ANTHROPOLOGIE • XXXIV/1 – 2 • pp. 47 – 53 • 1996

GÜNTER BRÄUER, AUDAX Z. P. MABULLA

NEW HOMINID FOSSIL FROM LAKE EYASI, TANZANIA

ABSTRACT: This paper presents a first description and analysis of a recently discovered fossil hominid from Lake Eyasi. The new specimen designated Eyasi IV consists of an occipital fragment and was found at the same site where Kohl-Larsen discovered the famous Eyasi hominids in the 1930s. Recent field work showed that the lithic assemblages from the Eyasi Beds are similar to the early MSA from the Upper Ndutu Beds at Olduvai Gorge, which points to an age of 0.3-0.2 my BP. The new occipital fragment is thick-walled and exhibits close similarities in shape to the occipital plane of Eyasi I. Eyasi IV can most likely be assigned to archaic Homo sapiens.

KEY WORDS: Eyasi IV – Archaic Homo sapiens – Occipital – Tanzania

Important fossil hominid remains were collected from Lake Eyasi, northern Tanzania, in 1935 and 1938 by the German anthropological expeditions led by Dr. Ludwig Kohl-Larsen (1940,1943). The hominid fossils include a fragmentary skull (Eyasi I), an occipital part (Eyasi II) and some small cranial fragments and teeth (Eyasi III). Weinert (1938, Weinert *et al.* 1940) initially classified the Eyasi cranial remains as *Pithecanthropus* or *Homo erectus*. Later morphological analyses attributed them to the subspecies *Homo sapiens rhodesiensis* (Protsch 1976, 1981) or to early archaic *Homo sapiens* (Bräuer 1984a,b, 1989).

Since the discoveries in the 1930s no other hominid remains have been found at the lakeshore site, apart from three early modern molars from the nearby Mumba rockshelter (Bräuer, Mehlman 1988), despite intensive survey by Michael Mehlman (1989). In 1993, one of us (A.M.) found another fossil hominid cranial fragment during an archaeological survey of the Eyasi Basin, which is described and analysed in this paper.

SURVEY AND DISCOVERIES

One goal of the 1992-1993 research in the Eyasi Basin was to recover fossil hominid material that would enlarge the East African hominid sample from the Middle and Late Pleistocene. The new hominid specimen described here was found on the surface along the modern shore of Lake Eyasi (*Figure 1*).

This area was selected for a systematic surface survey because it offered the best potential for recovering additional hominid remains on the basis of the available information (e. g. Mehlman 1989). A survey area of 6 × 0.5 kilometers was first defined, recorded on aerial and topographic maps and later traced on acetate overlay. The survey area is located along the flat lakeshore where there is little or no vegetation due to the soda and salt of Lake Eyasi. This salt flats area is called *jangwani* by the inhabitants of the Eyasi Basin (Swahili word for desert). North-south survey transects were defined and systematic surface walkovers were conducted by seven crew members (including two archaeologists and one geologist) spaced at intervals of 5 meters. Since the terrain was flat and open,

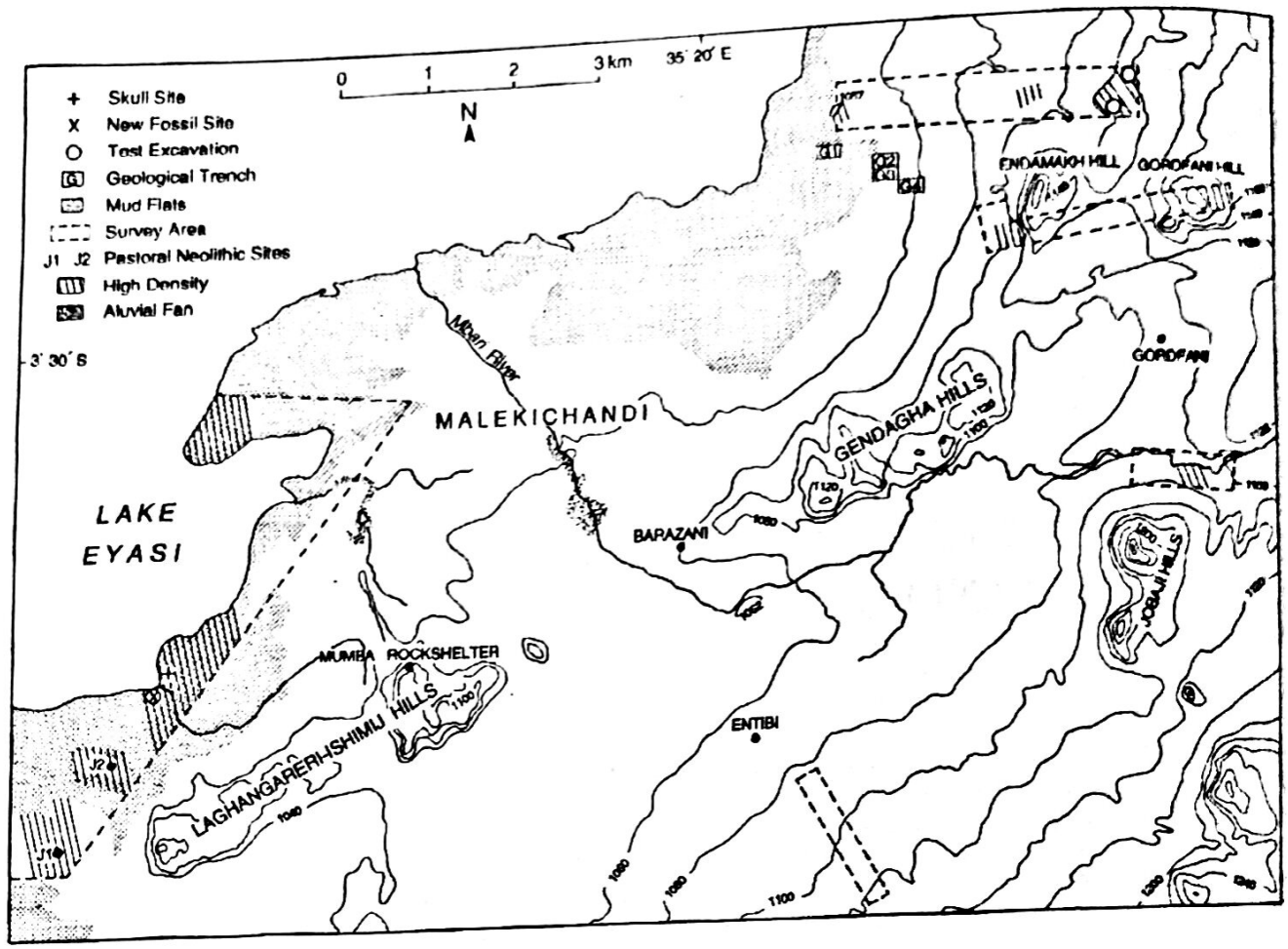

FIGURE 1. Map of the northeastern end of Lake Eyasi showing the hominid fossil site.

it offered excellent visibility and it is unlikely that artifacts and faunal remains were missed.

The survey yielded stone artifacts, fossilized bones of fish, hippo and small and large bovids. The bones were highly mineralized and black in colour. The hominid cranial fragment was found on the gentle slope of a small sand dune or hummock in close association with other fossilized and highly fragmented bones. Among these were a phalanx probably of *Crocuta sp.* and an upper incisor of a cercopithecid (T. Kaiser, pers. comm.). This locality is the same as the Skull Site where Kohl-Larsen found the hominid fossils in the 1930s (*Figure 1*). The UTM coordinates for the Skull Site, provided by Mehlman (1989; pers. comm. 1992) are 3°32'26" S and 35°16'05" E, with an elevation of about 1021 m (Mang'ola: Series Y742, Sheet 68/2, Edition 1-TSD). Intensive surface examination of all bone fragments within an area of 2000 square meters surrounding the hominid fossil failed to reveal additional hominid remains.

Stone artifacts of early Middle Stone Age (MSA) or "Sangoan/Njarasan" industry were found in direct association with many fragmented faunal remains, but not with the hominid fragment. This early MSA industry has already been described by Mehlman (1989). All the fossilized fauna (including hominid) and artifacts were found resting loosely on the surface of a dark gray clay underlain by patches of consolidated red/pale red clay or claystone. We established a test pit one by one meter at the top (relatively undisturbed) of the small sand dune, close to the hominid find. This was excavated to a depth of about 50 cm before being abandoned because of increasing hardness. No cultural or faunal remains were recovered, possibly because the excavation was stopped before reaching the horizon that the fossilized bones and lithic artifacts were eroding from.

About 4-5 kilometers northeast of the Skull Site (*Figure 1*), we found another locality with dense scatters of fossilized fauna. This area is probably within that of Kohl-Larsen's Nordostbucht (northeast bay) (Mehlman 1989). Two hominid mandibles were recovered, possibly from the surface of this locality, in the 1960s; one by C.A. Keilland and the other by J. Ikeda (Mehlman 1989). Unfortunately, full description and analysis of the hominid mandibles have never been published.

STRATIGRAPHY AND GEOCHRONOLOGY OF THE EYASI BEDS

Chronometric dating of the Eyasi Beds and the associated hominid and artifact findings has been problematic. Amino-acid determinations on fragments of the Eyasi hominids yielded dates of ca. 34.000 to 36.000 years BP (Bada, Protsch 1973, Protsch 1976, 1981). However, more recent research pointed to a much greater age for the Eyasi hominids. Mehlman (1987, 1989) has identified the exposed and eroded sediments at the Skull Site and along the ancient lakeshore between the Skull Site and Mumba rockshelter as the Eyasi Beds (*Figure 1*). From recent sedimentological analyses, he concluded that the Eyasi Beds stratigraphically underlie the Mumba deposits. According to Uranium series dates of ca. 110.000 to 130.000 years BP for a level in the lower deposits of the Mumba sequence (Bräuer, Mehlman 1988) a Middle Pleistocene age of the Eyasi Beds appears most likely. This is also supported by the extinct fauna (*Theropithecus, Pelorovis, Hipparion*, a giraffid, a large carnivore, a hippo and an antelope) and the early MSA eroding from the Eyasi Beds.

To further explore the age of the Eyasi hominid specimens and the early MSA at the Skull Site, we sampled exposed lacustrine sediments of the Eyasi Beds, .14 kilometers northeast of the Skull Site, to search for dateable material. We dug two stratigraphic units, G1 and G4 (*Figure 1*). Stratigraphic unit G1 was located about one kilometer from the modern lakeshore and G4 was located about 0.6 kilometer east/south-east of G1. In addition, we observed exposed stratigraphic units of the Eyasi Beds at G2 and G3.

The four stratigraphic units show the sedimentation history of Lake Eyasi (*Figure* 2), revealing that the Eyasi beds were deposited between two or more volcanic eruptions, following a period of regional faulting. The exposed (G1 and G2) and observed (G2 and G3) volcanic rocks are mud flows in nature, suggesting that volcanism was probably brought close to Lake Eyasi by the formation of scoriaceous lava cones along the ancient lakeshore. One small vent composed of scoriaceous lava was found near the ancient beach line surrounded by metamorphic rocks, probably representing the closing phase of volcanism in the region. This vent has been dissected, showing a typical outline of a volcano.

The stratigraphic sequence of the Eyasi Beds in the northeastern lakeshore (*Figure* 2) complements that at the Skull Site as described by Mehlman (1987, 1989). Nonetheless, the former stratigraphic sequence is longer, with volcanic rocks of two or more different histories and

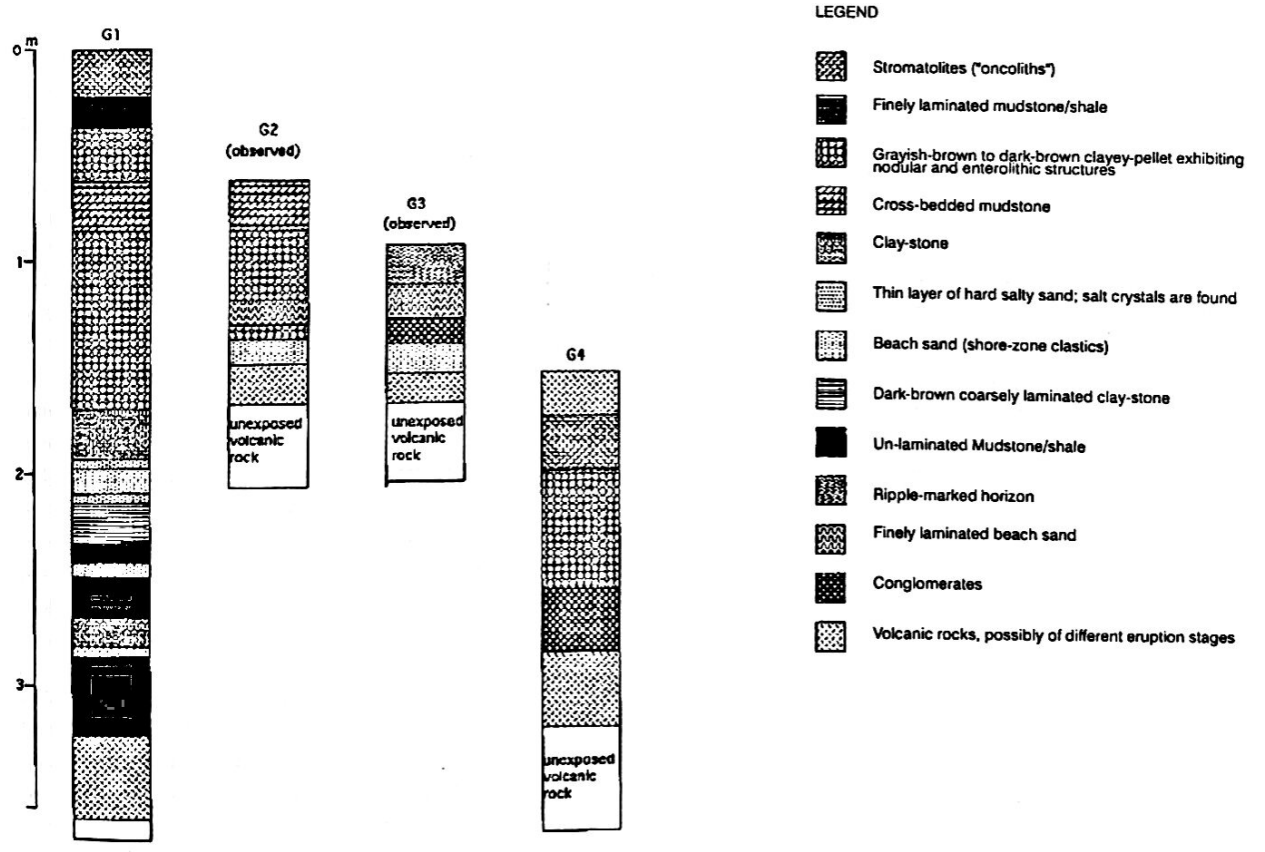

FIGURE 2. Stratigraphy of the Eyasi Beds.

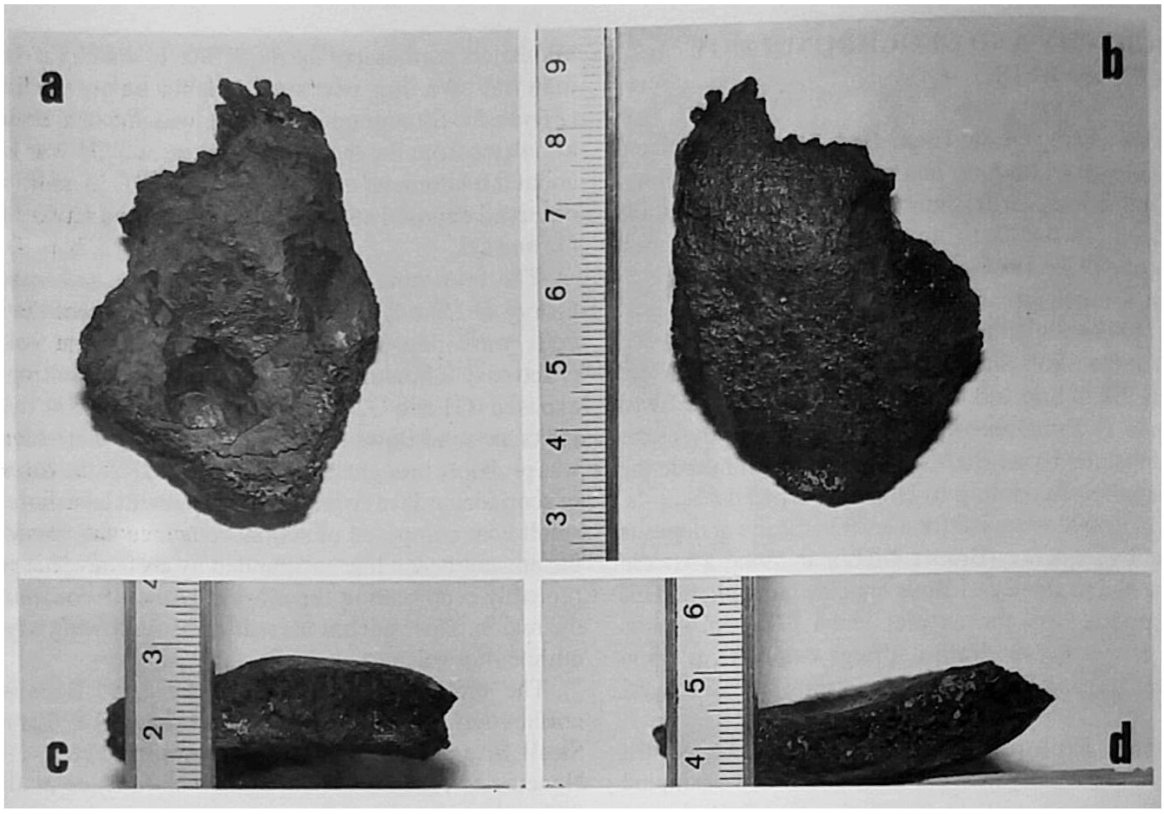

FIGURE 3. The Eyasi IV occipital specimen: a) internal surface; b) external surface; c) lambdoidal suture; d) fracture surface.

clusters of stromatolites. Unfortunately, we could not recover (due to lack of boring equipment) *in situ* fresh samples of volcanic rock for chronometric dating. However, the presence of volcanic material within the Eyasi Beds also points to Middle Pleistocene age. Recent studies indicate that the latest regional faulting and volcanism took place around 0.8 to 0.4 my BP (Manega 1993, Somi 1993). If the magnitude of this latest regional volcanism reached the Eyasi Basin, then it can be argued that the Eyasi Beds volcanic material dates to at least 0.4 my BP.

Alternatively, the Eyasi crania and the early MSA can be assigned a chronometric date of typologically similar lithic assemblages. In terms of typology, technology and predominant raw material type, the early MSA from the Eyasi Beds (locally known as the "Njarasan" industry) is similar to the early MSA from the upper Ndutu Beds at Olduvai Gorge (Mabulla 1990, in print). The upper Ndutu Beds have recently been dated by a combination of SCLFAr40/Ar39 and amino-acid analyses of ostrich eggshells to ca. 0.3-0.2 my BP (Manega 1993). This age is plausible for the Eyasi archaic *Homo sapiens* remains, the associated lithic industry, and thus also for the new hominid specimen.

THE NEW EYASI HOMINID

Description

The new hominid specimen designated Eyasi IV consists of a fragment of the occipital bone. It is heavily mineralized and of black colour as is the fauna at this site. The occipital fragment measuring about 6 × 4 cm is in a good state of preservation and shows only slight erosion on the internal surface (*Figure 3*). Among the anatomical features preserved are a section of the lamboidal suture (including the area at the lambda craniometric point), the occipital sagittal sulcus, and small parts of the cerebral fossae. The fragment can be identified as an upper central-right part of the occipital plane. The piece is broken off near the mid-sagittal plane and above the nuchal or transverse torus area. The central part of the occipital plane is rather flattened and is only curved anteriorly near the lambda point and towards the missing nuchal region. The cranial wall of Eyasi IV is rather thick measuring ca. 10 mm near the lambda point (which cannot be exactly located on the isolated occipital fragment). The maximum thickness along the preserved part of the lambda suture measures ca. 11.5 mm and the minimum thickness at the cerebral fossa ca. 7.5 mm. *Figure 4* shows several CT sections using high resolution technique (Siemens Somatom HQ Computer Tomograph).

Comparisons

The Eyasi IV specimen was compared to the Eyasi I and II originals as well as to a number of other archaic *Homo sapiens* specimens from Africa. Of great interest, of course, is the comparison to the cranial remains found at the same site in the 1930s.

In spite of the small size of the Eyasi IV fossil, the comparison with Eyasi I was revealing. In Eyasi I the

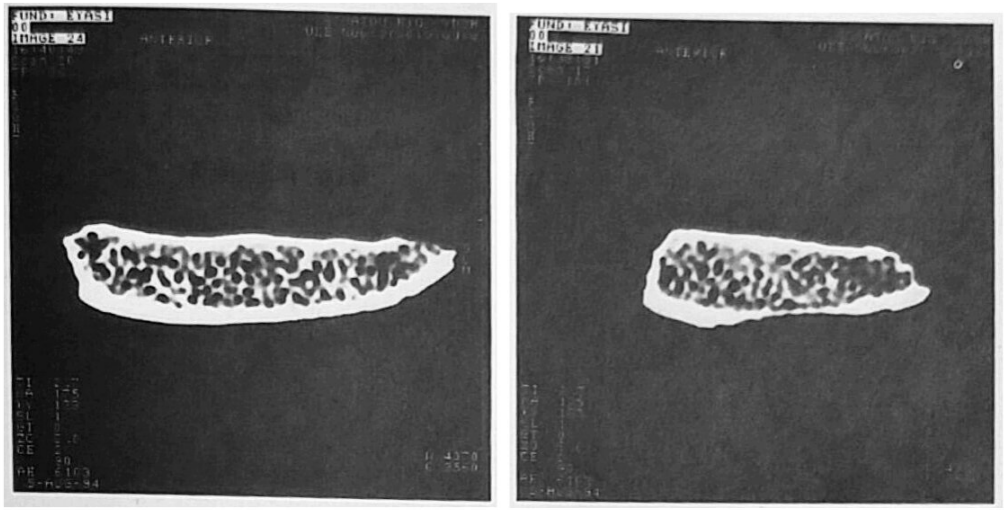

FIGURE 4. CT slices of Eyasi IV: a) sagittal; b) parasagittal.

FIGURE 5. Comparison of Eyasi I (cranium) and Eyasi IV.

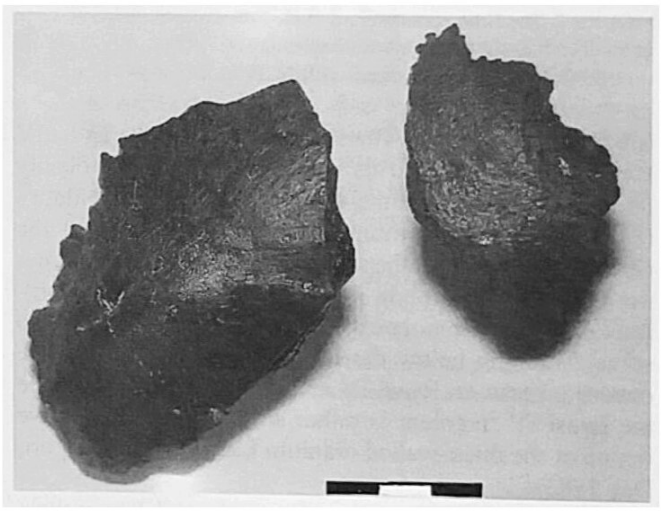

FIGURE 6. Comparison of Eyasi II (left occipital fragment) and Eyasi IV.

occipital plane is largely preserved including most of the upper right part and the lambda region (*Figure 5*). There are striking similarities between the two hominids in details of the shape of the occipital plane. In both specimens there is a marked flattening of the central part of the occipital plane (see *Figure 5*), an anterior curving of the lambda region, and a curving of the inferior part of the occipital plane which in Eyasi I continues towards a slightly developed transverse torus. Moreover, Eyasi IV and the respective region of Eyasi I appear rather similar in absolute size; perhaps the occipital bone of Eyasi IV was somewhat larger. There are also great similarities in the thickness of the occipital wall. Eyasi I measures ca. 9 mm near the lambda, a maximum of 10.5 mm at the lambdoidal suture (about 10 mm from lambda), and a minimum of 7 mm at the cerebral fossa. Thus, Eyasi IV has a slightly thicker-walled occipital bone than Eyasi I.

Eyasi II consists of much of the left half of the occipital bone (*Figure 6*) and shows a somewhat more modern morphology compared to Eyasi I (e.g. in the weaker angulation between the nuchal and occipital planes or in the torus development). Although the occipital plane is relatively thick-walled, it is not as thick as in the Eyasi IV fragment. At the center of the cerebral fossa Eyasi II measures 6 mm. The upper part of the occipital plane including the lambda region is missing in Eyasi II. The central region of the occipital plane is evenly curved in profile and does not show the flattening seen in Eyasi I and IV.

Eyasi IV can be compared to two further fossils from Tanzania, the early archaic *Homo sapiens* cranium from Ndutu and the late archaic specimen from Laetoli (Bräuer 1990). The Ndutu cranium is rather small and exhibits two large sutural bones in the upper part of the occipital plane

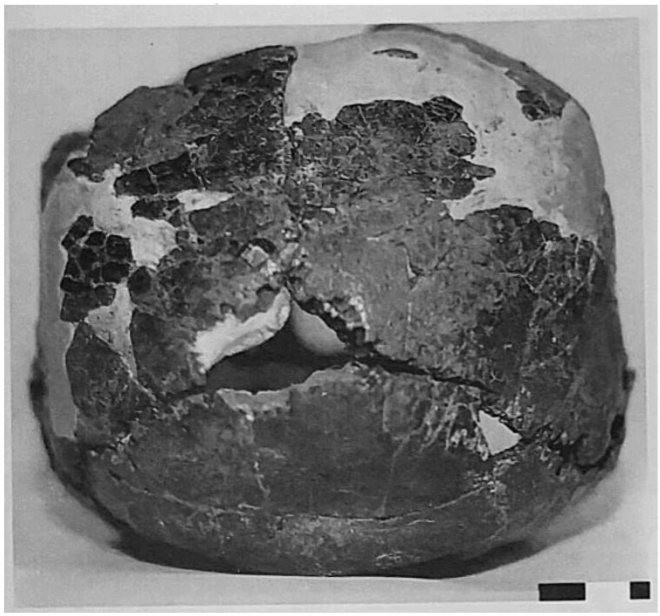

FIGURE 7. The Ndutu cranium.

(cf. also Clarke 1990). The size and shape of the Eyasi IV fragment indicates that its occipital plane was probably larger and sagittally somewhat less curved than Ndutu's (*Figure 7*). The minimum thickness of the wall at the cerebral fossa is about the same in both specimens, whereas the thickness at lambda is smaller in Ndutu (8.5 mm). Laetoli H 18 has a more expanded occipital plane and also some flattening below the lambda region similar to the conditions seen in Eyasi IV and I. In general appearance the Eyasi IV fragment is rather similar to the respective region of the thick-walled cranium Laetoli H 18 (Magori, Day 1983).

Comparisons with some other early and late archaic *Homo sapiens* specimens from Africa (see Bräuer 1989, 1990) were carried out as well. Although the respective area is defective in Kabwe/Broken Hill (Zambia) the better preserved left side indicates a sagittal curvature of the occipital rather different from the condition in Eyasi IV; here, the inferior part of the occipital plane points to a more rounded course. A comparison with Jebel Irhoud 1 (Morocco) shows that Eyasi IV's occipital bone was most likely not quite as strongly arched in profile. Jebel Irhoud 1's wall thickness at lambda is slightly larger than that of Eyasi IV. Comparisons to Omo-Kibish 2 (Ethiopia) similarly point to a sagittally more rounded occipital bone in Eyasi IV.

In summary, Eyasi IV's morphology and similarities to other hominids allow some conclusions: Especially the thickness of the wall which even slightly exceeds that of Eyasi I indicates that the fossil belongs to a non-modern hominid type. Moreover, there are remarkable similarities in details of the shape of the occipital plane (flattening, curvature) to Eyasi I. There are further indications that the occipital of Eyasi IV was probably larger than that of Eyasi I. Other comparisons show that the occipital bone was larger than Ndutu's and more rounded than those of Kabwe, Jebel Irhoud 1, and Omo-Kibish 2. It is also interesting that closer similarities in this respect exist to the late archaic specimen Laetoli H 18. Although the new fossil fragment Eyasi IV is very small and the diagnostically relevant region at the occipital-nuchal transition is unknown, its morphology most likely points to an assignment to archaic *Homo sapiens*, similar to or somewhat more derived than the Eyasi I hominid. This is also in agreement with its possible later Middle Pleistocene age.

ACKNOWLEDGEMENTS

First, we would like to thank Dr. Marta Dočkalová for the kind invitation to contribute to this volume dedicated to the 70th anniversary of our colleague and friend Prof. Jan Jelínek.

Major funding for this research was provided by the National Science Foundation. Additional funding was provided by Ford Foundation and NORAD. The Archaeology Unit, University of Dar-es-Salaam, provided support in the form of field equipment, transportation and financial commitments. A. M. sincerely thanks the support of all these institutions.

Also, A. M. would like to thank Drs. Steve A. Brandt, Michael J. Mehlman, Randi Haaland and M. Mutakyahwa for their support and advice. Thanks are also due to the Tanzania Antiquities Unit for permitting A. M. to work in the Eyasi Basin and for their help in granting a permit to ship artifacts to Florida. This research could not have been possible without the significant contributions of R. Mrema, A. Kweka, R. Maro, O. S. Kileo, S. Kilindo, J. Mosi, our Hadzabe survey crew and the people in the Eyasi Basin.

G. B. would like to thank the National Science Research Council of Tanzania for the allowance to study several hominid fossils at the National Museum in Dar-es-Salaam and for the support by Dr. Fidel Masao. My thanks go also to Prof. Nicholas Conard and Prof. Hansjürgen Müller-Beck (Abtg. Ältere Urgeschichte-Quartärökologie, Universität Tübingen) for giving me access to the Eyasi I cranium. G. B. is also grateful to Dr. Jörg Freitag, Dr. Christoph Groden, Andrea Brandes (Universität Hamburg) for their support with the computerized tomography. We also thank Dr. Thomas Kaiser and Dr. Friedemann Schrenk (Landesmuseum Darmstadt) and Prof. Juan-Luis Arsuaga and Dr. Ana Gracia (University of Madrid) for their generous help in identifying some faunal remains.

REFERENCES

BADA J. L., PROTSCH R., 1973: Racemization reaction of aspartic acid and its use in dating fossil bones. *Proceedings of the National Academy of Sciences* 70: 1331-1334.

BRÄUER G., 1984a: A craniological approach to the origin of anatomically modern *Homo sapiens* in Africa and implications for the appearance of modern Europeans. In: F.H. Smith and F. Spencer (Eds.): *The Origins of Modern Humans: A World Survey of the Fossil Evidence.* Pp. 327-410. Alan R. Liss, New York.

BRÄUER G., 1984b: The "Afro-European sapiens-hypothesis", and hominid evolution in East Asia during the late Middle and Upper Pleistocene. In: P. Andrews and J. Franzen (Eds.): The early evolution of man with special emphasis on Southeast Asia and Africa. *Courier Forschungsinstitut Senckenberg* 69:145-165.

BRÄUER G., 1989: The evolution of modern humans: a comparison of the African and non-African evidence. In: P.A. Mellars and C. B. Stringer (Eds.): *The Human Revolution: Behavioral and Biological Perspectives on the Origins of Modern Humans.* Pp. 124-155. Edinburgh University Press, Edinburgh.

BRÄUER G., 1990: Homo sapiens of Africa. *Encyclopaedia Britannica.* Chicago. Pp. 841-843.

BRÄUER G., MEHLMAN. M. J., 1988: Hominid molars from a Middle Stone Age level at the Mumba rock shelter, Tanzania. *Am. J. Phys. Anthrop.* 75: 69-76.

CLARKE R. J., 1990: The Ndutu cranium and the origin of Homo sapiens. *J. Hum. Evol.* 19: 699-736.

KOHL-LARSEN L., 1940: Auf neuer Fahrt nach dem Njarasagraben-Deutsche Afrika-Expedition 1937-39. *Umschau* 44:228-232.

KOHL-LARSEN L., 1943: *Auf den Spuren des Vormenschen.* 2 vols. Strecker und Schröder Verlag, Stuttgart.

MABULLA A. Z. P., 1990: An Archaeological Reconnaissance of the Ndutu Beds, Olduvai Gorge, Tanzania. Unpublished MA paper, Department of Anthropology, University of Florida.

MABULLA A. Z. P., in print: The Lithic Assemblage of the Ndutu Beds and its Implications for Future Research at Olduvai Gorge. In: P.R. Schmidt (Ed.): *Developing Archaeology: the Tanzanian Experience.*

MAGORI C. C., DAY M. H., 1983: An early Homo sapiens skull from the Ngaloba Beds, Laetoli, Northern Tanzania. *Anthropos* (Athens) 10:143-183.

MANEGA C. P., 1993: Geochronology, Geochemistry and Isotopic Study of the Plio-Pleistocene Hominid Sites and the Ngorongoro Volcanic Highland in Northern Tanzania. Ph.D. dissertation, University of Colorado, Boulder.

MEHLMAN M. J., 1987: Provenience, Age and Association of Archaic *Homo sapiens* Crania from Lake Eyasi, Tanzania. *Journal of Archaeological Science* 14:133-162.

MEHLMAN M. J., 1989: Later Quaternary Archaeological Sequences in Northern Tanzania. Ph.D. dissertation, University of Illinois, Urbana-Champaign.

PROTSCH R., 1976: The position of the Eyasi and Garusi hominids in East Africa. In: P.V. Tobias and Y. Coppens (Eds.): Les plus anciens hominidés. *IX Congrès de l'Union Internationale des Sciences Préhistoriques et Protohistoriques.* Colloque VI. Pp. 207-238. Edition du C.N.R.S., Paris.

PROTSCH R., 1981: The palaeoanthropological finds of the Pliocene and Pleistocene. In: H. Müller-Beck (Ed.): *Die archäologischen und anthropologischen Ergebnisse der Kohl-Larsen Expeditionen in Nord-Tanzania,* 1933-1939. *Tübinger Monographien zur Urgeschichte* 4(3).

SOMI J. E., 1993: Palaeoenvironmental changes in central and coastal Tanzania during the Upper Cenozoic. Ph.D. dissertation, Stockholm University, Sweden.

WEINERT H., 1938: Der erste afrikanische Affenmensch *Africanthropus njarasensis. Der Biologe* 4:125-129.

WEINERT H., BAUERMEISTER W., REMANE A., 1940: *Africanthropus njarasensis.* Beschreibung und phyletische Einordnung des ersten Affenmenschen aus Ostafrika. *Z. Morph. Anthrop.* 38:252-307.

Prof. Dr. Günter Bräuer
Institut für Humanbiologie
Universität Hamburg
Allende-Platz 2
20146 Hamburg
Germany

Dr. Audax Z. P. Mabulla
Archaeology Unit
University of Dar-es-Salaam
P.O. Box 35050
Dar-es-Salaam
Tanzania