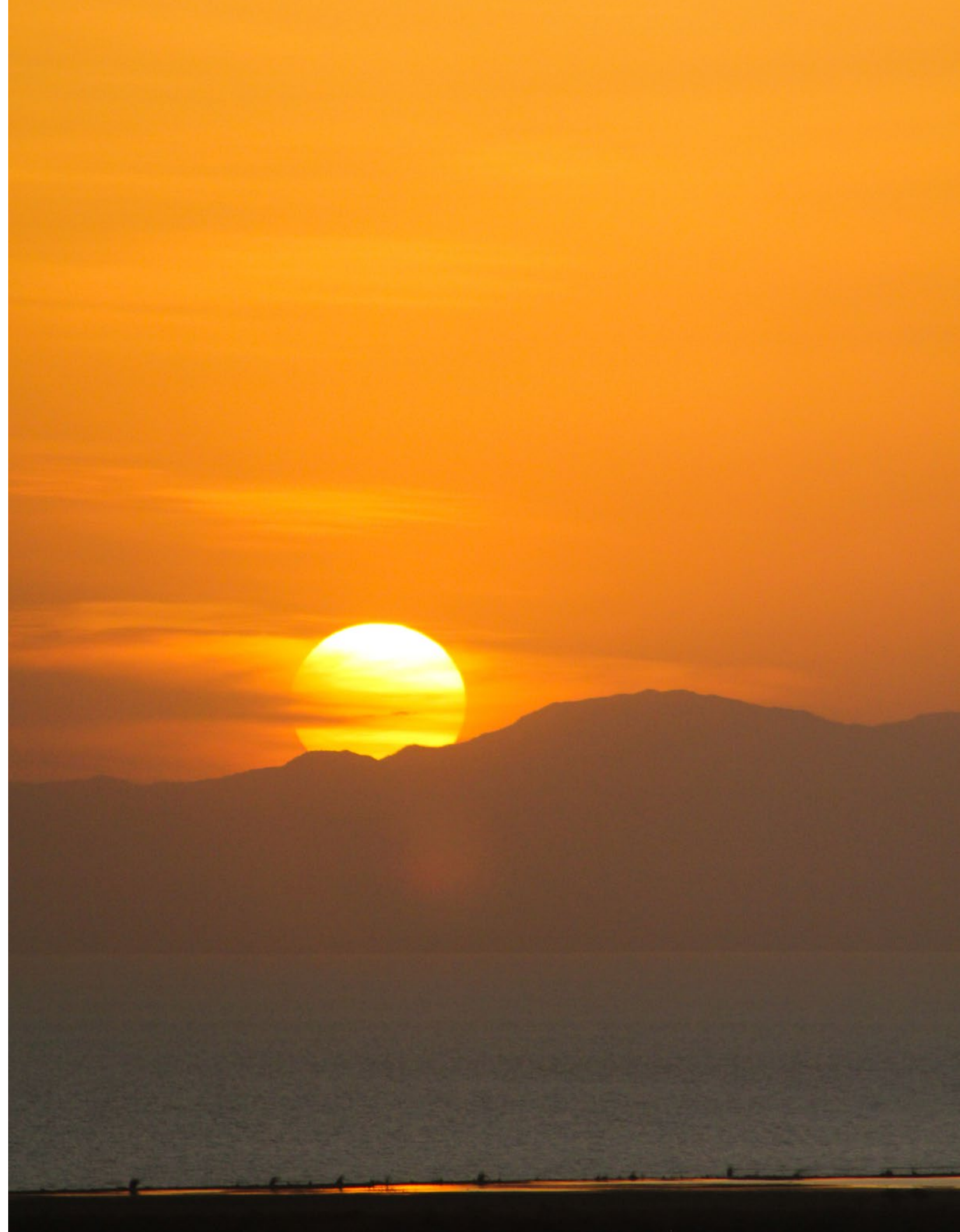


TURKANA BASIN INSTITUTE

2019

YEAR **IN** REVIEW



Dear Friends & Supporters of TBI,

The Turkana Basin Institute (TBI) was established in 2005, and since then we have made remarkable progress. In partnership with Stony Brook University and the Stony Brook Foundation, and with the support of generous friends and donors, we have built two fully equipped field stations at Lake Turkana, established an administrative office in Nairobi, and now operate an aircraft for charter, a Cessna Grand Caravan, to support field research. Each field station comprises about twenty buildings, totaling about 50,000 square feet, and provides accommodation for up to 50 visitors, scientists, and students at any time. Each field station has laboratories, fossil preparation facilities, and curatorial space for the prehistoric heritage collections with which TBI is entrusted. As well as accommodation for staff and visitors, there are facilities for metal and woodworking, and vehicle maintenance. Both field stations are off the grid and are completely self-contained in terms of providing clean drinking water and energy to run the stations and, increasingly, growing fresh vegetables, salads and fruits hydroponically.

TBI has a strong CSR program and enjoys good relationships with the communities neighboring the field stations, from which most of our permanent staff are drawn. We support schools by providing bursaries to enable students to attend high schools, as well as supporting a few teaching staff to support local primary schools. We support several health clinics, including the TBI mobile clinic around Ileret. TBI is now a registered research institution under the Ministry of Education and is close to realizing Richard Leakey’s decades-long vision of multidisciplinary research stations in one of the most remote and scientifically valuable places on the planet.

The purpose of this infrastructure is to enable research and education in this remote and understudied part of the world. This year we celebrate the inauguration of the TBI Research Fund that provides annual funding of over \$400,000 to support research in the Turkana Basin concerning the evolution of apes and humans, including geochronology, climate, and environment. TBI strongly believes that the recovery and analysis of new paleontological and archaeological material is key to furthering our understanding of hominid behavior and adaptation. A smaller amount of funding is available to support work on human prehistory in the most recent time periods. The grant for this program has been generously donated by the Life Sciences division of the Simons Foundation, as well as donations from members of TBI’s International Advisory Board (IAB).

With best wishes,



Lawrence Martin
*Director of the
Turkana Basin Institute*



Louise Leakey
*Executive Director,
TBI Kenya*



Isaiah Nengo
*Deputy Director of TBI,
Director for Research & Science,
TBI Kenya*

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Project team at the newly-discovered Topernawi site.

Research

Research projects facilitated by the Turkana Basin Institute continue to expand the boundaries of knowledge surrounding faunal evolution, prehistoric climate change, and our own origins. The following pages list research projects currently facilitated by TBI.

► **A new Oligo-Miocene site in Topernawi Gorge.** This site was discovered and mapped in 2018 and documents an important but poorly known time period for Old World primate evolution from 25-28 myr. This year’s expedition found excellent fossil specimens, and project leaders believe much more remains to be discovered at this promising site.

PROJECT LEADERS: Patricia Princehouse, Isaiah Nengo [More information](#) on page 7

► **Hominin footprints in the Turkana Basin.** This project examines new fossil footprint and skeletal fossil data to better understand the ecological context of hominins living in the Turkana Basin around 1.5 million years ago.

PROJECT LEADER: Neil Roach [More information](#) on page 7

► **Koobi Fora Research Project.** Since 1968, members of the KFRP have unearthed many of the top significant hominin discoveries known to science, such as skull KNM-ER 1470, the Turkana Boy skeleton, *Australopithecus anamnesis*, and *Kenyanthropus platyops*.

PROJECT LEADERS: Meave Leakey, Louise Leakey [More information](#) on page 8

► **The Buluk Research Project** investigates faunal remains at the rich Miocene site of Buluk to document the origins of modern African mammal clades, including Old World monkeys and apes.

PROJECT LEADERS: Ellen Miller, Isaiah Nengo [More information](#) on page 8

► **In-Africa Project.** In Africa, which just completed its eleventh field season, is a research program investigating the origins of our species—*Homo sapiens*—and its diversity in Africa, and aims to make new discoveries of early human fossils and archaeological sites to test models of human origins and diversification on the continent.

PROJECT LEADER: Marta Lahr [More information](#) on page 9

► **Napudet Research Project.** Continued exploration and excavation at Napudet has resulted in the recovery of numerous new fossils, including new primate specimens.

PROJECT LEADERS: Gabrielle Russo, Isaiah Nengo [More information](#) on page 9

► **West Turkana Archaeology Project.** The WTAP is a multidisciplinary scientific project that conducts archaeological fieldwork on the western shores of Lake Turkana to better understand the evolution of human cognitive abilities and adaptive strategies.

PROJECT LEADERS: Sonia Harmand, Jason Lewis [More information](#) on page 10

► **Later Prehistory of West Turkana.** The LPWT examines the beginnings of agriculture and herding in Africa. Ethnobotanical, archaeological, and archaeobotanical data are utilized to explore the economies, culture, and survival strategies of the earliest hunter-gatherers on the continent.

PROJECT LEADER: Elisabeth Hildebrand [More information](#) on page 10

► **Geological Evolution of the Turkana Basin, Kenya** seeks to further refine understanding of the complex geology in the Turkana Basin, enabling a more accurate dating of fossils and artifacts recovered there.

PROJECT LEADER: Craig Feibel [More information](#) on page 11

► **History of diets of large mammals, including apes and humans, in Africa from the Miocene to present.** This project utilizes measurements of stable, light isotopes detected in faunal remains to reconstruct diets of large African mammals from the Miocene to present, to better understand the paleoecology of the terrestrial ecosystems in which these creatures lived.

PROJECT LEADER: Thure Cerling [More information](#) on page 11

► **Current rifting in the East African Rift.** Using continuous GPS stations installed at TBI-Ileret and TBI-Turkwel to record frequent, precise measurements of movements in the Earth's crust, this project focuses on the history of the formation of the East African Rift.

PROJECT LEADER: Rebecca Bendick

► **Frontier dynamics across Lake Turkana** investigates the life ways of early African pastoralists through examination of archaeological and bioarchaeological evidence.

PROJECT LEADER: Elisabeth Sawchuk [More information](#) on page 12

► **Automating taxonomic classification of east African herbivore dentition through machine learning.** This project deploys neural network-based learning techniques to assist in the identification of fossil herbivore teeth found in the Turkana Basin, which are important ecological and climatic indicators.

PROJECT LEADER: Daniel Green [More information](#) on page 12

► **Ecological changes in Sibiloi National Park and surroundings, Kenya: an integrated inter-disciplinary approach.** Initiated in 2016, this project assesses the social and ecological status of Sibiloi National Park and surroundings, while exploring links between ecological and cultural change.

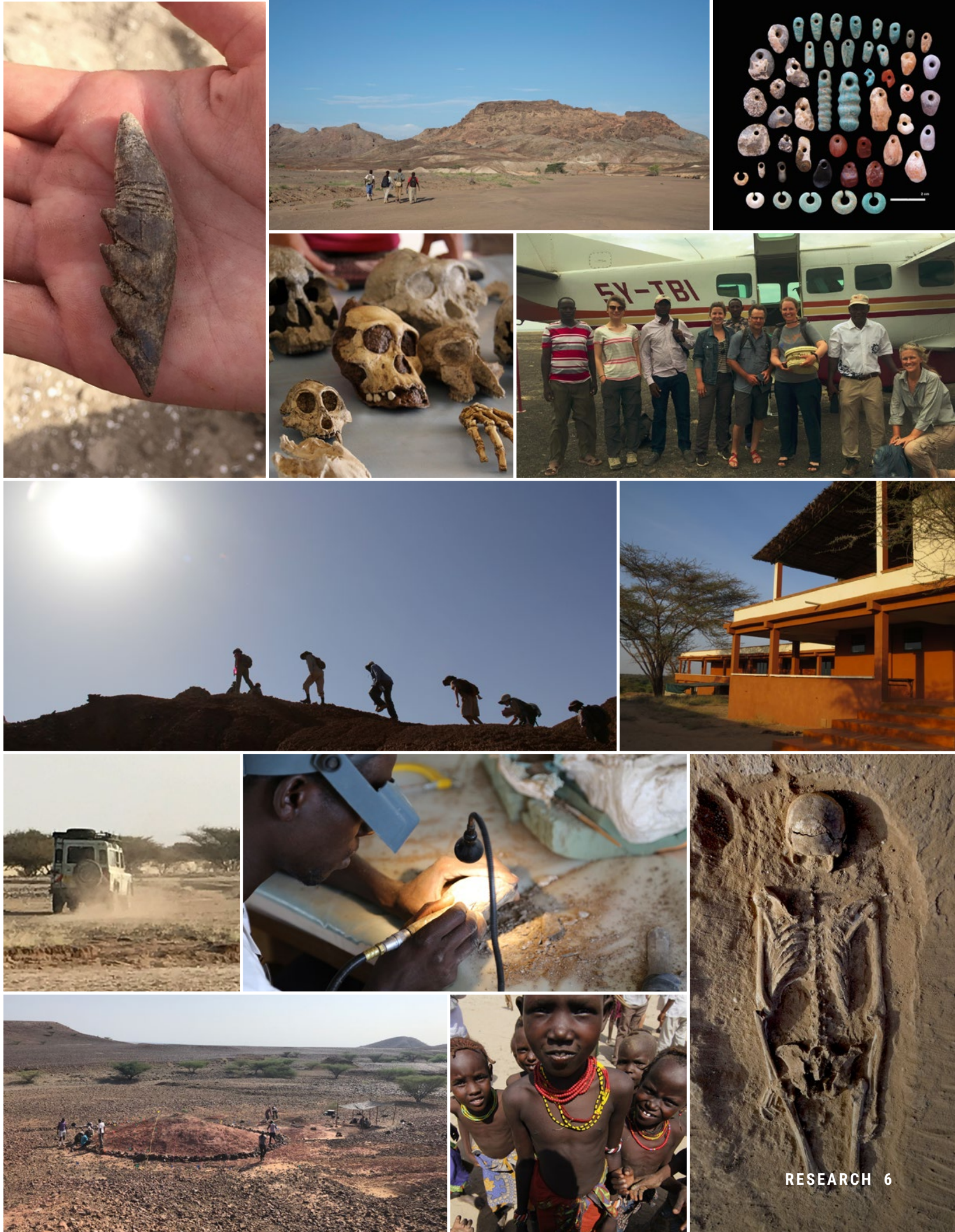
PROJECT LEADER: Mar Cabeza [More information](#) on page 13

► **Comparative hyena ecology in the context of defaunation and pastoralism.** This project explores the effects of human communities on hyena populations.

PROJECT LEADER: Miquel Torrents-Ticó [More information](#) on page 14

► **Local Indicators of Climate Change Impacts (LICCI).** The LICCI investigates the potential of local knowledge systems to assist in generating climate research data.

PROJECT LEADER: Victoria Reyes-García





The following pages list TBI-affiliated research projects in greater detail.

A new Oligo-Miocene site in Topernawi Gorge

This site, located in western Turkana County north of the Turkwel River, was discovered and mapped in 2018, and documents an important but poorly known time period for Old World primate evolution from 25-28 myr.

PROJECT LEADERS: Patricia Princehouse, Isaiah Nengo

TEAM MEMBERS: Emmanuel Aoron



- 2019 RESEARCH HIGHLIGHTS:**
- ▶ 91 mammal fossils discovered in the last field season were accessioned by the National Museums of Kenya.
 - ▶ This season, an abundance of additional fossils was recovered, particularly well-preserved teeth and jaws but with postcranial material as well.
 - ▶ The site offers a rich diversity of environments, ranging from deep lake sediments, to fast- and slow-moving fluvial deposits, to paleosols with trace fossils.
 - ▶ Researchers believe that fossils recovered from this site include primates of a variety of body sizes.
 - ▶ Approximately one-third of the site has so far been explored in-depth, leading researchers to believe they have just scratched the surface of what this site may offer.

Hominin footprints in the Turkana Basin

This project focuses on new fossil footprint and skeletal fossil data, with a goal of better understanding the ecological contexts of hominins living in the Turkana Basin around 1.5 million years ago.

PROJECT LEADER: Neil Roach

TEAM MEMBERS: Anna K. Berhensmeyer, Kevin Hatala, Frederick Manthi

- 2019 RESEARCH HIGHLIGHTS:**
- ▶ Discovery of four 1.5 million-year-old hominin footprint surfaces and subsequent excavations at each.
 - ▶ Comprehensive surveys of skeletal fossils were conducted in the same deposits as the footprints, revealing hundreds of skeletal fossils including a *Homo erectus* mandible.

Koobi Fora Research Project (KFRP)

Since 1968, members of the KFRP have unearthed many of the top significant hominin discoveries known to science, such as skull KNM-ER 1470, the Turkana Boy skeleton, *Australopithecus anamnesis*, and *Kenyanthropus platyops*.

PROJECT LEADERS: Meave Leakey, Louise Leakey



- 2019 RESEARCH HIGHLIGHTS:**
- ▶ Fieldwork on the east side of Lake Turkana focused first on fossil collection areas 202, 203, and 204, areas not explored for several decades. A hominin premolar was recovered.
 - ▶ Exploration progressed to areas 103 and 101, from which five new hominin specimens were recovered, including molars and hand bones from species *Paranthropus boisei*.
 - ▶ The team briefly visited the site of South Turkwel during a TBI collections management workshop, and a partial hominin molar was recovered from the site of previously excavated hominin specimen KNM-ST 64071.

Buluk Research Project

The Buluk Research Project investigates faunal remains at the rich Miocene site of Buluk to document the origins of modern African mammal clades, including Old World monkeys and apes.

PROJECT LEADERS: Ellen Miller, Isaiah Nengo

TEAM MEMBERS: Ellis Locke



- 2019 RESEARCH HIGHLIGHTS:**
- Research this year focused on describing, measuring, and photographing primate and mammal fossil material collected at Buluk during prior field seasons, in preparation for publication. Expected results include the announcement of a possible new ape species, and publications on Buluk proboscideans, rhinos, and carnivores.
- Additional forthcoming papers will focus on the geology of Buluk, Buluk monkeys, and the arm bones of a small-bodied ape.

In-Africa Project

In Africa, which just completed its eleventh field season, is a research program investigating the origins of our species—*Homo sapiens*—and its diversity in Africa, and aims at making new discoveries of early human fossils and archaeological sites to test models of human origins and diversification on the continent.

PROJECT LEADER: Marta Lahr

TEAM MEMBERS: Robert Foley, Abigail Parker, Hema Achyuthan, Katrien Janin, Celine Vidal, Aurélien Mounier, Jason Head



2019 RESEARCH HIGHLIGHTS:

The aim of the 2019 field season was to investigate fossil-bearing Middle Pleistocene deposits on the west side of Lake Turkana containing stone tools and abundant faunal remains, including hominins.

- ▶ Excavations at the site of Ngingolea 1, close to the location of previously discovered surface remains of hominins, were extended, revealing additional occurrences of lithics. Optically stimulated luminescence (OSL) samples as well as paleoenvironmental samples were taken, with a goal of linking the buried deposits with the fossil-bearing surfaces.
- ▶ Areas around the site of Lokodongot 6, which yielded significant hominin cranial remains the previous two years, were swept and sieved, and further hominin remains were recovered, strengthening the team's view that Lokodongot will become a key locality for the Pleistocene evolution of *Homo* in Africa.
- ▶ The stratigraphy of the site was further refined using biostratigraphic analysis, argon/argon dating, and potassium/argon dating techniques.

Napudet Research Project

Continued exploration and excavation at Napudet has resulted in the recovery of numerous new fossils including new primate finds, such as the Alesi fossil—a remarkably complete, 13 million-year-old infant ape skull.

PROJECT LEADERS: Gabrielle Russo, Isaiah Nengo

2019 RESEARCH HIGHLIGHTS:

- ▶ Survey and fossil recovery at Napenagila South, a newly established early Miocene site
- ▶ Continued data collection at Napudet, including new primate finds



West Turkana Archaeology Project (WTAP)

The WTAP is a multidisciplinary scientific project that conducts archaeological fieldwork on the western shores of Lake Turkana. In 2015, leaders of the project announced their discovery of the world's oldest stone tools, dated to 1.3 million years.



PROJECT LEADERS: Sonia Harmand, Jason Lewis

TEAM MEMBERS: Vincent Arrighi, Boes Xavier, Sandrine Prat, Nicholas Taylor, Jenna Anderson

2019 RESEARCH HIGHLIGHTS:

- ▶ The WTAP resumed excavation of the 3.3 million-year-old Lomekwi 3 (LOM3) site, recovering additional in-situ stone tools and fossil bones.
- ▶ A new archaeological site, named Lomekwi 4 and also dated to 3.3 million years, was discovered a kilometer away from LOM3. Four in-situ artifacts were found embedded in the Pliocene-age sediment of LOM4.
- ▶ Archaeological reconnaissance was conducted at Nadung'a, to the north of Lomekwi. Several new Acheulean-industry sites were discovered there.

Later Prehistory of West Turkana (LPWT)

The LPWT examines the beginnings of agriculture and herding in Africa. Ethnobotanical, archaeological, and archaeobotanical data are utilized to explore the economies, culture, and survival strategies of the earliest hunter-gatherers on the continent.

PROJECT LEADER: Elisabeth Hildebrand

TEAM MEMBERS: Elisabeth Sawchuk, Kate Grillo



2019 RESEARCH HIGHLIGHTS:

LPWT fieldwork this year focused on re-exposing previous excavations conducted at the Jarigole pillar site, to compare its stratigraphy and associated artifacts to those of Lothagam North, a site on the opposite side of Lake Turkana. The LPWT team hypothesizes that examination of the two sites will reveal strong material cultural similarities. Backfill was removed from the site, existing excavations were deepened, and additional excavations were undertaken adjacent to previous.

A mortuary cavity was discovered and remains from at least three individuals were recovered from this. Preliminary results indicate that the architecture and material culture of the Jarigole site parallels that of Lothagam North. Analysis of pottery, lithics, stone beads, and faunal and human remains is still ongoing, and the team plans to continue this work in 2020.

Geological Evolution of the Turkana Basin, Kenya

This project serves to further refine understanding of the complex geology in the Turkana Basin, enabling a more accurate dating of fossils and artifacts recovered there.

PROJECT LEADER: Craig Feibel



2019 RESEARCH HIGHLIGHTS:

Fieldwork based out of TBI-Ileret investigated major gaps in the Koobi Fora Formation to better understand the age and context of fossils recovered from there:

- ▶ Analysis of sedimentary features in collection area 116, associated with past erosional events, aided in the more accurate dating of geological member strata located there.
- ▶ Work in collection area 14 investigated the context of a nearly complete fossil elephant cranium, likely part of an ancient river delta.
- ▶ The extensive exposures in collection area 40, an area where the entire Koobi Fora sequence is represented along with multiple prominent geologic unconformities, was investigated.
- ▶ In addition, the project provided two weeks of field training for Everlyne Apondy of the National Museums of Kenya, who will continue her geology studies in a graduate program next year.

History of diets of large mammals in Africa from the Miocene to present

This project utilizes the measurements of isotopes detected in faunal remains to reconstruct diets of large African mammals from the Miocene to present, to better understand the paleoecology of the terrestrial ecosystems in which these creatures lived.

PROJECT LEADER: Thure Cerling



2019 RESEARCH HIGHLIGHTS:

180 specimens, including 36 hominins, were sampled from the fossil collections at TBI-Turkwel, predominantly from the late Pleistocene to recent Holocene. The samples will be analyzed in the first six months of 2020 at the University of Utah for the presence of stable isotopes. Anticipated outcomes for this project include:

- ▶ The development of a base map for Strontium isotope studies of the Holocene.
- ▶ Determination of hominin diets during the African Humid Period.
- ▶ Determination of group affiliation for hominins from the Nataruk bioarchaeology site

Frontier dynamics across Lake Turkana: Tracing the social lives and deaths of eastern Africa's first herders

This project seeks to understand the life ways of early African pastoralists through examination of archaeological and bioarchaeological evidence.

PROJECT LEADER: Elisabeth Sawchuk

Team members: Emmanuel Ndiema, Anneke Janzen, Dan Contreras, Katherine Grillo, Elisabeth Hildebrand



2019 RESEARCH HIGHLIGHTS:

This year's fieldwork focused on comparisons of bioarchaeological, material culture, and architecture patterns between the site of Lothagam North, on the west side of Lake Turkana, and the Jarigole pillar site on the east side. The team tested a hypothesis that deeper excavations at Jarigole would reveal evidence of primary burials, contrary to previous interpretations of the site as a secondary burial ground.

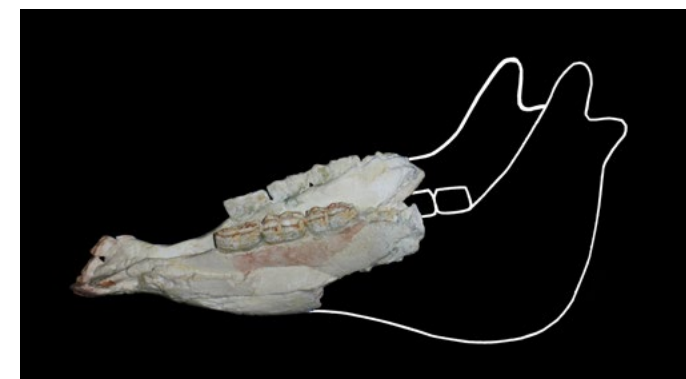
Excavations revealed a complex mortuary cavity with at least four pits with primary burials. In addition to burials, the team recovered pottery, figurines, stone tools, jewelry, and faunal remains.

Preliminary analysis was begun at the NMK and the team plans to return next year to finish this work.

Automating taxonomic classification of East African herbivore dentition through machine learning

This project deploys neural network-based learning techniques to assist in the identification of fossil herbivore teeth found in the Turkana Basin.

PROJECT LEADER: Daniel Green



2019 RESEARCH HIGHLIGHTS:

4500 standardized, high-resolution photos were taken of 800 fossil specimens from the Miocene, Pliocene, and Pleistocene housed at the National Museums of Kenya and TBI-Turkwel. Associated metadata will record details such as ID numbers, location, and stratigraphic affiliations. Once this is complete, the project intends to make this information available online for other researchers.

Ecological changes in Sibiloi National Park and surroundings, Kenya: an integrated inter-disciplinary approach

Initiated in 2016, this project assesses the social and ecological status of Sibiloi National Park and surroundings, while exploring links between ecological and cultural change.

PROJECT LEADER: Mar Cabeza

TEAM MEMBERS: Visa Koiso-Kanttila, Iiris Härmä, Daniel Burgas, Sara Fraixedas



2019 RESEARCH HIGHLIGHTS:

Ecological data collected in previous years, such as animal species distribution, were analyzed, providing a better understanding of the importance of various local habitats in conservation efforts.

To better understand bat distribution and survival strategies, GPS logging devices were placed on insectivorous species such as the yellow-winged bat. Analysis of this data revealed surprising details about the species' habits, such as small home ranges, survival without drinking water (getting required moisture from insects alone), and monogamy.

To better understand how proximity to local human communities affects wildlife distribution patterns, a citizen-science approach to game monitoring was developed, with 50 camera traps distributed among groups of pastoralists to record occurrences of wildlife. Likewise, livestock were fitted with GPS collars to track their range and movements. These data are currently under analysis and will hopefully shed light on issues of human-wildlife conflict.

Comparative hyena ecology in the context of defaunation and pastoralism

This project explores the effects of human communities on hyena populations.

PROJECT LEADER: Miquel Torrents-Ticó



2019 RESEARCH HIGHLIGHTS:

This year's expedition to Sibiloi National Park visited the local Daasanatch community near Ileret to collectively develop a template for a "social survey"—a way to canvas local community members for their practical ecological knowledge of local fauna. An initial pilot interview was developed to test the effectiveness of interview questions and interviewee's feedback. Twenty interviews were conducted, and preliminary answers of this pilot suggest that locals living in and around Ileret face increasing conflict with carnivores, particularly the spotted hyena.

To complement ecological surveys and to assist with community reporting of hyena conflicts, a mobile application was developed with collaboration from colleagues. The app included questions about incidents such as timing, magnitude of conflicts, and evidence of the conflict. The app has been used since the beginning of the year, with several incidents being reported.



Origins Field School

TBI's flagship field education program offers students from around the world an opportunity to explore human origins in the very place where much of the fossil evidence has been discovered.

This year, two Kenyans, Winfred Mbogo and Medina Lubisia, assisted field school instructors with mentoring students. Winfred, the Resident Academic Director of the field school, has a background in anthropology, and has been involved in various social and behavioral research projects in Kenya. Medina, holding a degree in Anthropology, served as the program's Teaching Assistant.

Students met in Nairobi and spent a couple of nights at the Wildebeest Eco Camp on the outskirts of the city. During their time in Nairobi, students visited the David Sheldrick Wildlife Trust and its community of orphaned elephant calves rescued from all over Kenya. They also visited the Giraffe Centre and enjoyed feeding its resident Rothschild giraffes. Last on the tour was the National Museums of Kenya where students had the rare opportunity to view the actual fossilized remains of "Turkana Boy," the nearly complete 1.6 million-year-old *Homo erectus* skeleton discovered in 1984 by Kamoya Kimeu, one of Richard Leakey's team of expert Kenyan fossil hunters.

From Nairobi, students flew to Mpala Research Centre in the wildlife-rich Laikipia region of central Kenya. Directed by Kenyan biologist Dino Martins, the Princeton-affiliated Mpala serves as a perfect location to begin the first course of the program, Ecology, taught by Dino. At any given time, Mpala might be home to elephant, giraffe, the rare Grevy's Zebra, hippos, big cats, a variety of antelope, a great diversity of birdlife, and many additional species.

Field trips from Mpala took students to the Mt. Kenya Conservancy where they were able to hike Mt. Kenya and interact with endangered mountain bongos, to an area where a pack of African wild dogs were being studied by Kenyan ecologists Dedan Natia and Paula Kahumbu, to the lively nearby town of Nanyuki to do some shopping. While at Mpala, students had the opportunity to attend the Laikipia Science, Education, and Conservation film festival, put on by Mpala and Kenya-based conservation organization Wildlife Direct.

Members of the 2019 Origins Field School.



Saying farewell to Mpala, students flew to TBI's Ileret campus on the east side of Lake Turkana for the Geology component of the Field School. Instructor Greg Henkes (Stony Brook University) introduced students to the complex stratigraphy of the Turkana Basin. Students learned traditional mapping skills utilizing the Brunton compass and Jacobs staff, as well as modern GPS techniques, to create slope profiles in fossil collection area 6A. Greg also tutored the students in the identification of different types of sedimentary, metamorphic, and igneous rocks. At the famed location of Koobi Fora, where Richard and Meave Leakey launched the Koobi Fora Research Project over fifty years ago, students had the opportunity to visit the Fossil Elephant Site, a complete skeleton of extinct proboscidean *Elephas recki* lying *in situ* in sediments dated to two million years.



Vertebrate Paleontology was taught by Ellen Miller (Wake Forest University), who, along with colleagues, conducts an ongoing investigation into the Miocene fauna of the region with the goal of understanding the origins of modern African mammal clades. Under Ellen's instruction, students examined the collection of modern animal skeletons to familiarize themselves with the morphological features and skeletal differences of modern forms in preparation for field excursions to study the fossilized remains of extinct taxa. TBI's chief curator, Martin Kiriinya Muthuri, gave a lecture on fossil management, detailing the process of transportation, cleaning, accessioning, and data-sharing that occurs after a specimen is discovered in the field. Students were able to test some of their newly-acquired skills by cleaning some fossil specimens recently collected.

A field trip to the site of Buluk proved the ideal opportunity to experience the faunal past of the Turkana Basin. Buluk is one of the richest Miocene sites in the world, and researchers have unearthed remarkably complete remains of the ancestors of modern elephants, rhinos,



antelope, pigs, carnivores, and apes. Students learned important fossil collection protocols, such as accurate recording of taxonomy, field numbers, GPS locations, and how to photograph specimens in a meaningful context to assist future research efforts. Student work at Buluk this year was especially productive, as field school members discovered fossil teeth of *Noropithecus bulukensis*, an Old World monkey studied by Ellen Miller and her colleagues.

The field school then flew to TBI's Turkwel facility on the west side of the lake, where Isaiah Nengo (TBI; Stony Brook) and Patricia Princehouse (Case Western Reserve University) introduced the class to a subject for which the Lake Turkana region is probably best known: Human Evolution. Student excitement was high for a field trip to the West Turkana site of Napudet. In 2014, in these fossiliferous Miocene and Plio-Pleistocene deposits, Isaiah's team discovered the Alesi fossil: a remarkably complete, 13 million-year-old infant ape skull of the species *Nyanzapithecus alesi*.

Stone tools are instrumental in understanding human evolution, as they reflect the cognitive abilities and morphological developments of their hominin makers. Sonia Harmand (TBI, Stony Brook), taught Archaeology, the final course of the program. Students visited the discovery site of the world's oldest known stone tools, Lomekwi 3, where they were provided an overview of the characteristics of the Lomekwian tool industry. They also visited the sites around Kokiselei, which contain artifacts of both the Oldowan and Acheulean industries. Program participants received expert instruction on the distinctions between these three industries, as well as the knapping techniques that produced them. A final field trip to the Later Stone Age site of Aiyangyen rounded out the participant's survey of stone tool technology. Razor-sharp "microliths" flaked from stone cores were found here in abundance, as well as decorated ceramic pot sherds and remnants of jewelry fashioned from ostrich eggshells.



Community Outreach

TBI is committed to making positive and sustainable changes in the lives of the people that surround Lake Turkana in areas of education, health, natural heritage awareness and environmental preservation.

TBI is pleased to report a number of important developments in its local community outreach program. A new Community Development Manager, Joanne Velo, assumed responsibility for coordinating outreach projects on both sides of Lake Turkana. Community Affairs committees have been established on both sides of the lake as liaisons between communities and TBI, and regular community engagement meetings have been initiated as a forum to discuss common interests shared by TBI and its surrounding communities. The former TBI Bursary program was updated to a Scholarship Program, financing

high school-level education to promising students in villages throughout the Turkana Basin. Joanne helped institute a menstrual health hygiene program to supply school-aged females in the area with sanitary pads and instruction for their use. Together with evolutionary biologist Patricia Princehouse, a science club was organized in the village of Kaikol, near TBI-Turkwel, to foster an interest in science, medicine, and the natural world among the youth. A mentorship program, now with over 200 beneficiaries, inspires students to seize educational opportunities and strive to excel in them.



TBI mobile clinic vehicles.

SOSAED

SOSAED (Sustainable Off-grid Solutions for African Economic Development) helps rural Africans develop tools for economic development through the application of affordable, renewable energy sources and innovative business strategies. The project is sponsored by its founder, former Brookhaven National Laboratory director Sam Aronson, and is based at TBI-Turkwel. In 2019 SOSAED developed a pilot project for a solar-powered business incubation and innovation hub that will allow new business ideas and technologies to be tested and

deployed, complimenting existing livelihoods in historically marginalized areas such as Turkana. The first vocational concept to be tested will be a clothing production business. This pilot has been defined by extensive community engagement in the villages surrounding TBI. This year SOSAED welcomed Jane Malala to the team as a liaison for the Turkana County government as well as local communities. Construction of the hub is being undertaken by TBI as part of its CSR efforts. Learn more about this initiative at www.sosaed.org.



A community engagement meeting.

Hydroponic Gardening

In an effort to supply the Turkana Basin Institute field stations at Ileret and Turkwel with fresh, locally-produced fruits and vegetables, TBI has established two hydroponic gardens. The gardens are enclosed in a net to minimize the impact of the many insects attracted to this little oasis in the midst of an arid landscape.

This year, the space allotted to the gardens was increased by 200 square meters, and TBI harvested 2,337 kilograms of kale, spinach, terere, melons, chillies, tomatoes, and paw paws.



Some of 2019's harvest.

Highlights from

TBI-Kenya

NACOSTI

Kenya established the National Commission for Science, Technology and Innovation (NACOSTI) as a State Corporation with the stated goal of improving the quality of life of Kenyans by integrating science and technology in social and economic development. One of the key functions of NACOSTI is to register, accredit, and monitor research institutions in Kenya, and to ensure that researchers affiliated with these institutions are in compliance with associated rules and regulations. TBI was one of the first of a handful of research institutions to complete NACOSTI's rigorous evaluations process and was granted a certificate of registration by the Ministry of Education to conduct research in prehistory and affiliated disciplines in the Turkana Basin. As of this year, TBI has granted affiliation to 80 researchers from around the world.

New Senior Staff Hires

This year, TBI-Kenya welcomed the following new staff members:

Diana Kuria, Chief Finance Officer

Francis Nassiye, Human Resources Manager

Margaret Njogu, Logistics Assistant

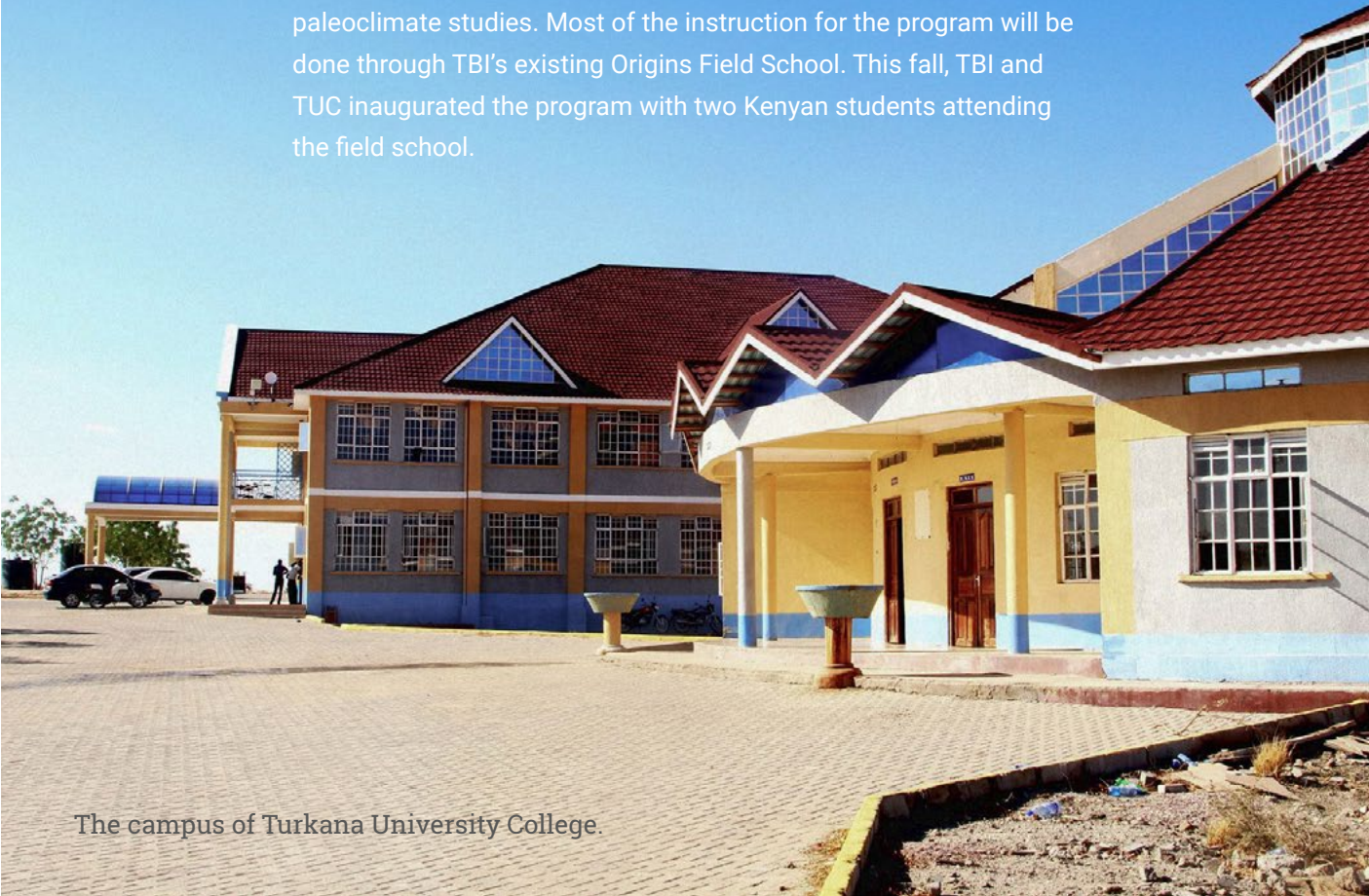
Joanne Velo, Community Development Manager

Winnie Wambui, Origins Field School Director

Turkana University College Master's program

Last year, TBI signed an MOU with Turkana University College (TUC), the first public university established in Turkana County, to create a Master's program in Human Evolutionary Biology. The program is the first degree program in a paleoscience offered at a Kenyan university, with a goal of providing students with the scientific and technical skills to pursue a career in human origin sciences.

As Kenya is one of the world's top contributors to the body of evidence for human evolution, this program is a critical step in engaging more Kenyan students, at an advanced level, in the tremendously important scientific heritage of their country. Applicants are able to specialize in areas such as archaeology, human paleontology, and paleoclimate studies. Most of the instruction for the program will be done through TBI's existing Origins Field School. This fall, TBI and TUC inaugurated the program with two Kenyan students attending the field school.

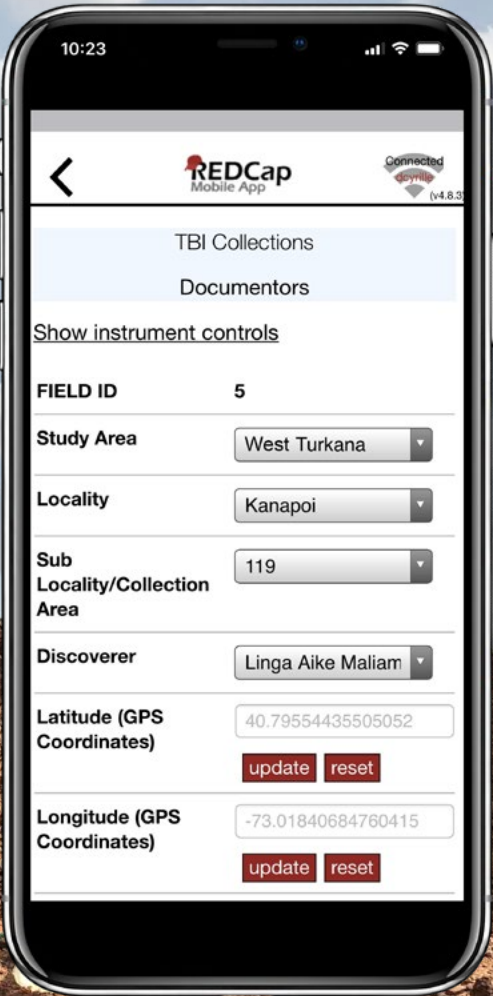


Data Management Plan

This year, we have worked closely with technology partners at Stony Brook University to create an online data management system to collect, organize, and curate the vast amount of data generated from the myriad of research projects facilitated by TBI. This project concept reflects current trends in government agencies, such as the National Science Foundation, to disseminate and publish scientific data in public spaces. This “knowledge management” system will store searchable data of two main types: collections data, such as location of discoveries and metadata related to recovered fossils and artifacts; and paleontological and archaeological research data such as specimen scans, aerial photographs, and scientific publications.

A companion mobile app is also being developed by Stony Brook and REDCap (Research Electronic Data Capture), enabling data to be captured in the field using an iPhone, iPad, or Android device, share it immediately with other researchers, and securely store it in a cloud-based environment. The app will support both online and offline data capture, useful in environments with poor Internet connectivity, and will be an instrumental tool for research studies in the Turkana Basin. The new data management system will be ready for testing in 2020.

Screenshot of the REDCap mobile app with field collection data.
Background: Napudet Research Project in the field.



Highlights from

TBI-Stony Brook

New Academic Hires

During 2019, TBI completed hiring the third and fourth, of five, Presidential TBI faculty lines assigned to the institute by President Stanley in cooperation with the Departments of Ecology and Evolution and of Geosciences. Having completed her Ph.D. in 2014 at the University of Bordeaux, **Marine Frouin** came to TBI from her position as a postdoctoral fellow at the Research Laboratory for Archaeology at the University of Oxford. Her work focuses on developing precise and reliable luminescence-based methods to determine the age of fossil-bearing sediments. An important objective is to improve understanding of the luminescence processes in mineral grains (e.g. Quartz and feldspar) to increase the age limit of this technique to millions of years. Marine is also interested in questions concerning the chronology of human evolution in Africa, the Middle-Upper Paleolithic in Eurasia, as well as the peopling of the Americas. Marine will be joining the Department of Geosciences and TBI in January of 2020.

Tara Smiley is an evolutionary ecologist interested in how climate and landscape history shape the diversity, biogeography, and ecological structure of mammalian fauna across time and location. Having received her Ph.D. in the department of Earth and Environmental Sciences and the Museum of Paleontology at the University of Michigan in 2016, her background spans biological and geological sciences. Using the fossil record of the Cenozoic, Tara tests hypotheses about how changes in climate, geography, and habitat impact biological communities at local scales, and govern diversity at regional scales. In parallel with her work with the past, Tara also investigates modern small-mammal populations across a variety of environments and climates. Tara will join the Department of Ecology and Evolution and TBI in September 2020.

Ngaren Project

A science museum complex celebrating our African origins

Ngaren celebrates the beginnings of all humanity.

Dedicated to educating humankind on our shared past, Ngaren will tell the story of our common ancestry, our epic journeys and our obligation to protect the planet that is our only home for the future. It has been a busy year for the Ngaren project—Richard Leakey’s vision for a 200-acre, state-of-the-art science museum campus in Kenya’s Rift Valley that will be a hub for education, research, and recognition of the African continent as a place of shared past and common future—with much progress to report. A strategic partnership was formed with the Naturalis Biodiversity Center and Museum in

Leiden, Netherlands. The Ngaren/Naturalis partnership will enable the Ngaren team to quickly develop exhibits and content for the campus. The campus will accommodate Ngaren: the Museum of Humankind, focusing on our common evolutionary heritage as evidenced by fossils and artifacts from Kenya’s abundant contributions to prehistory studies, as well as an East African art museum, a science and technology museum, and an observatory. The team have also produced a new website and companion film that will be enhanced as the content and vision for the Ngaren project continue to develop. Find out more at www.ngaren.org.

Artist’s conception of the Ngaren museum complex.

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Field team explores the Topernawi site.