

**EASTERN AFRICAN QUATERNARY RESEARCH
ASSOCIATION (EAQUA)
2ND WORKSHOP**



**THE EAST AFRICAN QUATERNARY:
LESSONS FROM THE PAST FOR THE FUTURE**

**Addis Ababa, Ethiopia
20-25 May 2009**

**VENUE:
Addis View Hotel
Addis Ababa**

PROGRAMME & ABSTRACT VOLUME

SCIENTIFIC COMMITTEE

Julius Lejju, President, EAQUA, Biology, Mbarara University of Science & Technology, UGANDA

Mohammed Umer, Vice President, EAQUA, Earth Sciences, Addis Ababa University, ETHIOPIA

Margaret Avery, Cenozoic Studies, Iziko South African Museum, SOUTH AFRICA

Asfawossen Asrat, Earth Sciences, Addis Ababa University, ETHIOPIA

Ngalla Jillani, National Museums of Kenya, KENYA

Frederick Manthi, Earth Sciences, National Museums of Kenya, KENYA

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2nd EASTERN AFRICAN QUATERNARY RESEARCH ASSOCIATION (EAQUA) WORKSHOP LAYOUT

Date	Time	Activity
May 20/2009		Arrival of Participants
May 21/2009	8.00 - 9.00	Registration
	9.00 - 9.10	Arrival of invited guests and the Guest of Honour
	9.10 - 9.15	Welcome Address by the Local Organizers
	9.15 - 9.20	Opening Address by the President of EAQUA
	9.20 - 9.30	Key Note Address by the Guest of Honour
	SESSION 1: Extreme Rain Fall Variability and Human-Environment Interactions in East Africa: The Last 2000 Years	
	9.30 - 10.00	Presentation 1 (Key Note): Mohammed Umer et al.: Research towards Unraveling Climates of the Last Few Thousand Years: the East African Perspective
	10.00 - 10.15	Presentation 2: Zewdu Eshetu : Forests as Natural Proxies of Climate Variability in the Highlands of Ethiopia
	10.15 - 10.30	Presentation 3: Bonnefille et al.: Climatic Variability during the Last 4kyr BP, a Pollen Record from Lake Tanganyika
	10.30 - 10.45	Presentation 4: Julius B. Lejju : Dynamics of Lake Victoria Water Levels: Climate Change or Human Induced Environmental Degradation?
	10.45- 11.05	Coffee Break
	SESSION 2: Evidences of Long Term Monsoon Variability and Abrupt Changes in East Africa	
	11.05 - 11.35	Presentation 5: (Key Note): Dirk Verschuren : Recent Advances in Knowledge on the Climate History of Equatorial East Africa, over the Last Few Centuries to Millions of Years
	11.35 - 11.50	Presentation 6: Asfawossen Asrat et al.: Speleothem Palaeoclimate Research in Ethiopia: High Resolution Climate Records
	11.50 - 12.05	Presentation 7: Fisher et al.: Provisional Correlations between Late Pleistocene OIS 3 Millennial Scale Climatic Changes and AMS ¹⁴ C Dated Archaeological Deposits at Moche Borago Rockshelter, SW Ethiopia
	12.05 - 12.20	Presentation 8: Lamb et al.: Death of the Nile? Lake Tana Reluctantly Reveals its Secrets
	12.20 - 12.35	Presentation 9: Alfred Muzuka : Vegetation Changes in Northern Tanzania for the Past 5k Years
12.35 - 2.00	Lunch Break	
SESSION 3: Paleobotany: Developing Techniques for Habitat and Paleoenvironmental Reconstruction of Pre-historic Sites		
2.00 - 2.30	Presentation 10 (Key Note): Bonnefille & Jolly-Saad : New Macrobotanical Remains from Pliocene Hominid Sites from Ethiopia	
2.30 - 2.45	Presentation 11: Terwilliger et al.: Relationships between Palaeoenvironmental Changes and Human Societal Developments in the Tigray Plateau: Why They are Important to Study and Some Promising Proxies to Use	
2.45 - 3.00	Presentation 12: Tsige Gebru et al.: Palaeovegetation History of the Tigray Plateau in Northern Ethiopia from Charcoal in Buried Soils	
3.00 - 3.15	Presentation 13: Rucina et al.: Late Quaternary Vegetation Dynamics and Fire Regimes on Mount Kenya	

	3.15- 3.30	Presentation 14: I.M. Akaegbobi : Late Quaternary Paleoclimate in the Alluvium Deposit of River Olobo in the Anambra Basin, Nigeria
	3.30 – 3.50	Coffee Break
	SESSION 4: The Fossil and Archaeological Record in East Africa	
	3.50 - 4.20	Presentation 15 (Key Note): Yonas Beyene : Paleoanthropological Research in Ethiopia and its Contribution to the Understanding of Human Evolution
	4.20 - 4.35	Presentation 16: Berhane Asfaw : Palaeoanthropology in Ethiopia: Human Kind's Rarest and Palaeoenvironmental Inference we can make from the Fossils
	4.35 - 4.50	Presentation 17: D. Barboni : Phytoliths of East African Grasses and Palaeoenvironmental Implications
	4.50 - 5.05	Presentation 18: Agazi Negash et al.: Geochemical Variability of the Middle Stone Age (MSA) Obsidian Artifacts from Middle Awash, Ethiopia
	5.05 – 5.20	Presentation 19: Brandt et al.: The SW Ethiopian Highlands as a Refugium and Center of Dispersal for Late Pleistocene Hunter-Gatherer Populations
	6.00 -	Reception
May 22/2009	SESSION 4: Contd.	
	9.00 - 9.15	Presentation 20: Emmanuel Ndiema : Early Pastoralists Adaptations and Mobility Patterns at Koobi Fora, Kenya: Evidence from Geochemical Analysis of Obsidian Sources and Artifacts
	9.15 – 9.30	Presentation 21: Harmand et al.: The Plio-Pleistocene of the West Turkana Region of Kenya: Research on Early Hominid Raw Material Procurement and Management
	9.30 – 9.45	Presentation 22: Jillani & Onjala : Archaeological Potential of Mt. Elgon-Sio Port region
	9.45 – 10.00	Presentation 23: Lamb et al: Climate Change, Agricultural Origins, and the Aksumite Empire in Northern Ethiopia
	10.00 -10.15	Presentation 24: Margaret Avery : A Re-assessment of Micromammals as Palaeoenvironmental Indicators
	10.15 – 10.35	Coffee Break
	SESSION 5: Climate and Global Change: Impacts, Adaptation and Vulnerability Assessment for East Africa	
	10.35 – 11.05	Presentation 25 (Key Note): Rob Marchant et al.: Using the Palaeorecord Lessons from the Past for Sustainable Development: A Case Study from the East Africa
	11.05 – 11.20	Presentation 26: Mumbi et al.: Late Quaternary Vegetation and Climate Change in the Eastern Arc Mountains of Tanzania: A 47.7 Kyr Pollen-based Record Compared with Modern Pollen Deposition
	11.20 –11.35	Presentation 27: Gayle McGlynn : Holocene Environmental Change in the Albertine Rift: Sediment-based Evidence from the Virunga Volcanoes, Uganda
	11.35 –11.50	Presentation 28: Grace Rugunda : Maintaining Biodiversity and Livelihoods in the Face of Climate: Case Study of Seasonal Shifts in Lake Mburo National Park
	11.50– 12.05	Presentation 29: Basil Tibanyendera : Resilience and Adaptation to Climate Change Effects in Ankole Region of Western Uganda
	12.05 – 12.20	Presentation 30: Charles Twesigye : The Impact of Climatic, Geological and Human Factors on the Evolution of Cichlid Fishes in Eastern Africa
	12.20 – 12.35	Presentation 31: Philista Ojwang : The Significance of Paleo-Environments in Bird Migration: A review
	12.35 – 2.00	Lunch Break

	2.00 – 2.15	Presentation 32: Seifu Kebede : The $\delta^{18}\text{O}$ and $\delta^2\text{H}$ enrichment of Tropical and Low Latitude Lakes in Africa
	2.15 – 2.30	Presentation 33: Okuku A. Ediang : The Teleconnection between Sea Surface Temperature Analysis from In Situ Data at East Mole, Lagos, and Global Warming
SESSION 6: Invited Speeches		
	2.30 – 2.45	Workshop Report: Cohen & Mohammed Umer : Scientific Drilling for Human Origins: Exploring the Application of Drill Core Records to Understanding Hominin Evolution; Workshop Report
	2.45 – 3.05	INQUA: Margaret Avery
	3.05 – 3.25	PAGES: Thorsten Keifer
	3.25- 3.45	PAST: Andrea Leenen
	3.45 – 4.00	Coffee Break
	4.00 – 6.00	General Discussion on Workshop Theme, Association Matters, Way forward
	6.00	Closing of Workshop
	7.00 -	Cultural Dinner
May 23 – 24/2009	Field Excursion to the Main Ethiopian Rift (see separate program for details)	
May 25/2009	Departure	

** Posters will be on display throughout the scientific sessions and presenters will be available during the coffee breaks.*

<i>Abstract No. 1</i>	<i>Presentation 14</i>	<i>21/05/2009</i>	<i>3.15 – 3.30</i>
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Late Quaternary Palaeoclimate in the Alluvium Deposit of River Olobo in the Anambra Basin, Nigeria

I. M. Akaegbobi

Department of Geology, University of Ibadan, Ibadan, Nigeria

Palaeoenvironmental changes dating back from the Holocene to the Recent as documented in pollen allow reconstruction of paleoclimatic inferences in the Anambra Basin, Nigeria. The locality at the alluvial/fluviol sediments at River Olobo contains sets of gray clay, mudstone and very fine sand. There could have been an association of fluvial reworked faunal/floral remains. The palaeoclimatic inferences are obtained by studying the pollen distribution in the sediments while taking into account the modern vegetation and present day climatic parameters.

At ca. 40000yrs B.P. the climate in the area must have been warmer and moister than today based on the high amount of tree pollen characteristic of the present day forest cover. This might have been due to marine influence in the Pleistocene. At the beginning of the Holocene the climate was wet as revealed by the expansion of the tropical forest. This was progressively replaced by semideciduous forest indicating warmer and drier climate.

Prior to 25000 years B.P the climatic condition in the Southeastern part of Nigeria seems to be cooler and possibly drier than present day. At the beginning of Holocene, the climate became wetter. And later in late Holocene the climate became warmer and essentially resembling the modern condition.

<i>Abstract No. 2</i>	<i>Presentation 16</i>	<i>21/05/2009</i>	<i>4.20 – 4.35</i>
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Palaeoanthropology in Ethiopia: Human Kind's Rarest and Palaeoenvironmental Inference we can make from the Fossils

Berhane Asfaw

Rift Valley Research Service, Addis Ababa

Abstract to be included later.

<i>Abstract No. 3</i>	<i>Presentation 6</i>	<i>21/05/2009</i>	<i>11.35 – 11.50</i>
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Speleothem Palaeoclimate Research in Ethiopia: High Resolution Climate Records

**Asfawossen Asrat¹, A. Baker², I.J. Fairchild², M.J. Leng³, P. Van Calstren⁴,
Mohammed Umer¹**

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We have been studying the Mechara karst system, in SE Ethiopia since 2003, and caves in northern Ethiopia since 2008. U-Th dating of speleothems recovered from various caves in these regions indicated that speleothem growth has been active at least since 125 Ka. The focus of our work has been on recovering high-resolution climate (mostly rainfall) record of the Holocene. Our high resolution speleothem records representing most of the last 10 Ka show decadal scale variability in both growth rate and $\delta^{18}\text{O}$, implying decadal scale rainfall variability throughout the Holocene which could be attributed to persistent decadal-scale variability for the large-scale atmospheric and oceanic driving factors. Extending the time frame of our investigation, we conducted a pilot, coarse-resolution (12-20 years) $\delta^{18}\text{O}$ analysis of Pleistocene speleothems which were deposited episodically during ~ 125 Ka, ~ 91 Ka, ~ 77 Ka, ~ 61 Ka, ~ 31 Ka, and ~ 17 Ka. Our pilot data clearly marked the Oxygen Isotope Stages: stalagmite $\delta^{18}\text{O}$ in isotope stage 5e is -7 to -9‰, indicative of a significantly wetter climate than the Holocene (-1 to -6‰), while the value around ~ 77 ka is -1 to -2‰, similar to values observed today. A high-resolution oxygen-isotope and growth rate analysis of these speleothems will, therefore, provide climate records which may in turn give clues to better understand some interesting archaeological questions like the dispersal of Early Modern Humans.

<i>Abstract No. 4</i>	<i>Presentation 24</i>	<i>22/05/2009</i>	<i>10.00 - 10.15</i>
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A Re-assessment of Micromammals as Palaeoenvironmental Indicators

D. Margaret Avery

Iziko South African Museum, South Africa

Micromammals from archaeological cave sites have provided considerable information on environmental (vegetational and climatic) conditions during the Quaternary in southern Africa. The material basis is jaws of small mammals below 150 g mass. An underlying principle of palaeoenvironmental reconstruction is that each taxon carries with it, or can be said to represent, a more or less detailed suite of environmental information. More explicitly, members of a given taxon may be known to inhabit certain habitats, aspects of which may include vegetation, landform and climate, and to have certain biological or ecological characteristics. Palaeoenvironmental interpretation borrows extensively from ecology and biology, both for methods and data. For this reason, it is opportune to re-consider the validity of some previous assumptions in the light of significant improvements in understanding of modern processes as well as the constraints implicit in palaeoecological studies. With knowledge has come increased difficulty in extracting reliable information. Advances in identification of modern taxa, especially at the species level, make it more difficult to equate identifications based on bones with those based on microbiological material. The development of the field of taphonomy has greatly impacted on interpretation of fossil samples. The environmental correlates of mean individual size, life-history adaptations of species richness and diversity are harder to separate from the suite of factors now known to be involved but are still worth investigating. Currently, micromammal studies can probably be characterized as being in an intermediate, rather

conservative, phase of development but can be expected to progress once more information and understanding from modern ecological studies is incorporated into palaeo studies.

<i>Abstract No. 5</i>	<i>Presentation 17</i>	<i>21/05/2009</i>	<i>4.35 - 4.50</i>
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Phytoliths of East African Grasses and Palaeoenvironmental Implications

D. Barboni

CEREGE (UMR6635 CNRS-Univ. Aix-Marseille), Europôle de l'Arbois BP80, 13545 Aix-en-Provence cedex 4, France

Phytoliths are usually found well preserved at fossil sites where pollen grains are not. They are produced in abundance and are most diverse in the Poaceae (grasses). However, the palaeoenvironmental and taxonomic interpretation of grass phytoliths is not straightforward. An assessment of the relations between phytolith occurrences, grass taxonomy and habitat will be presented here for 184 East African grass species. It is the result of a re-analysis of two qualitative surveys of phytolith types in leaves epidermis, in conjunction with data on grass subfamily, photosynthetic pathway, and requirement for light and moisture compiled from floras and the literature. This study was conducted in order to further investigate the potential for grass short cell phytoliths to characterize the environment, and therefore improve reconstructions of past vegetation and climate in East Africa.

In this work, we identified ca 60 phytoliths types (within the main categories Rondel, Trapeziform short cell, Bilobate, Cross, Polylobate, Saddle, and Sinuate trapeziform) reported to occur in 10 grass subfamilies (Pharoideae, Bambusoideae, Ehrhartoideae, Pooideae, Danthonioideae, Arundinoideae, Chloridoideae, Centothecoideae, Panicoideae, and Incertae Sedis Streptogyna). These subfamilies include hydrophytic, helophytic, mesophytic and xerophytic species, with C3 or C4 photosynthetic pathways, and with affinities for shade, open, or semi-shade habitats. Analysis of phytolith occurrences shows that few morphotypes are restricted to some species only.

Morphological variations (of size and number of lobes) within the main phytolith categories Rondel, Bilobate, and Cross could be considered to improve environmental and taxonomical interpretation of phytolith assemblages. A correspondence analysis, however, shows that these distinctions which require time-consuming microscope examinations may add little to discriminating among grasses and the environment, since relations between grass phytoliths and moisture or light-availability are already evident with phytolith main categories. Our results confirm the strong relations between 1) saddles, C4 pathway, open and xeric habitats, 2) bilobates, crosses, polylobates, shaded and hydric habitats, 3) sinuates trapeziform and Pooideae. Of major implication for palaeoenvironmental reconstructions in East Africa, we establish that the Sinuate trapeziform phytoliths mark the presence of C3-grasses of the Afromontane zone, but not Rondels which occur in many C4 species of the Chloridoideae subfamily. Also, collapsed saddles are not diagnostic for Bambusoideae closed-habitat grasses since they occur in several open-habitat, xerophytic species of the Chloridoideae. We conclude that the redundancy of phytolith morphotypes (even while considering less than 20% of the grass species included in the Flora of Tropical East Africa) and more than 60 phytolith types precludes the use of diagnostic grass phytoliths to trace the presence of particular taxa and/or environments in East

Africa. These results are used to interpret the phytolith content of Pliocene sediments at Aramis palaeoanthropological site, Middle Awash Valley, Ethiopia.

<i>Abstract No. 6</i>	<i>Presentation 15</i>	<i>21/05/2009</i>	<i>3.50 - 4.20</i>
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Palaeoanthropological Research in Ethiopia and its Contribution to the Understanding of Human Evolution

Yonas Beyene

Authority for the Research and Conservation of Cultural Heritage, Addis Ababa, Ethiopia

Because of its geographical and geological positions, Ethiopia shares a greater portion of the Great East African rift system with other Eastern African countries. The various sites that were discovered between the Afar Triangle in North and the Omo Basin in the South have produced evidences that bear on the human biological and cultural evolution. In addition to that, other sites are also known from outside of the Rift.

Owing to the time depth represented in the various sites, Ethiopia occupies a unique position in the world. Most of the data bearing on the human evolution are recorded in the past 20 years. Discoveries made in Ethiopia include twelve of the thirteen known species in East Africa. The archaeological records also show the beginnings and development of the best part of the known Cultural Modes, which are sometimes associated with hominids.

The field research is supported by a modest research facility that is in place at the National Museum of Ethiopia, Authority for Research and Conservation of Cultural Heritage (ARCCH). A new research, conservation and storage facility currently under construction with the financial support of the Ethiopian Government will surely help advance research in palaeoanthropology. Scientists and institutions concerned with palaeoanthropological research have professional and moral obligation in supporting Ethiopia's efforts.

<i>Abstract No. 7</i>	<i>Presentation 10</i>	<i>21/05/2009</i>	<i>2.00 - 2.30</i>
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New Macrobotanical Remains from Pliocene Hominid Sites from Ethiopia

R. Bonnefille¹, M. C. Jolly-Saad²

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Direct evidence for past vegetation is critical to address reconstruction of early hominid habitats and food resources before and after the appearance of stone tool industry. They are necessary to provide additional precision on palaeoenvironmental reconstruction at hominid sites essentially based upon isotopic and faunal studies in the lack of good preservation of pollen data. However they have been poorly collected and less investigated. We present here the record of fossil endocarps attributed to hackberry tree *Celtis* cf. *C. toka* (syn *C. integrifolia*). This tree is today a common component of riverine forest or deciduous humid woodland and savanna encountered within an altitude range from 500 to 1200 m, in Western Ethiopia, the Omo and Awash valley, notably in the Awash Valley National Park, upstream Middle Awash. New investigation on fossil

wood indicates the co-occurrence of *Ficus* sp., also a common tree in Ethiopia. Identification to the species level could not be achieved on this sample because the necessary microscopic details of wood anatomy were not sufficiently well preserved in our analyzed specimen. Moreover, detailed comparison with modern fossil wood anatomy from modern trees requires a modern collection of microscopic wood anatomical features, not yet available for the Ethiopian trees. We hope that these studies will be encouraging further prospection and research on this line. A comparison between the well preserved forest macroflora from the Oligocene Chilga site on the Ethiopian plateau and the Mio-Pliocene vegetation certainly addresses key issues in Early Hominid evolution.

Bibliography: Jolly-Saad M., Dupéron-Laudouaneix M., Dupéron J., and Bonnefille R. (submitted to CRAS). Pliocene 4.4 Myr fossil wood (*Ficoxylon* SP.) from the Middle Awash, Afar region, Ethiopia.

Acknowledgements: Tim White for helpful encouragements, CNRS Museum d'Histoire Naturelle France, the Middle Awash research project and its primary sponsors, the National Science Foundation (BCS 99-10344) and IGPP Los Alamos, and to the Revealing Hominid Origins Initiative (NSF-HOMINID-RHOI BCS-0321893).

Abstract No. 8	Presentation 3	21/05/2009	10.15 - 11.30
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Climatic Variability during the Last 4kyr BP, a Pollen Record from Lake Tanganyika

R. Bonnefille¹, C. Stager², G. Buchet¹, F. Chalieu¹, D. Barboni¹

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Numerous multiproxies analyses have been carried out on many cores recovered from Lake Tanganyika during the last decades. These studies showed that strong fluctuations occurred during the last 40 kyr BP in response to orbital forcing and that human impact recently influenced the lake levels and water. Here we present the results of a high resolution pollen record from a core collected under 130 m depth in the northern eastern basin offshore the Luiche River delta (4°95 S; 29°61 E). This record documents the last 4 kyr BP. Indeed the upper Holocene period was not documented by any previously published pollen records from the northern and southern basins. Our new pollen data helps understanding the dynamic of the Miombo vegetation in comparison with lake level variations and water chemistry changes based upon diatoms, ostracods, mollusks and stromatoliths studies.

In the presented pollen data, we observe a significant increase in aquatics and subaquatic plants at 2.8 kyr BP indicating higher lake level than before ca 3.7 kyr BP, a period known to have recorded a shift towards drier climate in Central Africa. Ca 2 kyr BP, at the beginning of the historical period, a significant decrease in abundance and diversity of arboreal pollen took place. During the last two thousand years, the strongest fluctuations of aquatic pollen took place in the interval from 500 to 200 yr BP in agreement with successively high, low and high again lake levels variations. They clearly indicate higher climatic variability during that period that includes the Little Ice Age. However, despite a temporal resolution of 60 to 100 yrs for the pollen data, it is not possible to address interpretation through ENSO mechanism. Although human impact such as deforestation cannot be totally ruled out to explain the decrease in trees during the historical period, the only firm direct evidence of its effects on vegetation remains the appearance of oil palm (*Elaeis guineense*) at 650 yr ago, therefore much later than the XIV century.

<i>Abstract No. 9</i>	<i>Presentation 19</i>	<i>21/05/2009</i>	<i>5.05 - 5.20</i>
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The SW Ethiopian Highlands as a Refugium and Center of Dispersal for Late Pleistocene Hunter-Gatherer Populations

Steven A. Brandt¹, Elisabeth A. Hildebrand², Erich C. Fisher¹

¹University of Florida

²Stony Brook University

Over the last decade, many scholars have pointed to the “Southern Corridor” as the most likely dispersal route of anatomically modern humans out of Africa, across the Red Sea and into Arabia ~50-70 kyr. However, little attention has been paid to the environmental and social contexts from which these African founder populations emerged. Our refugium model for Late Pleistocene *Homo sapiens* aggregation and dispersal hypothesises that the hyperarid and cold conditions of OIS 4 made much of northern Africa and the Horn uninhabitable for hunter-gatherers. However, the relatively moist SW Ethiopian highlands served as a palaeoenvironmental refugium that attracted culturally diverse hunter-gatherer groups from surrounding regions. We suggest that contact between these culturally diverse foraging groups may have stimulated technological and social innovations that were further enhanced as climatic conditions ameliorated during MIS 3. Armed with these technological and social skills, hunter-gatherer populations would have been able to successfully adapt to a wide range of conditions as they migrated out of the SW Ethiopian highlands across and out of Africa. After discussing the genetic, archaeological and palaeoenvironmental data currently available for testing this hypothesis, we conclude with a consideration of what future research is required.

<i>Abstract No. 10</i>	<i>Poster 1</i>	<i>21 – 22 /05/2009</i>
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Reconstructing Hand Function in Fossil Hominins Based on Metacarpal Trabecular Structure

H. Chirchir¹, B.G. Richmond^{2,3}

¹*Hominid Paleobiology Doctoral Program, Center for the Advanced Study of Hominid Paleobiology, Department of Anthropology, The George Washington University*

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³*Human Origins Program, National Museum of Natural History, Smithsonian Institution.*

The debate surrounding arboreality versus terrestriality (partial or complete) in the fossil hominin record is yet to be resolved. Based on available data and methods, the extent of arboreality among Pliocene and Pleistocene hominins has been interpreted by some workers as primarily terrestrial while others prefer to interpret it as interplay of the two. This study aims to reconstruct hand functional activity among Plio-Pleistocene hominins to understand the significance and extent of arboreal locomotion during this time. We investigate this by comparing third metacarpal head CT-scans of extant primates and fossil hominins (e.g *Pan troglodytes*, *Pongo pygmaeus*, *Papio anubis*, *Homo sapiens*, and early *Homo*) in order to decipher the relationship between habitual loading and resulting trabecular remodeling. We predict that among modern humans the density of trabecular bone will be somewhat isotropic compared to

the non-human primates. This will be achieved by using the program Quant 3D to calculate bone density and volume. The results show a great variation between human third metacarpal heads compared to the orangutans, baboons, and chimpanzees. The data also exhibit consistency with the hypothesis that humans will have bone density fraction and low degree of anisotropy compared to the non humans primates.

<i>Abstract No. 11</i>	<i>Presentation 33</i>	<i>22/05/2009</i>	<i>2.15 - 2.30</i>
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The Teleconnection between Sea Surface Temperature Analysis from In Situ Data at East Mole, Lagos, and Global Warming

Okuku A. Ediang, Anekian A. Ediang

Nigerian Meteorological Agency, Pmb1215 Oshodi, Lagos, Nigeria

Marine weather observers have since 1988 been making sea surface temperature observations at East mole station, about 2 kilometres from the Coast. The station uses the rubber sea – temperature bucket thermometer and makes observations on hourly basis, sea surface temperature has influence on Lagos coastal weather and it is important especially for coastal fishermen, offshore oil and gas industries, shipping vessels, coastal recreational and port handling facilities. Some evidences of global warming in Nigeria have been observed using sea surface temperature (SST) for the period of 1989 – 2007 which statistically analyzed, results shows that the Nigerian coastal water is warmest in April and Coldest in August. The period 1989 – 2007 mean yearly data of sea surface temperature (SST) show some of the teleconnections with global warming.

The attempt in this paper is however to highlight the features of sea surface temperature over the Lagos coastal waters. Indicating the global warming is evident in the environment of Nigeria Coastal line.

<i>Abstract No. 12</i>	<i>Poster 2</i>	<i>21-22 /05/2009</i>
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Understanding Ocean Surges and Possible Signals over the Nigerian Coast

Okuku A. Ediang, Anekian A. Ediang

Nigerian Meteorological Agency, Pmb1215 Oshodi, Lagos, Nigeria

Twenty Seven occurrences of ocean surge events over the beach of the Victoria Island in Nigeria were recorded between 1994 and 2008 and each with its devastating consequences resulting from the massive flooding and erosion. Statistical analysis and parametric wind-wave model were used to investigate the ocean atmospheric interactions in terms of their characteristics, especially before during and after every surge event from 1994-2008.

It revealed that all ocean surges apart from the surge of March 2002 were experienced in summer months of April to October, but more frequent in August. Analysis of the trend and pattern of sea surface temperature variations were carried out with the obtained sea surface temperature data. The mean monthly observations for each year of storm surges for the period 1994 – 2008, excluding 1999, 2003, 2004, 2006 due to lack of data were statistically treated to

obtain the mean yearly sea surface temperature values and dates of storm surges. Further investigations revealed that the ocean surges are influenced by moderate winds (between 15 – 18kts in the strength on the average) over the retch (Lat. 100S – 200S and Long 00E – 100E). These winds were observed to be generally strongest three to two days before the event. They can generate wave heights of about 1.8m and with favourable cross equatorial flow, the swell may reach the coast in about 2 – 4 days and when they coincide with high tide they can inundate the beach. The highest mean wind speeds are between 5.8m in 1994 and 4.1m in 2002 and 3.6m in 2005 respectively.

<i>Abstract No. 13</i>	<i>Presentation 2</i>	<i>21/05/2009</i>	<i>10.00 - 10.15</i>
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Forests as Natural Proxies of Climate Variability in the Highlands of Ethiopia

Zewdu Eshetu

Forestry Rresearch Center, Ethiopian Institute of Agricultural Research, Addis Ababa, ETHIOPLA

Ethiopia underwent several droughts over the last thousand years. Droughts followed by famine and human migrations have occurred not only repeatedly but also often abruptly. These had devastating repercussions for water, soil and forest resources that led to a decline in agricultural productivity. These climate anomalies are poorly understood, because 1) Instrumental climate records are not long enough (usually only cover a few decades), 2) the network of climate stations is geographically limited; and hence, 3) they are not able to reconstruct the natural climate variability in Ethiopia. Therefore, there is an urgent need to develop long-term proxy records of past drought histories for northern Ethiopia, which is a drought prone part of the country.

In order to reconstruct Ethiopian drought frequency and rainfall variability, *Juniperus procerea* tree ring discs were collected from Hugumburda forest in northern Ethiopia. The discs were polished and rings were visually cross-dated, and the crossdating was statistically checked by tree ring software COFECHA. Exactly dated tree ring widths were measured by measuring stage, and ring width values were indexed.

Accordingly, a 132-year tree ring chronology (1874-2005 AD) was developed. Relatively lowest tree ring indices with values below -1 with an absolute values of tree ring width below 0.386 mm were found in AD 1877, 1878, 1884, 1886, 1888, 1892, 1895, 1902, 1904, 1905, 1908, 1913, 1915, 1922, 1932, 1945, 1970, 1973, 1977, 1982, 1991, and 1995 showing about 22 years of extremely moisture stressed tree ring growth suggesting that there have been about 22 drought years in northern Ethiopia during the last 130 years since AD 1876. This indicated an average cycle of drought at every six years. During a growth period of 130 years, 70% of the trees radial growth was remaining below average growth, suggesting a decline of agricultural production by at least 70%. Tree growth was positively correlated with spring rainfall (Fig. 2), and indicating the decline in spring rainfall lead to substantial decline in agricultural production.

Some of these drought years, identified from tree ring growth, were consistent with ENSO variability and other historical records on Ethiopian famine years (Trenberth, 1997). For example the drought in 1887 was corresponding to the Indian drought in 1877, which was

related to ENSO. The 1982 drought was consistent with El Nino episode. The data on drought events in Ethiopia are also consistent with historical rainfall variability as reconstructed from stalagmite lamina bands and stable isotopes in stalagmites (Kassa, 2008). Fore example stalagmite chronology data showed that years 1912-1913, 1921-1922, 1977-1979, 1983-1984, and 1991-1993 were dry years. This stalagmite research site is about 500 km south east of the tree ring research site. Other tree ring studies in Ethiopia showed the same pattern of drought frequency (Gebrekirtsos, 2006; Wils and Eshetu, 2007).

This pattern matching in drought years between the two proxy sites suggest that the climate variability in Ethiopia may link to regional climate variability driving forces, although Ethiopian drought is thought to be related to extensive deforestation. However, whether the causes of Ethiopian climate anomalies are related to global climate driving forces or to local land use changes are not well established, and this needs to be researched more in detail.

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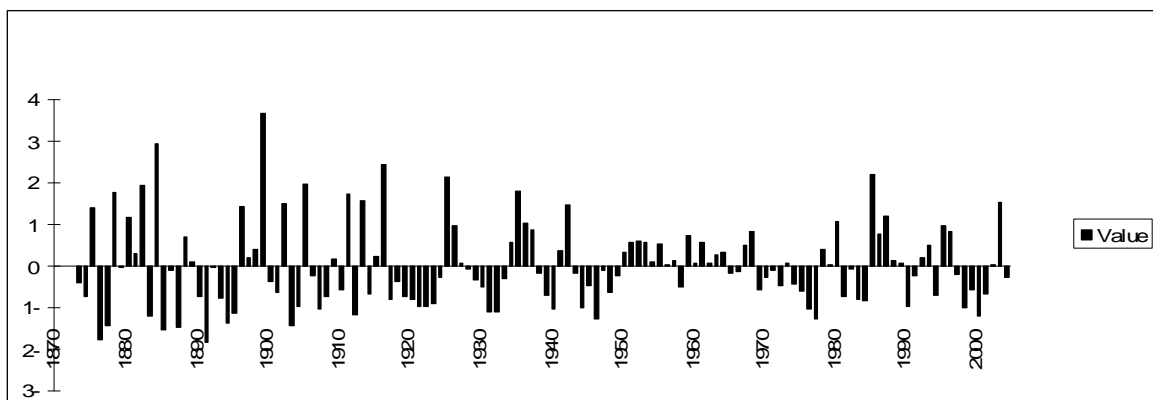


Fig. 1. Bar plot for tree ring chronology. Negative values are indicating narrow rings while positive values are indicating wider rings. The very negative values (< -1) and positive values ($> +1$) are pointer years of extremely dry season and extremely wet season, respectively.

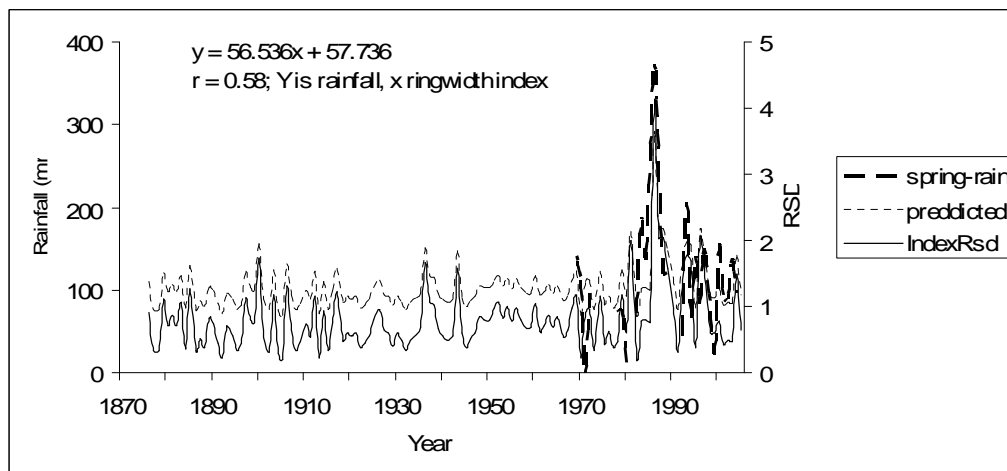


Fig. 2. Spring rainfall as reconstructed from Tree ring growth indices.

Abstract No. 14	Presentation 7	21/05/2009	11.50 - 12.05
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Provisional Correlations between Late Pleistocene OIS 3 Millennial Scale Climatic Changes and AMS ¹⁴C Dated Archaeological Deposits at Moche Borago Rockshelter, SW Ethiopia

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Recent excavations at Moche Borago Rockshelter near Sodo Wolayta, SW Ethiopia have yielded a wealth of archaeological, geomorphological and paleomagnetic data from almost 1 m. of Late Pleistocene deposits securely dated by more than 25 AMS and conventional ¹⁴C charcoal dates to ~55 – 35 ka. This represents the first archaeological site in Eastern Africa, if not all of Africa, to have a continuous radiocarbon-dated sequence spanning virtually all of OIS 3.

We have identified four major depositional units composed of aeolian silts and alluvial clays punctuated by distinct tephra layers. Overlying an undated volcanic lahar is Unit T1, AMS dated by a single charcoal sample to ~53 +/- 2 ka. The alluvial clays and oxidized iron within these sediments suggest a humid depositional environment. T2 is AMS dated on multiple samples to ~45 ka, and suggests a more arid environment. The T1 and T2 units are capped by a volcanic ash securely dated by AMS to ~43 ka. The ash is directly overlain by Unit S sediments which reveal localized fluvial channels indicative of a brief, but intense period of increased humidity, Unit S is also AMS dated to ~ 43 ka and implies re-occupation of the cave soon after deposition of the ash. The overlying Unit R deposits, securely dated to ~43 ka – 41ka, suggest a return to arid conditions.

Recent high resolution $\delta^{18}\text{O}$ speleothem records from the Chinese caves of Xiabailong and Hulu, together with a $\delta^{18}\text{O}$ speleothem record from Moomi Cave on Socotra Island in the W. Arabian Sea, plus other paleoclimatic proxy data, indicate millennial scale climatic variations during OIS 3 which can be linked to fluctuations in the NE and SW Asian summer monsoon

systems. We hypothesize that the depositional history of Moche Borago during OIS 3 may also reflect similar temporal changes in monsoonal activity and paleoclimates in Ethiopia and the Horn. We suggest that the T1 Unit represents the onset of humid conditions after Heinrich Event 5 and subsequent increases in summer monsoon precipitation during Dansgaard-Oeschger interstadial 12. This was followed by increasing aridity toward ~45 ka (T2) and Heinrich Event 5 at ~44 ka. The S Unit correlates with Dansgaard-Oeschger interstadial 11 (~43ka) and increased summer monsoon precipitation. Unit R deposits indicate increasing aridity leading up to Heinrich Event 4 (~40 ka).

Further research in Eastern Africa is needed to test this and other hypotheses that argue for regional, if not global, correlations in paleoclimatic and paleoenvironmental changes during OIS 3, and human behavioral responses to these changes.

<i>Abstract No. 15</i>	<i>Presentation 12</i>	<i>21/05/2009</i>	<i>2.45 - 3.00</i>
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Palaeovegetation History of the Tigray Plateau in Northern Ethiopia from Charcoal in Buried Soils

Tsige Gebru¹, Zewdu Eshetu², Yongsong Huang³, Taddese Woldemariam⁴, Nikki Strong⁵, Mohammed Umer⁶, Valery J. Terwilliger⁷

The Tigray Plateau of Northern Ethiopia is a promising region for the study of relationships between palaeoenvironmental change and the trajectories of human societies. The natural vegetation of elevations ≥ 2200 m is thought to be forest dominated by *Juniperus procera*. Nonetheless, this assertion is not supported in the vegetation cover now and is almost unstudied in the palaeorecord. To assess changes in natural vegetation over time and obtain inferences about shifts in past climate and land use, we identified buried charcoal in the soils of gully walls in the boundaries of the ancient Aksumite Empire. Identifiable charcoal ranged in age from 7890 to 110 cal yr BP. Charcoal from *Juniperus procera* and *Podocarpus falcatus* was found in even the youngest soils, although a higher percentage of older than younger charcoal was from these gymnosperms. However, rapidly regenerating angiosperms usually dominated or co-dominated charcoal even in some of the oldest strata. These results indicate that juniper/podocarp forest has long been a natural vegetation type at >2200 m in Northern Ethiopia but has rarely been the dominant natural vegetation. Furthermore, lack of repeatable correspondence between factors suggests that the causes of similar shifts in vegetation composition were not always the same.

Key Words: *Palaeovegetation; Charcoal analysis; ¹⁴C dating*

<i>Abstract No. 16</i>	<i>Poster 3</i>	<i>21-22 /05/2009</i>
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Modern Non-Pollen Palynomorph (NPP) Diversity and Distribution in East African Lake Sediments: Evaluating a New Palaeo-ecological Tool for Tracing Human Impact and Climate Change

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The value of non-pollen palynomorphs (NPPs) as palaeo-environmental indicators has been clearly demonstrated in studies of peat deposits, archaeological features and lake sediments in Europe and South America, but so far NPPs have been scarcely used for this purpose in tropical African contexts. In this contribution we assess the biodiversity of modern African NPP morphotaxa, and aim to validate their distribution in the surface sediments of 25 Ugandan crater lakes situated along gradients of local landscape variables (vegetation, land use, erosion, burning practices) and limnological characteristics (morphometry, aquatic production, water chemistry, taphonomy). We collected data on current vegetation cover and land use within the crater catchments by mapping natural and disturbed vegetation types, patterns of human occupation and the abundance ratio of livestock versus large wild herbivores.

In our dataset of approximately 10,000 NPPs recorded to date, about 97 % could be assigned to 285 distinct morphotypes, which were documented by photographs, type numbers and short descriptions. Most NPP morphotypes belong to one of four taxonomic groups: spores and other remains of fungi (204 morphotypes), spores of ferns and mosses (24 morphotypes), coenobia and zygospores produced by algae (13 morphotypes) and microscopic zoological remains (13 morphotypes). We succeeded in identifying about 30 % of these morphotypes to family, genus or species level, however the affinity of many other types remains unknown.

Redundancy Analysis (RDA), applied separately on each significant ecological-taxonomic group and the relevant site characteristics, was used to assess the ecological value of the most common terrestrial and aquatic NPP taxa. Initial analysis revealed that some fungal taxa (*Delitschia* sp., *Glomus* sp., *Sordaria* type, *Cercophora* type) were significantly correlated with anthropogenic variables such as the area of pasture, annual agriculture, and total nitrogen (TN) in the lake water. Aquatic taxa (mostly Chlorococcales) were more correlated with physical limnological variables.

Direct comparison of NPP data from lake-surface sediments with actual vegetation cover and land use is a relatively new methodological approach to investigate non-pollen palynomorphs. With this study we will be able to contribute to the reconstruction of past East African vegetation disturbances caused by human impact, separately from climate-driven vegetation changes.

<i>Abstract No. 17</i>	<i>Poster 4</i>	<i>21 – 22 / 05 / 2009</i>
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Landscape Palaeoecology in Tropical Africa: Oral Traditions and Vegetation History in the Lower Omo Basin, Southwest Ethiopia

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The study presented here intends to analyze the dynamics of environmental change in relation to social history, environmental insecurity and landscape ecology in the Lower Omo valley. Within this broad aim, our particular objectives are: (1) to deduce the sequence of environmental changes over Late Holocene to recent times, identifying whether recent trends have been

unprecedented or within the normal range of variability in this savanna ecosystem; and (2) to determine the way these changes have influenced, and been influenced by, the land-use practices, migratory and seasonal movements, social institutions and cultural values of the local human populations. The research combines methodologies from three different disciplines – history, anthropology, and palaeoecology - to provide a more complete picture of the changing landscape in the Lower Omo valley. Social changes and human practices will be inferred from oral histories of settlement and movement through the Lower Omo valley, triangulated with documentary sources and palaeoecological findings. The long-term sequence of past environmental change will be deduced using a variety of proxies addressed to reconstruct vegetation fluctuations, land-use change (pollen analyses, fossil charcoal), and pedogenesis (XRF geochemistry, magnetic mineralogy). Remote sensing techniques will assist in interpreting recent, short-term land-use changes, lake-level variations, and river dynamics.

The environmental history of savanna areas is an important issue because desertification and soil degradation in dry, semi-arid and subhumid zones threatens 40% of the Earth's surface, inhabited by 37% of the world's population. Palaeoenvironmental research in climate-sensitive regions, such as savanna, will permit us to identify past analogues for current and future climatic change in these areas. However the lack of suitable basins for pollen preservation poses particular challenges for palaeoenvironmental research. One approach, palynology of fossil hyrax dung, applied recently to hyrax midden deposits in southern Africa (the Cape region, the Richtersveld and the central and northern Namib) shows considerable potential in East Africa. Using pollen in fossil hyrax dung from the Lower Omo basin, we reconstruct past vegetation dynamics for a northern section of the Mago National Park, southwest Ethiopia. These data will allow detailed reconstruction of savanna dynamics, as well as definition of a baseline of landscape variability, both before and after the arrival of the present-day human occupants. Our results will aid understanding of the extent of human impact and vegetation response in the Lower Omo Valley.

<i>Abstract No. 18</i>	<i>Presentation 21</i>	<i>22/05/2009</i>	<i>9.15 - 9.30</i>
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The Plio-Pleistocene of the West Turkana Region of Kenya: Research on Early Hominid Raw Material Procurement and Management

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Recent investigations on Late Pliocene and Early Pleistocene lithic assemblages have revealed a greater complexity and diversity among oldowan technology than commonly assumed. However, the nature and significance of oldowan variability remains highly controversial. In addressing this matter, the Nachukui Formation, west of Lake Turkana, Kenya, is of great relevance. The Nachukui Formation, the Shungura Formation, and the Koobi Fora Formation are the three main Plio-Pleistocene sedimentary formations of the upper part of the Turkana basin ("Omo group", 4.5-0.7 Ma) that share a common climatic, sedimentary, tectonic and volcanic history. The Nachukui Formation sedimentary sequence is one of the longer and more complete in East Africa and happens to be very rich in sizable, well-preserved archaeological sites of great antiquity and occupied by hominins between 2.34 and 0.70 Ma. Ongoing research carried out by

the West Turkana Archaeological Project (WTAP), a joint program between the National Museums of Kenya (NMK) and the *Mission Préhistorique au Kenya* (MPK), documents hominid behavioral evolution and technical diversity across the Plio-Pleistocene. We present here an update of our continuing research, focusing on documenting potential differences in raw material procurement and management from several geographically close archaeological localities of the Nachukui Formation spanning from 2.34 to 0.70 Ma. The hominid technological activities compared at multiple Late Pliocene, Early Pleistocene and Early Middle Pleistocene localities provide a more accurate assessment of the spatial and temporal range of variation in Early Stone Age lithic provisioning and exploitation patterns. It provides a better understanding of the factors which may have influenced diversity in oldowan lithic productions both at single slices of time and across the Plio-Pleistocene boundary.

<i>Abstract No. 19</i>	<i>Presentation 22</i>	<i>22/05/2009</i>	<i>9.30 - 9.45</i>
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Archaeological Potential of Mt. Elgon-Sio Port region

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The land between Mt. Elgon and Sio Port, on Lake Victoria shores, has great potential for Archaeological research as revealed by studies carried out in the area in January 2008.

Driven by the thought that this landscape may have been useful and formed a link between Lake Victoria and the Nile River Valley and beyond, a reconnaissance survey to record/report potential sites for data not previously documented in the region was undertaken.

This paper presents results of a study which documented new sites through surveys of the landscape between Mt. Elgon and the Lake Victoria basin, covering Bungoma, Teso, Malaba, Busia and Samia Districts of western Province, Kenya.

The reconnaissance survey involved driving and walking over all accessible landscapes to find and document sites for future studies. Both open air and rock shelter sites were documented.

The landscape is of cultural and religious significance to the communities in this region as some of the sites were actively used for religious and cultural ritual practices denoting continuity in occupation and use through time.

Intensive iron smelting activities practiced by both pastoralists and farmers living in the region through time were documented during the study.

The Sudan Meroe Iron smelting activities could have had links and influences further south to include Mt. Elgon and L. Victoria basin, yet this has not been archaeologically demonstrated in this area.

This area has great potential for archaeology research and therefore needs further investigations through excavations and ethno-archaeology.

<i>Abstract No. 20</i>	<i>Presentation 32</i>	<i>22/05/2009</i>	<i>2.00 - 2.15</i>
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The $\delta^{18}\text{O}$ and $\delta^2\text{H}$ enrichment of Tropical and Low Latitude Lakes in Africa

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Quantitative retrieval of Lake Isotope records from sediment proxies require a clear understanding of isotope enrichment processes. The $\delta^{18}\text{O}$ signature retained in carbonates and other proxies pass through a complex process of isotope fractionations and exchanges. How far these processes are disentangled and subject of interest such as evaporation rates, precipitation sources and amounts, temperature etc. be quantitatively depends on how exactly we can model these processes.

The objective of this work is to show the isotope enrichment pattern of low latitude setting lakes in Africa. It investigates how far existing isotope enrichment models capture enrichment trends in tropical lakes.

<i>Abstract No. 21</i>	<i>Poster 5</i>	<i>21 – 22 /05/2009</i>
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Climate Change and Globalization: What Psychological Implications Accrue from the Methods to Reconstruct Climate Change for Adaptation?

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Mbarara University of Science and Technology

Life on the planet earth is increasingly becoming less enjoyable to human beings, animals and plants due to adverse climate change. The change induced in the habitat threatens animals and plants to extinction. Prompted by such a situation, scientists are up in arms to reconstruct the climate for adaptation through various methods including pollen, phytoliths, stalagmites, fungal spores, isotopes, meteorological, charcoal and diatoms. Judging from a felt harsh gap, these methods adopt a retrospective approach to identify a state of environment acceptable for human growth and development. It was imperative therefore to explore how these methods in themselves impact the applicant. The focus of this research was to examine people's feelings, symptoms and problems met down the road to reconstruct for adaptation. An exploratory study sought to analyze feelings, categorize symptoms in order to make informed coping strategies. A questionnaire was used to collect data on feelings and symptoms. Data was coded, themes developed and interpretation derived. The impact of climate change methodology in terms of emotional balance, levels of depression and anxiety were established. After which coping strategies were suggested. Methods of reconstructing climate change should not be a source of misery to the persons who engage them. It takes a healthy body in a healthy mind to reap from an environment facilitating human growth and development.

<i>Abstract No. 22</i>	<i>Presentation 8</i>	<i>21/05/2009</i>	<i>12.05 – 12.20</i>
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Death of the Nile? Lake Tana Reluctantly Reveals its Secrets

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Lake Tana, Ethiopia's largest lake, is the source of the Blue Nile, a river of key importance to the origin of ancient Egyptian and eastern Mediterranean civilisations, and critical to current sustenance of northeast African states. Although 2000 km shorter than the White Nile, high summer discharge of the Blue Nile contributes more water to the main Nile below their confluence at Khartoum, and a vastly greater proportion of transported sediment. Despite the Blue Nile's significance, very little is known about the Late Quaternary history of its headwaters, in marked contrast to the wealth of information about the history of Lakes Victoria and Albert, at the headwaters of the White Nile.

High-resolution seismic survey, combined with palaeoecological core data from Lake Tana, shows that the lake was dry at ca. 17 cal ka, at the time of Heinrich event 1. Shallow water and *Cyperus* swamp occupied the central part of the lake basin between 16.7 and 15.1 cal ka. As the lake subsequently refilled, open-water evaporation from the large, closed, shallow water body caused a rise in salinity, followed by an abrupt return to freshwater conditions at 14.7 cal ka, when the lake surface reached the level of the Blue Nile outflow. Simulations of Lake Tana's response to varying precipitation emphasize the severity of drought required to desiccate the lake, and suggest that the peat and shallow-water sediments at the base of the central core were formed when rainfall was at most 40% that of the present day.

Desiccation of both the Blue and White Nile headwaters coincides with Heinrich event 1, when icebergs flooded the North Atlantic, and disrupted the Atlantic conveyor that exports heat northwards from tropical waters. New seismic reflection data, and detailed results from a 92-m core from the northern basin of the lake, indicate a very dynamic lake history, including several Pleistocene and Holocene desiccation events in Lake Tana. The new data suggest that severe drought in NE Africa has been a frequent response to sea-surface temperature changes in the Atlantic, especially during the Late Pleistocene.

<i>Abstract No. 23</i>	<i>Presentation 23</i>	<i>22/05/2009</i>	<i>9.45 - 10.00</i>
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Climate Change, Agricultural Origins, and the Aksumite Empire in Northern Ethiopia

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It is widely held that agriculture has been practised in the northern Ethiopian highlands since the early Holocene. Similarly, the area has long been recognized as important in the development of African agriculture, on the basis of its indigenous crops, and the diversity and distinctive genetic signatures of local cultivars of wheat, barley and sorghum. Very little is known about when Middle Eastern cereals were adopted in Ethiopia, nor if cultivation of native plants preceded that of the non-indigenous crops. From the second to the ninth centuries AD (1700 – 1200 BP), the Aksumite empire wielded considerable power in the wider region, partly because of its control of Red Sea trade routes, but also because of its rich agricultural economy. Butzer (1981) first put forward the view that exhaustion of soil and forest resources caused the abrupt decline of Aksumite power in the ninth century AD. Today, the region is still dominated by cereal farming, but at subsistence levels, and it is highly vulnerable to drought and famine. The apparently degraded aspect of the present-day landscape is often attributed to the unsustainability of traditional land use, exacerbated by a rapidly increasing human population.

In this paper, we address several of these issues. Based on pollen and palaeolimnological evidence from Lake Ashenge, a closed-basin lake in the northeastern highlands, we present preliminary evidence for the timing of early farming in the Ethiopian highlands, and track subsequent variations in the intensity of human modification of the landscape against a background of climate change. Specifically, we address four principal research questions: (1) When was agriculture first practiced in the Ethiopian highlands? (2) Which were cultivated first: indigenous or non-indigenous crops? (3) Did climate play a role in the origin and expansion of Ethiopian agriculture? (4) Did environmental change influence the rise and fall of the Aksumite civilisation?

<i>Abstract No. 24</i>	<i>Presentation 4</i>	<i>21/05/2009</i>	<i>10.30 - 10.45</i>
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Dynamics of Lake Victoria Water Levels: Climate Change or Human Induced Environmental Degradation?

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Over the last four decades, Lake Victoria has undergone major environmental changes that have resulted in rapid reduction in the water levels and its natural resources. In the recent past the lake experienced a significant drop in its water levels. This became a major subject of social economic and political concern in the East African region, as it threatened the economy of the East African member states and lives of over three million people who are engaged, directly and indirectly, in subsistence and commercial fishing, agricultural and industrial sector. The continued fluctuations in lake levels caused conflicting speculations with environmentalists attributing it to reduced rainfall experienced in the East African region, while hydrologists and politicians blame it on environmental degradation and excessive water release through the

operations of the two parallel Kiira-Nalubale hydroelectric power dam complex on the outlet of River Nile at Jinja. This study examines the relationship between water level changes, climate variability, human-induced environmental degradation, and the operations of the two parallel hydroelectric power dam complex.

Key Words: Lake Victoria, water level dynamics, climate change, environmental degradation.

<i>Abstract No. 25</i>	<i>Presentation 31</i>	<i>22/05/2009</i>	<i>12.20 - 12.35</i>
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The Significance of Paleo-Environments in Bird Migration: A review

Philista Malaki

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Migration is the regular, usually seasonal, movement of all or part of an animal population to and from a given area. The population often breeds in one area and not in the other. This movement is normally related to climatic conditions and to the suitability of the environment to the animals' survival. Long-distance migration almost certainly first evolved among birds which lived at low latitudes (i.e. near the equator) and spread out into areas to the north and south into habitats which they could occupy only for part of the year. Studies of bird migration are of special interest for revealing the importance of bird migration between breeding and non breeding grounds and for understanding the evolutionary implications of intercontinental migratory connectivity among birds. Migration system may also be influenced by the historical situation. This paper explores the relationship of bird migratory routes and the palaeo-environments. It also examines the importance of these environments in completing the migration systems.

Key Words: *Migration, Paleo-Environments*

<i>Abstract No. 26</i>	-	-	-
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The Importance of Modern Small Mammal Faunas as Proxies for Palaeoenvironments

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Studies of modern small mammals not only provide useful insights into the evolutionary and biogeographic history of different small mammal groups, but also provide information from which to reconstruct past environments. Modern small mammal faunas from two hominin localities in northwestern Kenya have been studied in order to elicit information useful for reconstructing the environmental contexts in which two hominin taxa, *Australopithecus anamensis* and *Kenyanthropus platyops*, lived respectively some 4.0 and 3.5 million years ago. Aside from building a taxonomic list for palaeoecological studies, carbon and oxygen isotope ratios are also been determined on the modern rodent teeth (particularly the incisors). These ratios are important tools for studying present and past ecosystems, and this new area of study has been possible following recent advances in laser ablation GC-IRMS, which make it possible to analyse

the isotopic composition of teeth that are otherwise too small to analyze conventionally using the phosphoric acid method. The intention of this presentation is therefore to highlight this current work, which underscores the importance of a multi-proxy approach in reconstructing past human environments.

<i>Abstract No. 27</i>	<i>Presentation 25</i>	<i>22/05/2009</i>	<i>10.35 - 11.05</i>
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Using the Palaeorecord Lessons from the Past for Sustainable Development: A Case Study from the East Africa

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East Africa is characterized by an extremely rich palaeoecological archive that offers exceptional insights in to how ecosystems have responded to past climate changes and human interactions since the last glacial period. East Africa is also characterized by a diverse range of environments with strong economic, social and cultural ties to the natural resource. Under projected future climate change the relationship between the people and the environment is likely to become more strained under competing demands for natural resources like water, crops and land. For example, the Eastern Arc Mountains of Tanzania and Kenya are a biodiversity hotspot characterized by high species richness that increasingly recognized as valuable for service provision and a national resource vital to the continued national development. Combining biogeography, ecosystem modelling, palaeoecology and plant genetics how ecosystems in East Africa have responded to environmental change are determined through the temporal chain of past present and future. Using the palaeoecological archive we can see that ecosystems in certain locations are more responsive than others to climate change. The enhanced understanding of ecosystem dynamics can be combined to model how ecosystems and the associated services (biodiversity, carbon, hydrology, non-timber forest products, timber and tourism) will change under predicted future climatic, governance and economic scenarios. These future projections have a solid foundation of known past response of ecosystems to environmental and anthropogenic changes that can promote the potential for sustainable development.

<i>Abstract No. 28</i>	<i>Presentation 27</i>	<i>22/05/2009</i>	<i>11.20 - 11.35</i>
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Holocene Environmental Change in the Albertine Rift: Sediment-based Evidence from the Virunga Volcanoes, Uganda

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Highland ecosystems at low latitudes may be among the most sensitive to environmental perturbation, including climate change. The Holocene period (i.e. the past ca. 11,000 years) in tropical Africa has been punctuated by numerous decadal- to millennial-scale climatic

perturbations, including prolonged drought periods, although there is little consensus regarding the timing, magnitude and causes of such events. Moreover, little is known on how such events impacted high-altitude ecosystems. A widespread shift to drier conditions ca. 4,000 years ago is evident at several sites across tropical Africa, but again, additional information is required in order to understand the effect that such a climate shift may have had on sensitive high-altitude ecosystems. Other externally-induced stresses (such as fire, grazing and volcanic activity) are also likely to play an important role in highland ecosystem dynamics, the impacts of which may be enhanced by climate change, although relatively little attention has been paid to their effects. This research aims to reconstruct environmental changes in the Virunga volcanoes – high-altitude sites associated with the Albertine Rift – during the Holocene period, with a particular focus on the late Holocene. The Albertine Rift is one of the most important conservation areas in Africa, with exceptionally high levels of biodiversity, including rare and endemic montane flora and fauna. Furthermore, the Virunga volcanoes straddle a climatic boundary between drier, Indian Ocean-influenced eastern Africa and wetter, Atlantic Ocean-influenced western Africa.

This study applies a multi-proxy sediment-based approach to environmental reconstruction. Sediments accumulating in lakes and swamps are valuable environmental archives and – through the use of sedimentary proxy data – offer the potential to reconstruct past ecosystem conditions and responses to environmental perturbations over long time-scales. Sediment cores have been extracted from crater sites on two of the Virunga volcanoes – the crater lake on Mt. Muhavura (4,127 m), and the crater swamp on Mt. Gahinga (3,474 m). AMS radiocarbon dating indicates that the sediment cores from the lake and swamp extend continuously back to ca. 3000 cal BP and 8000 cal BP, respectively. Ongoing laboratory work includes lithostratigraphic, pollen and stable isotope analyses, with the aim of assessing temporal variations in vegetation distribution and in aquatic ecosystem and catchment conditions, in order to provide an additional dimension to our understanding of high-altitude ecosystem change during the Holocene in a climatically-sensitive area of tropical Africa.

<i>Abstract No. 29</i>	<i>Poster 6</i>	<i>21- 22/05/2009</i>
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Detecting Environmental Change and Anthropogenic Activities on the Laikipia Plateau, Kenya

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Pollen, spore and charcoal analysis of deposits from Marura and Ewaso Narok swamps in Laikipia, Kenya, reveals anthropogenic activities and climate variability during the Late Holocene. Specifically, there was a shift from relatively closed to open woodland dominated by *Acacia* and grassland as suggested by an increase in Poaceae and herbaceous taxa indicative of an increase in disturbance. The reduction of Afrotropical taxa such as *Podocarpus*, *Olea* and *Rapanea*, and the increase of *Justicia* and Asteraceae support the indication of an increase of human

activities. This ecosystem change may result from a period of disturbance of bush clearance and agriculture intensification and/or climate variability during the last 2000 years. This ecosystem shift may further have been as a result of associated fire intensity in the savanna biome as indicated by increases in charcoal.

Key Words: *Laikipia, Ecosystem, Climate, Anthropogenic, Pollen, Charcoal, Spores, Holocene.*

<i>Abstract No. 30</i>	<i>Presentation 26</i>	<i>22/05/2009</i>	<i>11.05 - 11.20</i>
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Late Quaternary Vegetation and Climate Change in the Eastern Arc Mountains of Tanzania: A 47.7 Kyr Pollen-based Record Compared with Modern Pollen Deposition

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Sediment cores were collected from a peat bog in SW Tanzania that provide the multi-proxy record demonstrating relative environmental stability over the past 48,000 ¹⁴C yr BP with seven major periods identified. The relationship between modern pollen rain and modern vegetation is first established and subsequently used to improve the reconstruction of paleovegetation change. Period 1 (ca. 47.7-44.3 ¹⁴C kyr BP) is characterised by coarse sandy clay sediments and very low pollen concentration, that indicate a high-energy depositional local environment and possibly very dry conditions. Period 2 (ca. 44.3 to 40 ¹⁴C kyr BP) suggests an upslope shift of montane forest by 300 m relative to present-day conditions. Period 3 (ca. 40-31 ¹⁴C kyr BP) shows the boundary of upper montane to montane forest (UMF/MF) at present day altitudes of 2000 m. Period 4 (ca. 31-21 ¹⁴C kyr BP) shows the UMF/MF transition slightly lower at 1900/1950 m compared to the previous period. Period 5 (ca. 21-10 ¹⁴C kyr BP) the UMF/MF transition is even lower at 1850/1950 m reflecting a LGM cooling. Period 6 (ca. 10-4 ¹⁴C kyr BP) shows the UMF/MF transition occurred around 1800 m, likely to stem from a more mesic environment relative to the previous period. Period 7 (ca. 4-0 ¹⁴C kyr BP) shows an upslope shift of the UMF/MF boundary to present-day at 2000 m, reflecting increasing dryness. The late Holocene (4000 cal yr BP to Present) showed decrease in forest cover particularly upper montane forest, as supported by modern pollen rain. Abundant fungal (dung) and algal spores, and charcoal percentages point to increasingly dry conditions and increased human disturbance.

Key Words: *Eastern Arc Mountains; Tanzania; palaeovegetation; modern pollen rain; charcoal; human impact.*

<i>Abstract No. 31</i>	<i>Presentation 9</i>	<i>21/05/2009</i>	<i>12.20 - 12.35</i>
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Vegetation Changes in Northern Tanzania for the Past 5k Years

Alfred N.N. Muzuka

Pollen and stable isotopic compositions and contents of organic carbon and nitrogen for core EMP PC2 retrieved from water depth of 70 m are used to establish vegetation changes in northern Tanzania as recorded in the Empakai Crater lake sediments. The most abundant pollen taxa are Cyperaceae, Poaceae, *Hagenia abyssinica* and *Podocarpus*. *Hagenia abyssinica* and Cyperaceae comprise at least 60% of the total taxa. Pollen diagram show 5 zones, where by Zone 1 (5.3-4.4ka) is characterized by large changes in *Hagenia/Podocarpus* with Cyperaceae being the dominant of the total pollen. Zone 2 (4.4-3.8 ka) is characterized by high abundance of *Podocarpus* pollen while Zone 3 (3.8-3.3 ka) is characterized by high abundance of *Hagenia* pollen that is associated with increase in Cyperaceae pollen. Zone 4 (3.3-2.4 ka) is characterized by increase in relative abundance of *Podocarpus* pollen over that of *Hagenia* and changes in the increase in abundance in Poaceae and Cyperaceae pollen. Zone 5 (2.4-1.6 ka) is characterized by *Hagenia* with Cyperaceae being the most common. Furthermore, this core showed 3 periods (3000-3200, 3500-3700, 4100-4600) of low values of ^{13}C , ^{15}N , OC, N_2 , and C/N ratios. Whereas low ^{13}C and ^{15}N values in these intervals may indicate increased input of terrestrial materials or reduced nutrient utilization, pollen zones dominated by *Podocarpus* taxa may indicate dry conditions. *Podocarpus* is a well dispersed pollen type that is found in dry montane environment and is also relatively tolerant to drought, thus zones that are characterized by high abundance of this taxa (Zones 2 and 4) represent dry conditions that is not favourable for forest development. Pollen zones 1, 3 and 5 are dominated by taxa that thrive well in humid condition. However the geochemically defined zones overlap with those of pollen an indication of differences in record memory. The zones suggest changes in climatic conditions from wetter to drier conditions probably in response to the monsoon winds variability.

<i>Abstract No. 32</i>	<i>Presentation 20</i>	<i>22/05/2009</i>	<i>9.00 - 9.15</i>
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Early Pastoralists Adaptations and Mobility Patterns at Koobi Fora, Kenya: Evidence from Geochemical Analysis of Obsidian Sources and Artifacts

Emmanuel Ndiema

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This paper aims to illuminate archaeological relationships between mobile pastoralism and material culture, specifically obsidian sourcing. In East Africa, pathways to food production followed a unique trajectory: Cattle-based pastoralism developed long before the development of any indigenous agricultural systems. Any study on early food production therefore must focus on questions related to relatively high mobility rather than on settled village life. The Galana Boi Formation, in the Turkana Basin, Kenya, represents a rare opportunity to study the dynamics of pastoralists' ancient lifestyles during periods of increased climatic variability.

Using XRF and LA-ICP-MS techniques we investigate the geochemical signatures of obsidian artifacts, with a view of determining, early header adaptations and mobility patterns in relation to resource availability and distribution. We incorporate Geomatic techniques such as least cost path analysis to model land use patterns and delineate possible landscape facets that were utilized by competing economies.

Results indicate that the transition to food production in Turkana basin and east Africa in general was more complex, fluctuating and may have operated independently of one another. Pathways to food production perhaps involved diffusion, adoption and in-situ transformation in subsistence systems taking into account local conditions, hence the need for regional focus on such studies. Abundance of aquatic and terrestrial fauna and non- local obsidian at archaeological sites indicate a instances of intensification during times of nutritional stress.

Key Words: *Galana Boi, Turkana, XRF, Obsidian, pastoralism*

<i>Abstract No. 33</i>	<i>Presentation 18</i>	<i>21/05/2009</i>	<i>4.50 - 5.05</i>
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Geochemical Variability of the Middle Stone Age (MSA) Obsidian Artifacts from Middle Awash, Ethiopia

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Obsidian geochemical studies have been used to address a number of archaeological issues in many parts of the world. Recent development of such investigations in Ethiopia has begun shedding some light on prehistoric hominin/human behavior. Fieldwork and laboratory instrumental analysis of archaeological obsidian artifacts and geological sources allow examination of prehistoric long distance transport of raw materials, regarded by most archaeologists as one of the criteria that characterizes the emergence of modern human behavior. With its abundant obsidian geological sources and artifacts, Ethiopia presents a unique opportunity for undertaking such an investigation. Here we discuss the geochemical variability of the MSA obsidian artifacts from the sites of Aduma, Halibi, and Herto, all found in the Middle Awash Valley, Ethiopia.

<i>Abstract No. 34</i>	<i>Presentation 13</i>	<i>21/05/2009</i>	<i>3.00 - 3.15</i>
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Late Quaternary Vegetation Dynamics and Fire Regimes on Mount Kenya

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Pollen and charcoal data generated from a 1469 cm core, radiocarbon dated to 26430 ¹⁴C yr BP, recovered from Rumuiku Swamp on the southeast of Mount Kenya, are used to document changes in the distribution and composition of montane vegetation and fire regime over the Late Quaternary. Throughout the transition from the Last Glacial Maximum (LGM), high resolution

(sub-centennial scale) analysis documents a highly dynamic ecosystem and fire regime. The pollen record shows that under a cool, but rather moist LGM climate, Ericaceae and *Stoebe* species shifted down-slope more than 1000 m relative to the present day. Rather than simple altitudinal shift of current vegetation zonation these taxa formed a vegetation assemblage that mix high altitude components with relatively lowland taxa, in particular *Juniperus* that is presently found at altitudes lower than the study site but on the drier side of Mount Kenya. There is noticeable addition and co-dominance of *Hagenia* to the ecosystem from 20500 ¹⁴C yr BP, until around 14000¹⁴C yr BP when a mix of taxa Ericaceous belt and upper montane forest taxa, such as *Artemisia*, *Polycias*, *Schefflera* and *Stoebe*, dominated the initial development of montane forest. Reduced levels of *Hagenia*, *Juniperus*, *Olea* and *Podocarpus* are recorded about the time of the Younger Dryas with highly variable presence of more mesic taxa such as *Polycias* and *Schefflera*. The development of montane forest during the Holocene reflects a significant reorganization of the ecosystem composition that was heavily, likely to be impacted by a variable fire regime as reflected in the charcoal record. The vegetation shifts reflect the onset of a warmer moist climate from the beginning of Holocene as mixed montane forest became more established. The latter part of the Holocene registers human impact and forest clearance with increased anthropogenic impact marked by a transition to open vegetation and increased fire frequency.

Key Words: *Charcoal, Holocene, Last Glacial Maximum, Kenya, Pollen*

<i>Abstract No. 35</i>	<i>Presentation 28</i>	<i>22/05/2009</i>	<i>11.35 - 11.50</i>
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Maintaining Biodiversity and Livelihoods in the Face of Climate: Case Study of Seasonal Shifts in Lake Mbuoro National Park

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Billions of the worlds poorest will suffer the consequences of climate change, with potentially devastating implications for biodiversity, particularly the protected areas. In and around Lake Mbuoro National Park (LMNP), some species climatic range has shifted faster than they are able to disperse hence they cluster around the only lake in drought. In other species, like the Bush pig, the feeding pattern has changed. Bush pigs' usual consumption to the banana fruit shifted to the banana Pseudo stem and Banana damage was significantly high in the dry season ($t=0.62$; $P=0.38$). Climate change (Rainfall & temperatures) can also lead to a net exodus of species from protected areas. Many species that conflict with communities in LMNP live outside the park in search of water. Climate change will thus alter the outcomes of conservation strategies and therefore there is need for it to be factored into conservation planning.

There are powerful and pragmatic arguments for conservation/protected areas to help the poor who bear high costs of conserving biodiversity like denied access to land or coming into conflict with wildlife. In LMNP, conservation helps the poor in terms of employment, and provision of services which would otherwise be absent; however, high costs of conserving this rich resource are also born by the community in terms of crop raiding and disease inter-transmission between wildlife and livestock. In view of this, climate change is likely to hit the poorest hardest and this will have serious repercussions for biodiversity because in times of crisis, the rural poor having

no other means of coping with change will have little choice but to fall back on natural resources. In LMNP, where timber resource for building was depleted, some members of communities shifted to the use of excavated anthills for as shelter for cooking. Given that an increasing proportion of the worlds protected areas are forests which are owned and managed by communities, it is vitally important to support these natural resource-dependent people in their efforts to manage ecosystems so that carbon sequestration levels increase. Otherwise, ecosystem changes in the tropical regions will translate into significant biodiversity loss. Conservation to offset climate change, therefore, desperately needs local champions and the poor will only support conservation if not disadvantaged by them.

<i>Abstract No. 36</i>	<i>Poster 7</i>	<i>21 - 22/05/2009</i>
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Ethiopian Lakes Studies in the Frame of CRC-806

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The CRC-806 (Collaborative Research Centre) “***Our way to Europe: Culture- environment interaction and human mobility in the Late Quaternary***” is a new research activity at the Universities of Aachen, Bonn and Cologne (Germany). It comprises a total of 23 regional (i.e. in North Africa, the Near East, the Balkans, Central and West Europe) and supra-regional projects (Dating and modelling), working together using a combination of different geo-archives and methods. In the framework of this research initiative it is planned to study Ethiopian lake-sediment profiles in order to reconstruct the climate and environment in the source region of modern man for the last 200 ka. The project (A3) “***Ethiopian lakes and their potential for palaeoenvironmental reconstruction***” is designed in close cooperation with the working group of Henry Lamb (UK) and Mohammed Umer (Ethiopia). During the first phase of this research we would like to inspect different lakes and dry lakes in the southern rift valley of Ethiopia in order to prepare a deeper drilling campaign. These efforts are also connected to the ICDP deep drilling activities in East Africa. In this framework we will also collaborate with the Arba-Minch University. Seismic investigation as well as short core studies will provide new information about sediment structures and the palaeoenvironmental potential of these sediments.

<i>Abstract No. 37</i>	<i>Presentation 11</i>	<i>21/05/2009</i>	<i>2.30 - 2.45</i>
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Relationships between Palaeoenvironmental Changes and Human Societal Developments in the Tigray Plateau: Why They are Important to Study and Some Promising Proxies to Use

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The Tigray Plateau of Ethiopia and Eritrea has been the site of an origin of agriculture and a succession of highly developed but poorly studied kingdoms. Its mountainous topography makes it prone to accelerated erosion and mass wasting from land use practices. Location along the ITCZ and the East African rift system are factors making the region prone to climatic changes. The fact that the Plateau has supported a succession of sophisticated kingdoms confers replication for testing hypotheses about effects of environmental change on the rise and fall of human polities. The hypothesis that environmental changes influenced the ascents and collapses of the kingdoms supported by the Tigray Plateau would be supported if environmental changes repeatedly matched specific human societal developments.

Lakes are East Africa's best exploited repositories for palaeoenvironmental proxies. None of East Africa's great lakes are in the Tigray Plateau, however, so other sources of proxies must be examined. We are reconstructing environmental changes from analyses of soil organic matter and charcoal in nine sections of gully wall deposits in eastern Tigray. Identification of charcoaled wood and estimates of C₄ and C₃ plant cover from stable organic carbon isotopic analyses suggest that disturbance maintained acacia savannas have been spreading for 1000 years. Nonetheless, these ecosystems were important portions of landscapes even 8000 cal yr BP. *Juniperus procera* - *Podocarpus falcata* forests, which are less favored by disturbance, had a continuous history in the region during the Holocene but have disappeared in the last ca. 150 years.

Changes in C₄ relative to C₃ plant cover do not necessarily imply climate changes. Both nitrogen and fatty acid compound specific hydrogen isotopic analyses suggest that climate has been becoming steadily drier since 5500 cal yr BP. Although the percentage of C₄ derived carbon did increase significantly after ca. 6000 cal yr BP, it has oscillated greatly from that time until ca. 100 cal yr BP. These oscillations show relationships to the trajectories of kingdoms suggesting that the vegetation changes were influenced by land use practices. If this is true, then human disturbances of land had a stronger association with societal developments than did climate change. One of the disturbances was undoubtedly manipulation of fire for land clearing and the gullies of the Tigray Plateau are promising repositories of information about fire history.

Key Words: *palaeoenvironmental change, stable isotopes, charcoal, Ethiopia*

<i>Abstract No. 38</i>	<i>Presentation 29</i>	<i>22/05/2009</i>	<i>11.50 – 12.05</i>
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Resilience and Adaptation to Climate Change Effects in Ankole Region of Western Uganda

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Climate change per se is not a completely new phenomenon for the human race, and indeed all other living things. What makes it a serious concern today is its unpredictability and more pronounced variations. Historically different societies in different social, economic and

ecological environments respond differently, using different coping mechanisms to climatic changes.

Ankole region lies within the equatorial climatic region but it does not experience purely equatorial climatic conditions due to the effects of altitude and relief. Generally Ankole experiences tropical climatic conditions. Human activities such as clearance of forest cover have resulted in climatic variations, with at times prolonged dry seasons or heavier rains at times. These have tended to worsen the effects of global warming.

Economic activities of the Banyankole predominantly include crop farming of food and cash crops as well as animal husbandry. Climate change affects productivity and people's livelihoods in various ways. Interestingly the dichotomous life styles of Banyankole imply that the coping mechanisms of Bahima and Bairu vary significantly. Bahima are predominantly cattle keepers while Bairu are crop growers.

The presentation will highlight the various coping mechanisms especially of the rural dwellers who earn their living directly from the land and therefore solely depend on rain/climate for their survival and the survival of their livestock.

<i>Abstract No. 39</i>	<i>Presentation 30</i>	<i>22/05/2009</i>	<i>12.05 - 12.20</i>
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The Impact of Climatic, Geological and Human Factors on the Evolution of Cichlid Fishes in Eastern Africa

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The Great East African Lakes have provided ideal model systems for evolutionary studies, as they hold hundreds of endemic species. The majority of these still occur in the cradle of their origin. Although radiations from ancient lakes are generally assumed to be adaptive, this view is not fully supported, because non-adaptive radiations also appear to be common, for example through chromosomal changes, hybridization or sexual selection. This paper examines the impact of climatic, geological and human factors on the evolution of cichlid fishes within the East African Inland Waters. The paper also examines the vulnerability of fish species to fishing pressures, introduction of exotic species and other anthropogenic factors that have a bearing on aquatic ecosystems. The loss of an estimated 200 taxa of endemic cichlid species from Lake Victoria's fauna, following introduction of exotic fishes stresses the need to protect the unique fish species in the Great East African Lakes. The Great East African Lakes support fisheries of great socioeconomic importance for the rapidly rising human populations. Water level fluctuations due to climatic and geological factors have been important modulators of speciation processes in eastern African as they temporarily form or break down barriers to gene flow among adjacent populations. Time estimates of the most recent major low-stands of water in the East African Great Lakes are thus crucial to infer the relative timescales of explosive speciation events in cichlid species flocks. This review combines geological evidence with genetic divergence data of cichlid fishes from the Great East African Lakes derived from the fastest-evolving mtDNA segment. The available data reveal that individuals sampled from several populations which are currently isolated by long geographic distances or deep water form clusters

of closely related haplotypes. The distribution of identical or equally closely related haplotypes in a lake basin allows delineation of the extent of lake level fluctuations. This suggests that the same climatic phenomenon synchronized the onset of genetic divergence of lineages in affected species flocks, such that their most recent evolutionary history seems to be linked to the same external modulators of adaptive radiation. A rapid rise of water levels for lakes Malawi, Tanganyika and Victoria about 11,000 years ago established the large-scale population subdivisions observed today. During that period of time, several species originated in Lakes Malawi and Victoria with an impressive degree of morphological and ecological differentiation, whereas the Tanganyika taxa that were exposed to the same habitat changes hardly diverged ecologically and morphologically. In order to compare the evolutionary consequences of the most recent lake levels on the fish faunas of the East African Lakes, it is necessary to investigate the geographic distribution of closely related genotypes.

Key Words: Genetic divergence, cichlid fishes, adaptive radiation, East African Lakes, water level fluctuations

<i>Abstract No. 40</i>	<i>Presentation 1</i>	<i>21/05/2009</i>	<i>9.30 - 10.00</i>
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Research towards Unraveling Climates of the Last Few Thousand Years: the East African Perspective

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In Africa meteorological records and written observations are limited to the very recent past (often only the past few decades); thus data on longer term cyclical fluctuations is very limited, as is our understanding of how these impact on regional environments and human societies, or how these various components interact. It is noted, for example, that during the late Holocene when natural forcing and boundary conditions were similar to today, climate variability often exceeded anything that is seen in modern instrumental records (Oldfield and Alverson, 2003). Knowledge of long-term climate change, therefore, is necessary in order to assess the significance of historically documented and modern-day climate change. Palaeo-research also enables us to estimate better the range or 'envelope' of natural climate variability under boundary conditions similar to the present, and also to discriminate between natural and anthropogenic perturbations of the climate system. It enables us to recognize locally and regionally significant human impacts, and is critical in the development and testing of models which can then be used to simulate future climate.

The palaeo-climate records of north and East Africa indicate with high confidence that droughts lasting decades or longer were a recurrent feature of climate over the last two millennia, and that under gradual climate forcing (e.g. orbital), the climate system can change abruptly. Decadal scale droughts and intervening wet periods in Lake Naivasha are attributed to high and low phases of solar radiation, respectively (Verschuren et al., 2000). A similar record has been documented at Lobo Plain (between Lakes Baringo and Bogoria), where abrupt wetland formation is related to

a climate shift from drier conditions associated with the mid-Holocene and Medieval Warm Period (~AD 800–1270), to wetter conditions associated with the Little Ice Age (~AD 1270–1850) (Driese et al., 2004). Further northeast in Ethiopia, similar conditions prevailed (Lamb et al., 2007). Contrasting (out-of-phase) data from western Uganda during this period highlights the strongly regional nature of century scale climate dynamics on the African continent (Russell et al., 2007).

Compared to obtaining records of century scale droughts and wet phases, it has been a challenge to reconstruct annual to decadal scale changes. Recent efforts, however, based on tree ring and stalagmite research; reveal ample potential for studying ENSO scale variability. Establishing a climate change research group that integrates data from such archives and from observed records will help to obtain a long time series of quantified rainfall variability for the region.

<i>Abstract No. 41</i>	<i>Workshop Report</i>	<i>22/05/2009</i>	<i>2.30 - 2.45</i>
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Scientific Drilling for Human Origins: Exploring the Application of Drill Core Records to Understanding Hominin Evolution; Workshop Report

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How did environmental history, and particularly climate, affect the evolution of our hominin ancestors and closely related species? Limited numbers of fossils and geographic and temporal gaps among them impede the formulation of testable hypotheses about the climate/evolution linkage. And, our understanding of Earth's environmental history close to fossil finds also remains limited. Scientists interested in the problem currently make use of outcrop exposures at the fossil sites, which are temporally and geographically discontinuous, and/or deep sea or lake paleoclimate records, derived from long distances from where the hominins lived, to address the Earth history side of this equation. A workshop was held in Addis Ababa, Ethiopia (Nov 17-21, 2008) to consider how scientific drilling might improve our understanding of the connection between earth history and human origins. This workshop, funded by the International Continental Scientific Drilling Program and NSF, brought together a diverse group of 60 earth scientists, anthropologists and archaeologists from 13 countries to develop a drilling plan for East African sedimentary basins where important fossil and stone tool discoveries have been made. Seven potential sites have been proposed for drilling: five during the meeting and two more later. The proposed sites are: Olduvai Basin (Tanzania), Olorgesailie and Magadi basins (South Kenya), Baringo Basin (Kenya), Turkana Basin (Kenya), Chew Bahir Basin (Ethiopia), Northern Awash Basin, Ledi Geraru area (Afar, Ethiopia), Gamari plain (Afar, Ethiopia). By the end of the meeting a consensus had emerged that the project steering committee should move ahead with a formal evaluation of all proposed sites, along with an analysis of funding options for the projects. Much of the meeting discussion time was devoted to considering the science/logistical issues surrounding each area, and strategies for core sampling, analysis, curation and logging.

<i>Abstract No. 42</i>	<i>Presentation 5</i>	<i>21/05/2009</i>	<i>11.05 - 11.35</i>
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Recent Advances in Knowledge on the Climate History of Equatorial East Africa, over the Last Few Centuries to Millions of Years

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In recent years significant progress has been made in the documentation and understanding of tropical-African climate dynamics at short (decades to centuries), long (millennia) and very long (millions of years) time scales throughout the Quaternary and into the Pliocene. These new high-quality paleodata contribute to the resolution of famous old debates, such as whether marine sediment records from the tropical Indian Ocean are representative for long-term palaeoenvironmental evolution on the African continent; to what extent climate influences from high northern latitudes overrode the anti-phased pattern of precessional insolation forcing on monsoon dynamics in the northern and southern tropics and on the equator; on the reality and timing of millennial-scale hydrological variability during the Holocene; and on the geographical distribution of wet and dry climate anomalies during the Medieval Climatic Optimum and the Little Ice Age. A true synthesis of this improved understanding must await proper regional integration of the relevant datasets, which continue to accumulate. This presentation aims to convey some of the current excitement in the African palaeoclimate research community, using a selection of recent research results across time scales.

<i>Abstract No. 43</i>	<i>Poster 8</i>	<i>21 - 22/05/2009</i>
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Out of Africa—Late Pleistocene Rock Shelter Stratigraphies and Palaeoenvironments in Northeastern Africa

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Northeastern Africa is deemed a centre of origin and dispersal of Modern Man from Africa to Western Eurasia, and particularly to Europe. Regional climatic changes and environmental conditions during the Pleistocene play a major role in human adaptative behaviour. Our project focuses on the underlying factors for this major process in the history of mankind – both the environmental background and the socio-cultural context in the source area. The two research areas in Ethiopia and Egypt provide different altitudinal, climatic and geomorphological configurations. A comparison of the regional results thus offers new aspects to the global discussion of climatic change and human responses.

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