rancho La Brea and Tar Pits Worldwide (Dr. Emily Lindsey, Curator & Karin Rice, Excavator)
Thursday, June 28: History of Los Angeles and Rancho La Brea (Gary Takeuchi, Collections Manager)
Tuesday, July 3: Introduction to Paleoecology (Dr. Alexis Mychajliw, Postdoctoral Fellow)
Thursday, July 5: Conservation Paleoecology and Rancho La Brea Research (Dr. Emily Lindsey, Curator)
Tuesday, July 10: Research Proposal Assignment Discussion and Brainstorming (All, led by Dr. Lindsey)
Thursday, July 12: Theory and Practice in Collections Management (Aisling Farrell, Collections Manager)
Tuesday, July 17: Museums and Informal Science Education (Dr. Libby Ellwood, Postdoctoral Fellow)
Thursday, July 19: Research Proposal Roundtable and Lightning Talks (All)

Special Dates

Friday, July 6: Midterm Exam (8:00 – 9:00 a.m., Education Classroom)

***Saturday, July 7:** Field trip to Carpenteria asphalt seep & Beach Day (Depart Tar Pits 9:00 a.m.)

Friday, July 20: Wrap-up Lab and Excavation work. Final Discussion and Goodbye!

EQUIPMENT LIST

The La Brea Tar Pits & Museum will provide all necessary field equipment, lab supplies, and special PPE for the project. Students should bring warm-weather field clothes including rugged, long pants, short- and long-sleeved shirts, socks, and closed-toed shoes *which may be discarded at the end of the field school* and weather-proof notebooks and writing utensils for taking notes in lectures and in the field.

MANDATORY READINGS

Akersten, W. A., Shaw, C. A., Jefferson, G. T., & Page, G. C. (1983). Rancho La Brea: status and future. *Paleobiology*, 9(3), 211-217.

Barnosky AD et al. (2017). Merging Paleontology with Conservation Biology to Guide the Future of Terrestrial Ecosystems. *Science* 355: eaah4787

Coltrain, J. B., Harris, J. M., Cerling, T. E., Ehleringer, J. R., Dearing, M. D., Ward, J., & Allen, J. (2004). Rancho La Brea stable isotope biogeochemistry and its implications for the palaeoecology of late Pleistocene, coastal southern California. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 205(3), 199-219.

Fox-Dobbs, K., Stidham, T. A., Bowen, G. J., Emslie, S. D., & Koch, P. L. (2006). Dietary controls on extinction versus survival among avian megafauna in the late Pleistocene. *Geology*, 34(8), 685-688.

Frischia, A. R., Van Valkenburgh, B., Spencer, L., & Harris, J. (2008). Chronology and spatial distribution of large mammal bones in Pit 91, Rancho La Brea. *Palaios*, 23(1), 35-42.

Harris, JM (Ed.) 2015. La Brea and Beyond: The Paleontology of Asphalt-Preserved Biotas. *Natural History Museum of Los Angeles County, Science Series* (42), 174 pp.

Holden, A. R., Southon, J. R., Will, K., Kirby, M. E., Aalbu, R. L., & Markey, M. J. (2017). A 50,000 year insect record from Rancho La Brea, Southern California: Insights into past climate and fossil deposition. *Quaternary Science Reviews*, 168, 123-136.

Jefferson, G. T., & Goldin, J. L. (1989). Seasonal migration of *Bison antiquus* from Rancho La Brea, California. *Quaternary Research*, 31(1), 107-112.

Koch, P. L., & Barnosky, A. D. (2006). Late Quaternary extinctions: state of the debate. *Annual Review of Ecology, Evolution, and Systematics*, 37.

Merriam, J. C. (1911). *The fauna of Rancho La Brea* (Vol. 1, No. 2). The University Press.

Spencer, L. M., Van Valkenburgh, B., & Harris, J. M. (2003). Taphonomic analysis of large mammals recovered from the Pleistocene Rancho La Brea tar seeps. *Paleobiology*, 29(4), 561-575.

Van Valkenburgh, B., & Hertel, F. (1993). Tough times at La Brea: tooth breakage in large carnivores of the late Pleistocene. *SCIENCE-NEW YORK THEN WASHINGTON-*, 456-456.

Woodard, G. D., & Marcus, L. F. (1973). Rancho La Brea fossil deposits: a re-evaluation from stratigraphic and geological evidence. *Journal of Paleontology*, 54-69.

RECOMMENDED READINGS

- Barnosky AD, Matzke N, Tomiya S, Wogan G, Swartz B, Quental T, Marshall C, McGuire JL, Lindsey EL, Maguire KC, Mersey B, Ferrer EA (2011). Has the earth's sixth mass extinction already arrived? *Nature* 471: 51-57.
- Brown, C., Balisi, M., Shaw, C. A., & Van Valkenburgh, B. (2017). Skeletal trauma reflects hunting behaviour in extinct sabre-tooth cats and dire wolves. *Nature ecology & evolution*, 1(5), 131.
- DeSantis, L. R., & Haupt, R. J. (2014). Cougars' key to survival through the Late Pleistocene extinction: insights from dental microwear texture analysis. *Biology letters*, 10(4), 20140203.
- Fuller, B. T., Southon, J. R., Fahrni, S. M., Harris, J. M., Farrell, A. B., Takeuchi, G. T., ... & Taylor, R. E. (2016). Tar Trap: No Evidence of Domestic Dog Burial with "La Brea Woman". *PaleoAmerica*, 2(1), 56-59.
- Holden, A. R., Harris, J. M., & Timm, R. M. (2013). Paleoeological and taphonomic implications of insect-damaged Pleistocene vertebrate remains from Rancho La Brea, southern California. *PLoS one*, 8(7), e67119.
- Lindsey EL, Lopez EX (2015). Tanque Loma, a new late-Pleistocene megafaunal tar seep locality from southwest Ecuador. *Journal of South American Earth Sciences* 57: 61-82.
- Louys, J. (Ed.) 2012. Paleontology in Ecology and Conservation. Springer Berlin Heidelberg. 273 pp.
- Stock, C. (1929). A census of the Pleistocene mammals of Rancho La Brea, based on the collections of the Los Angeles Museum. *Journal of Mammalogy*, 10(4), 281-289.
- Ward, J. K., Harris, J. M., Cerling, T. E., Wiedenhoeft, A., Lott, M. J., Dearing, M. D., ... & Ehleringer, J. R. (2005). Carbon starvation in glacial trees recovered from the La Brea tar pits, southern California. *Proceedings of the National Academy of Sciences of the United States of America*, 102(3), 690-694.