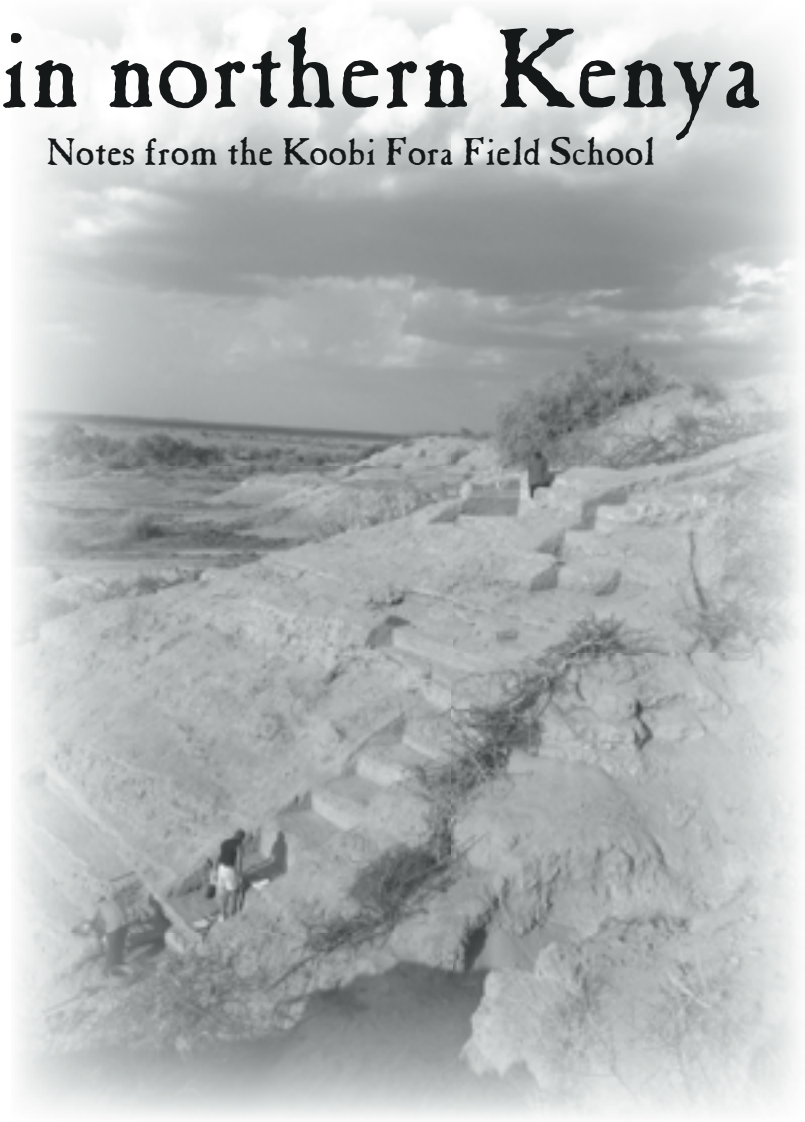
Time Travel in northern Kenya

Notes from the Koobi Fora Field School



Every year in June, 30 or so undergraduates assemble at the National Museums of Kenya in Nairobi to participate in the Koobi Fora Field School in northern Kenya. Right from the outset, the students are briefed that their journey to the desert wastes on the eastern shores of Lake Turkana at Koobi Fora will be an adventure in science—one where the frontiers of humankind have been literally pushed back millions of years.

So begins an odyssey across time and space. The students will travel back in time and walk over ancient landscapes that are millions of years old, where animal communities—including some of our earliest ancestors—once lived.

The modern day journey by lorry and Land Rover takes three days and 850 km across three-quarters of the length of Kenya. Beginning in Nairobi, the drive takes them over lush and fertile landscapes onto the high plateau flanks of the Great Rift Valley that are the heartland of agriculture in Kenya. Then they plunge kilometres on winding and dusty roads to the floor of the Rift Valley, past fields filled with volcanic cobbles and boulders, to the arid and barren lands that are the home of nomadic pastoralists. The final leg of this journey brings the students to the windswept spit that juts out into the jade-coloured waters of Lake Turkana at Koobi Fora.

¤ ¤ ¤ ¤ ¤ ¤ ¤ ¤ ¤

The field school prides itself as the pre-eminent field training programme for undergraduate and graduate students in the study of human origins. This collaboration between NMK and Rutgers University has borne unprecedented educational and research successes for an international pool of students. The field school plays a major role in education, as part of the National Museum's overall mandate, and makes major contributions to museum research. The KFFS is a unique opportunity for the students to learn the basic principles and field methods of palaeoanthropology in one of the world's most productive and spectacular regions for documenting the emergence and evolution of humankind.

Prof JWK Harris, co-director of the Koobi Fora Field School for palaeoanthropology.

The Koobi Fora Field School (KFFS) is a fully integrated training and research program of the National Museums of Kenya (NMK) and is jointly administered with Rutgers University, in New Jersey, USA. The field school is staffed by Kenyan and American researchers and support staff. Senior NMK researchers—in particular, Dr Mzalendo Kibunjia, Director of Regional Sites and Monuments, Dr Emma Mbua, Head of Palaeontology, and the acting Head of Archaeology, Dr Purity Kiura—play a major role in both teaching and research.

The base camp at Koobi Fora, on the eastern shore of Lake Turkana.

The locality where most of the field season is spent is a low altitude desert setting, on the floor of the Rift Valley, at Koobi Fora. Situated on the eastern shores of Lake Turkana, Koobi Fora is part of Kenya's Sibiloi National Park and a place of sparse dryland flora and fauna. The other locality, Segera Wildlife Ranch, is a high altitude plateau grassland setting, near Nanyuki. Therefore, the field school could not offer two more starkly contrasting ecological settings within the overall African savannah ecosystem, and this contrast is fundamentally important to the research and training goals of the field school.

Why does the field school place so much emphasis on the field school students gaining a strong understanding of these contrasting settings? It is because the diverse settings of the African savannah are the environments that our ancestors, the African hominins, inhabited. As such, utilisation of these environments played a role in our evolution. From the earliest African hominids to our most recent human ancestors, each species has lived and prospered (or not prospered) within a particular niche, or segment, of this overall savannah ecosystem. Some of our early ancestors inhabited forested areas, taking advantage of the security and resources afforded by trees, whilst others of our ancient lineage inhabited the sparsely vegetated, more open dry lands. Understanding the make-up and character of the plants, animals and settings of these landscapes, helps students to understand the ecology of the past landscapes. So the field school devotes considerable discussion to the effects that changing environments, climates, and biotic communities may have played in moulding and selecting changes in hominin anatomy, physiology, and overall behaviour—changes that the students will see in the fossil and archaeological records contained in the sedimentary deposits, when they reach Koobi Fora.

Koobi Fora is a place inhabited since 1968 by a select sub-group of humans: palaeoanthropologists. The base camp at Koobi Fora consists of sleeping and teaching bandas, showers and flush toilets, water treatment plant, solar energy system, and Museum support staff. At the edge of Lake Turkana, it serves as the research base for scientists who are studying the extraordinary palaeontological and archaeological deposits found in this area. Deposits here are rich with fossil bones from a diverse collection of animals, including early hominids. These deposits have yielded spectacular collections of archaeological materials, such as stone tools and fossil bones with evidence of stone tool cut-marks that indicate hominid usage. Two million years of history embedded in the eroding sediments hold tantalising clues to humankind's evolution and ecology. This is Koobi Fora, welcome to your time capsule.

Learning how our ancestors utilised their environment helps students understand the factors that shaped human evolution.

Each morning students wake early to a hearty breakfast of porridge, *mandazi* and strong cups of tea or coffee. The teaching banda is also where students take meals, tables along the outside edge of the large thatched-roof building overflow with skeletal material from hundreds of animals. Teeth, jaws, turtle shells, fish vertebrate, horn cores, and skulls are labelled to taxon and skeletal element. Incredibly, students soon learn to identify the bones. Experts in faunal analysis and the identification of fossil bone help students learn the identification nuances that enable a field archaeologist to spot a blue-black piece of fossil bone on the sedimentary exposures, bend down, and be able to say "bovid metacarpal", quicker then one can untangle from a wait-a-bit thorn bush. At first glance it may seem overwhelming: students need to learn the animals and the animal groupings—order, family, genus, species—both past and present, understand the skeletal anatomy of diverse types of animals, learn the names of the skeletal elements, know the proximal from the distal bone ends, and to do all this from partial and fragmentary pieces of bones. But students do it every year—starting out with only a cursory knowledge and ending with strong abilities to identify and work with fossil materials. It is one of the wonders of such a programme, that the intensity of the educational experience makes learning such huge amounts of information just a small part of the day.

One of the reasons that students can absorb so much data is that each day the classroom lectures are reinforced in the field and through "hands-on" work. Notebooks quickly fill with drawings of bones, field observations of animals, measurements of artefacts, geological trench sketches, or a feather found on the daily field walks. But it's not just the bones that students learn: early man had an impressive array of tools manufactured from stones found on the landscape. In that first week of lessons, students learn about stone tool manufacture, stone tools types that span two million years of innovation, the rocks that the tools are made from, the physics and internal rock structures that control the way certain stones cleave, and how to make a sharp cutting edge from a chunk of stone (with some bloodied fingers along the way). Add lessons in geology, geomorphology, and ecology and it is easy to see how the first week can speed pass. Students get eight academic credits for the field school but some students say they have learned more in the month at Koobi Fora than in a whole year at university.

Tables at Koobi Fora overflow with skeletal material from hundreds of animals, which students quickly learn to identify.

Other lessons can't be so easily measured. The harsh environment means that students quickly learn about their own physical limits. Each morning students are reminded, "Hats on, water bottles full, no open-toed shoes", but after a few days the reminders are unnecessary, as students find themselves filling an extra water bottle, wearing an extra bandana on their heads, and abandoning sandals for well-shod feet.

Koobi Fora is a base camp and as such is the jumping off point for explorations within the 3,000 square kilometre region of sedimentary deposits that comprise the study area. After a week or so of morning lessons and afternoon field excursions, students again pack up their gear, the lorries are loaded and the entire camp moves either north to Ileret or northeast to the Karari. Now they will live in their tents for a couple of weeks, and the lessons learned in base camp will be put to use in actual field surveys, excavations, and by doing experiments.

The Koobi Fora region is singular in its importance for reconstructing past hominin behaviours. Three factors make this setting so instructive, the first of which is the geographic scale of the deposits. The deposits of interest stretch for tens, if not hundreds, of square kilometres. The ancient landscape, rather then a single hominid find or an isolated occurrence of stone tools, becomes the point of reference.

Secondly, the time depth of deposits is an important factor. There is a record of the history of hominid occupation that is almost continuous and spans two million years.

A caption is needed for this photo..???

The third factor is the ongoing study of modern landscapes and peoples. Modern day studies on the vegetation, animals (both wild and domestic) and humans can be undertaken because of access to the Siboloi National Park, and the surrounding lands. Ethnographic and ethno-archaeological studies of these modern day peoples, for example, can provide models for the types of food exploitation and foraging strategies practiced by peoples living on similar landscapes in the past. All three factors in tandem make Koobi Fora one of the most important palaeoanthropology regions worldwide.

One of the major time intervals of interest to the field school is between 2.2 and 1.2 million years ago and is known as the Plio-Pleistocene. This time interval is crucial in human evolutionary studies and witnesses the appearance of the earliest representatives of the genus Homo, followed by the emergence of a more evolved form, Homo erectus or Homo ergaster. In addition, there is the earliest evidence of the first stone tool kits (called Oldowan tools) and some of the earliest evidence for the incorporation of meat into the diet of early hominins. During this transitional period, there are changes to tool manufacture, as well as the production of larger-sized and heavier stone implements (called Acheulean tools), that may be associated with increasing utilisation of meat and perhaps organised hunting. This all occurs against a palaeoenvironmental setting that indicates increasing aridity, heightened seasonality and greater habitat diversity.

During the 2002 KFFS summer field school season, survey was extended from the Ileret area in the northernmost deposits to the east, into a locality known as Area 41. This work gave the field school students a taste of just how difficult it can be to conduct research. No roads, no water, and extreme heat made for exhausting days of survey. But with the discomfort came discovery—students found Oldowan-like artefacts (stone tools) interspersed on the surface with a rich collection of fossil fauna. The site was designated as FwJj20 site complex. In subsequent years the field school has visited the site. During an August/September field season in 2004 and February/March season in 2005 KFFS researchers and National Museum of Kenya staff conducted small scale excavations in this area. Our investigations of this site indicate that the stone tools found here may be some of the oldest stone tools yet discovered (possible pre-dating two million years). The fossil fauna from this site is something special as well, and some of the pieces show modification through butchery practices utilising stone tools. This makes the site one of the few examples

where there is a geographic juxtaposition of tools and evidence of the acquisition and incorporation of meat into the diets of our ancestors on the ancient landscape two million years ago. Moreover the indications are that this place was a wetter, more vegetated area of the ancient landscape. In addition to documenting the hominid activities at this site, a number of KFFS researchers are conducting complementary research to determine details of the age, the palaeoecology, the palaeoenvironment, and the nature and character of the fossil bone and artefact occurrence for this important locality.

FwJj14 is another site of equal importance, where over the last seven or eight years the field school has played a major role. Each year since 1998, KFFS staff and students have undertaken field studies along about a kilometre of outcrop, measuring some 50,000 square metres, in collection area 1A. This has involved survey and systematic excavation of two concentrations of hominin modified bone, designated FwJj14 north and FwJj14 south. In addition, detailed field geological research is in progress for establishing the age, stratigraphic provenience and context of the archaeological finds, as well as palaeoecological studies for reconstructing the local palaeoenvironment. The incorporation of a palaeobotanist and a botanist into the research to study the large sample of fossil wood collected from Area 1A will be a powerful tool in fleshing out a more detailed picture of the palaeoenvironments. In addition, this sample of fossil wood allows future research goals in modelling early hominid palaeoecology, ranging behaviour and diet to incorporate the identification of fossil trees as an indicator of the variety of plant foods, particularly fruits that were available as a food source for harvesting and consumption by early Pleistocene hominins.

This site is slightly younger than the FwJj20 site. It dates to about 1.5 million years ago,

A hominid-modified fossil animal bone showing the distinctive traces of cut-marks and breakage patterns typical of early hominid butchery.

nevertheless; here at this site are preserved two of the largest concentrations known of hominid-modified fossil animal bones. These bones show the distinctive traces of cut-marks and breakage patterns that a trained eye can see relate to early hominid butchery practices - in other words, using sharp-edged stone tools to cut the meat off the bone, and using the blunt heavier tools to break open the bones to extricate the nutritious bone marrow.

In the final days of the field school in year 2004, eleven unquestionably hominin post-cranial bones belonging of the fingers, hand, arm and shoulder were found eroding down the slope of very steep deposits, metres from the previously excavated hominin-modified bone. There was a distinct possibility that these post-cranial bones belonged to the hominin species known as early Homo erectus, or Home ergaster as it is known to some researchers. Moreover, there are very few well preserved fore-limb fossil materials, particularly the bones of the hand and arm, of early Homo erectus/ H. ergaster that have been recovered elsewhere in the fossil record.

In light of the significance of these finds, large scale investigations including excavations of this site took place during the field schools session in 2005. Dr Brian Richmond, a physical anthropologist at George Washington University and a specialist in the post-cranial anatomy of early hominids joined the KFFS team. Senior scientists and senior graduate students, including Emma Mbua (NMK) Mzalendo Kibunjia (NMK), David Braun

(Rutgers) and others directed the dig. Over 185 square metres was gridded and excavation yielded further hominin fossil bones, to the great delight of the student participants. These fossil bones are now housed in the National Museums of Kenya, and we await with high interest the detailed studies to find out what hominid taxon the post-cranial bones belong to.

The late Pleistocene and Holocene deposits of the last 12,000 years are also studied by KFFS. One of the priorities in re-establishing Late Pleistocene/ Holocene research was to relocate archaeological sites discovered in the 1970s. Finding these sites and beginning to restudy them has been fundamental. We have begun to address issues relating to changing subsistence practices, including the introduction of domestic stock, against a background of environmental change indicated by fluctuating lake levels. In addition to surveys, several Kenyan and American graduate students articulated their own research priorities and have conducted fieldwork in this time interval. Lori Dibble has completed an MA thesis (Rutgers) on Holocene landscapes at Koobi Fora with particular reference to the high lake-stand levels of 9,000 years ago. Her continuing research into the early fishing peoples in the Lake Turkana region will play a role in future field schools, as will the work of Emmanuel Ndiema, a beginning doctoral student, working on the earliest evidence for the domestication of stock animals 4,000 years ago which will be the subject of his PhD research.

Dr Purity Kiura (NMK) has completed her PhD thesis (Rutgers) on direct field observations of the food residues and the isotopic analysis of the food consumption of three groups of modern day peoples with different subsistence strategies—Dassenach, Gabra, El-molo. Her research is critical to re-evaluating and modelling the diets of peoples living over the last 10,000 years. Her PhD research, together with Dr Emma Mbua's earlier study of the Holocene human remains, form the core for undertaking new research on the human remains, including isotopic studies, which this Museum research team has planned for the future.

Dr Kiura's fieldwork amongst the Dassenach at Ileret has been incorporated into the KFFS curriculum over the years. Students visit Dassenach bomas and learn the basics of ethnographic observations and interview techniques. In addition, Alfreda Ibui (NMK) has begun field research on wild plant knowledge, belief and practice amongst the Dassenach that also involves field school students. She has begun transects of the modern landscape to map and identify the vegetation at Koobi Fora. The Dassenach people are a part of the field school community and help us with survey work, serve as camp staff, and teach us the usage of local plants for food, medicine and for making clothing, shelters, and other objects. Improving inter-community relations is an important part of the field school's overall aims and goes hand-in-hand with our collaboration with the Kenyan Wildlife Service. By bringing employment opportunities, paying teacher's salaries, providing medicines, and in many other ways, KFFS hopes to have a positive impact on the economy, education, and health standards of the local peoples. We hope the support will have the effect of raising the overall standards of living and helping these nomadic pastoralists retain some of their traditional ways in a rapidly changing world.

Once back at the Koobi Fora base camp, exams are soon over and students pack up for the return trip to Nairobi. Students climb up yet again for the ride in the Unimog, passing now familiar landmarks for the last time, wondering how the weeks spent in this remarkable place can seem so short and so long at the same time. A day's drive later, the convoy pulls into the desert oasis town

of Loiyangalani, at the southern tip of Lake Turkana, with its tall palm trees and natural hot spring showers. The journey across space and time is over, but the impressions and memories will be carried with the students forever. Goodbye, place of the commiphera, filled with traces of our ancestors, goodbye to the land were two million years ago seems like a reachable distance.

ALL PHOTOS BY THE AUTHOR.

Acknowledgements

This paper is dedicated to the late William Chesire. William was the head cook on the Koobi Fora Field School and a key person to its overall success. He will be sadly missed. Portions of this paper have benefited immeasurably through the editing of Lori Dibble. I would also like to acknowledge the support and collaboration in all Field School endeavours by my co-director on the field school, the Director-General of the National Museums of Kenya, Dr Idle Farah.

About the author

Professor JWK Harris (PhD, UC Berkeley) is a New Zealander by birth and first began research in Kenya as a palaeoanthropological student in 1971. He conducted large-scale excavations and surveys of Koobi Fora for his PhD thesis. His research topic was the archaeological traces and behavioural interpretations of early hominids 1.5 million years ago. He was a post-doctoral fellow and curator in archaeology based at the National Museums of Kenya, Nairobi from 1976-1980. After he returned to the United States, he was appointed Professor of Anthropology at the University of Wisconsin. He has been at Rutgers University in New Jersey since 1988. He was Chairman of the Anthropology Department from 1992 to 2005 and has been co-director of the Koobi Fora Field School for Palaeoanthropology since 1996.

He is currently on extended sabbatical leave as a Research Associate of the National Museums of Kenya, Nairobi.