



CONSERVATION PALEOECOLOGY AT THE LA BREA TAR PITS, LOS ANGELES, CA

Course ID: ARCH 300K

June 15-July 10, 2020

Academic Credits: 8 Semester Credit Units (Equivalent to 12 Quarter Units)

School of Record: Connecticut College

FIELD SCHOOL DIRECTOR:

Dr. Emily L. Lindsey, La Brea Tar Pits and Museum (elindsey@tarpits.org)



Tuition covers the cost of instruction and 8 semester credit units. Participants are responsible for cost of travel, accommodations, and meals.

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 active excavations, including Pit 91, the site's iconic and longest-running paleontological dig, now 15' deep in the ground, and Project 23, a pre-LGM (MIS 3) locality comprising 16 separate asphaltic fossil deposits between 30,000 and 50,000 years in age. Both of these excavations have yielded hundreds of thousands of plant and animal remains from the last Ice Age of the Pleistocene epoch. Students will excavate and prepare fossils of dire wolves, giant ground sloths, 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 or elsewhere in western North America today. In addition to forming the basis for active research projects at the Tar Pits, fossils collected during this field season will be integrated with the >4-million-specimen collection in the Tar Pits Museum to be used by researchers in Los Angeles and around the world to understand and predict long-term biotic response to environmental changes past, present, and future.

During the 2020 field school, students will participate in several active research projects being led by different Rancho La Brea scientists: These include studies focused on understanding the response of large and small mammals to climate changes and defaunation; research on Pleistocene food webs and trophic interactions; and reconstructing the vegetation communities of ancient Los Angeles.

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 institution 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 more transcript may be sent to the student home institution at no cost. Additional transcripts may be ordered at any time through the National Student Clearinghouse: <http://bit.ly/2hvurkl>.

COURSE OBJECTIVES

Students will develop expertise in 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 our site. In the Fossil Lab, students will learn laboratory techniques including asphalt and sediment removal, bone preparation and restoration, and sorting and identification of microfossils. Students will complete an intensive module in vertebrate skeletal morphology, wherein they will become versed in fossil identification, evolutionary morphology, and biomechanics. 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 their communication skills through public engagement inside the Museum and at the excavation site.

Through daily lectures, readings, 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. Topics will include broad overviews of Quaternary extinctions, paleoecology, and conservation paleobiology, as well as specific topics spanning the breadth of paleontological research at Rancho La Brea. Lecturers will represent a wide variety of paleontological positions, including academic faculty, museum personnel, graduate students, postdoctoral researchers, and professional paleontologists. Students will also be instructed in paleoecological research design and analysis, and will assist with data collection for active research projects at the La Brea Tar Pits under the mentorship of Museum researchers.

DISCLAIMER – PLEASE READ CAREFULLY

Our primary concern is with education. Traveling and conducting field research involve risk. Students interested in participating in IFR programs must weigh whether the potential risk is worth the value of education provided. While risk is inherent in everything we do, we do not take risk lightly. The IFR engages in intensive review of each field school location prior to approval. Once a program is accepted, the IFR reviews each program annually to make sure it complies with all our standards and policies, including student safety.

The IFR does not provide trip or travel cancellation insurance. We encourage students to explore such insurance on their own as it may be purchased at affordable prices. insuremytrip.com or Travelgurad.com are possible sites where field school participants may explore travel cancellation insurance quotes and policies. If you do purchase such insurance, make sure the policy covers the cost of both airfare and tuition. See this [Wall Street Journal article about travel insurance](#) that may help you with to help to decide whether to purchase such insurance.

We do our best to follow schedule and activities as outlined in this syllabus. Yet local permitting agencies, political, environmental, personal, or weather conditions may force changes. This syllabus, therefore, is only a general commitment. Students should allow flexibility and adaptability as research work is frequently subject to change.

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 petrocarbons 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.

If you have any medical concerns, please consult your doctor. For all other concerns, please consult the project director or IFR staff, as appropriate.

PREREQUISITES

There are no academic 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 more than 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 are imperative.

GRADING MATRIX

- 75%** Participation: Participation in all scheduled activities (excavation, Fossil Lab work, collections work, data collection, field trips, and lectures) and mastery of fossil excavation and preparation techniques.
- 5%** Midterm 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%** Lab Practical Exam: Students will rotate stations on two-minute intervals and answer questions about real fossils placed at each station.
- 5%** Field Notebooks: While working in excavations students will keep a standard Field Notebook as instructed by the Excavators.
- 5%** Science Communication: Part of student training will comprise modules on written and spoken science communication; students will have opportunity to demonstrate these skills throughout the course.

TRAVEL & MEETING POINT

Hold purchasing your airline ticket until six (6) weeks prior to departure date. Natural disasters, political changes, weather conditions and a range of other factors may require the cancelation of a field school. The IFR typically takes a close look at local conditions 6-7 weeks prior to program beginning and make Go/No Go decisions by then. This time frame still allows the purchase of discounted airline tickets while protecting students from potential loss of airline ticket costs if we decide to cancel a program.

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 and Museum 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 the Project Director or Assistant Instructor 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 are responsible for their own accommodations. 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.

A limited number of housing stipends will be available to help defray housing costs for non-local students.

COURSE SCHEDULE

All IFR field schools begin with safety orientation. This orientation includes proper behavior at the field area, proper clothing, local cultural sensitivities and sensibilities, potential fauna and flora hazards, review of IFR harassment and discrimination policies, and review of the student Code of Conduct.

Monday, June 15

8:00 am – 5:00 pm Orientation Day

Tuesday, June 16 – Friday, June 26

8 – 9:00 am Morphology Class

9:00 am – 12:00 pm Excavations

12 – 1:00 pm Lunch (independent)

1 – 5:00 pm Excavations

Monday, June 29 – Thursday, July 2

8 – 9:00 am Morphology Class

9:00 am – 12:00 pm Lab and Collections

12 – 1:00 pm Lunch (independent)

1 – 5:00 pm Lab and Collections

Monday, July 7 – Friday, July 10

8 – 9:00 am Lecture and Discussion

9:00 am – 12:00 pm Collections-based research

12 – 1:00 pm Lunch (independent)

1 – 5:00 pm Collections-based research

Special Dates

✚ Saturday, June 20 Geology and Taphonomy Field Trip (Carpinteria, Ojai)

✚ Friday, June 26 Midterm Exam

✚ Thursday, July 2 Lab Practical Exam

✚ Friday, July 3 No Class for Holiday Weekend

✚ Monday, July 6 Deep Time Field Trip

✚ Thursday, July 9 Mitigation Paleontology Field Trip

✚ TBD Science Communication Field Trip

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
- closed-toed shoes *which may be discarded at the end of the field school*
- weather-proof notebooks and writing utensils for taking notes in lectures and in the field.

REQUIRED READINGS

PDF files of all mandatory readings will be provided to enrolled students via a shared Dropbox folder.

- 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. *Palaaios*, 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*, 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., Wiedenhoft, 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.