

Map of the Lake Baringo area showing the location of the Tugen Hills and several neighboring fossil localities. Courtesy of Andrew Hill.

By E. Delson, J. A. Van Couvering and A. Hill

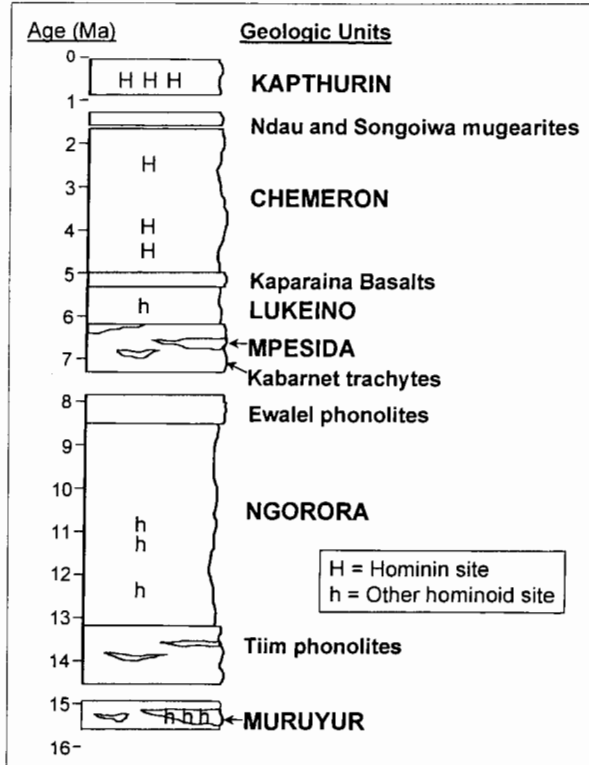
Baringo Basin/Tugen Hills

Region of the Central Kenya Rift Valley exposing Late Neogene sediments and volcanics ranging in age from ca. 15.5 to 0.2 Ma. Paleontological and archaeological finds are numerous, including *Kenyapithecus*, indeterminate ?hominins, ?*Australopithecus*, *Paranthropus*, *Homo*, and prolific open and stratified Paleolithic sites. The main importance of this area for human evolution lies in the fact that the fossil record represented here includes sites that document the period from 12 to 4 Ma, which is otherwise extremely poorly known in sub-Saharan Africa. It was during this time that the Ethiopian fauna became established and humans and modern African apes diverged from their common ancestor.

Paleontological investigation of this region began in the 1930s, when expeditions by C. Arambourg and L.S.B. Leakey passed through en route to the Turkana Basin. The geologist H. Wayland had already made it the type area of the Kamasian pluvial, following initial geological studies by J. Thomson in the 1880s. The 20-km-long Lake Baringo, just north of the equator, is surrounded by badlands that yield abundant fossils of plants and animals. Isolated sites are found in the north, at Karmosit and Aterir, and to the east at the foot of the Laikipia Escarpment, at Alengerr and Chesowanja. Most of the Baringo sites, however, are found on the west of the lake in the Tugen Hills.

Tugen Hills Stratigraphy and Dating

The Tugen Hills, sometimes known as the Kamasia Range, extend ca. 75 km north-south along the rift on the west of Lake Baringo. The Tugen Hills are a complexly faulted, west-tilted horst (upthrust block) in which ca. 3,000 m of rift-floor deposits are exposed in scarps and foothills facing the lake. The strata are displaced by a crazy-quilt of large and small faults, including some that were already active during deposition of the beds, making stratigraphic correlation be-



Stratigraphy of the Tugen Hills succession. The major geologic units are shown in an idealized stratigraphic column, with sedimentary formation names in capital letters, and the horizons of hominoid fossils indicated. Courtesy of Andrew Hill.

tween separate areas difficult. Despite this, the sediments have been placed in six main fossiliferous formations. From oldest to youngest these are the Muruyur Beds, the Ngorora Formation, the Mpesida Beds, and the Lukeino, Chemeron, and Kapthurin formations. They are, for the most part, separated from one another by volcanic horizons, including several thick lava sequences, and they also include numerous tuffaceous horizons. Radiometric dating on the volcanics, and paleomagnetic stratigraphy in the sedimentary succession, support a relatively detailed and fine-grained age calibration.

The Muruyur Beds span roughly 16–15 Ma and, while they are as yet little known, have yielded a diverse fauna from a number of sites, especially around Kipsaramon (ca. 15.5–15 Ma). The more widely exposed Ngorora Formation, which spans a lengthy time interval from 13 Ma to less than 9 Ma, is a fairly unbroken sequence up to 450 m thick. Most Ngorora fossils, however, come from sites dated between 12.7 and 10.5 Ma, with a few in outlying fault blocks that are most probably younger (e.g., Ngeringerowa, ca. 9 Ma or less). Most of the time interval between ca. 8.5 and 6 Ma is either not exposed or is known only by volcanic rocks. The exception is the Mpesida Beds, lenses of fossiliferous sediment within the very thick Kabarnet Trachyte that are dated at ca. 6.5 Ma. The extensive Lukeino lake beds and sands resting on the lavas have a number of sites that have been dated between ca. 6.3 and 5.6 Ma. The overlying Chemeron Formation is informally divided into three segments that span nearly all of the Pliocene, from ca. 5.6 to 1.6

Myr. Unconformably resting on Chemeron strata in the area close to Lake Baringo are the Kapthurin Beds, dated from ca. 0.8 to 0.25 Ma, an extensive blanket of sediments that contains important fossil sites.

In addition to fauna, many levels in the Baringo Basin sequence have yielded important collections of plant remains. An extensive macroflora, indicating forest conditions, is known from the Lower Ngorora Beds at 12.6 Ma.

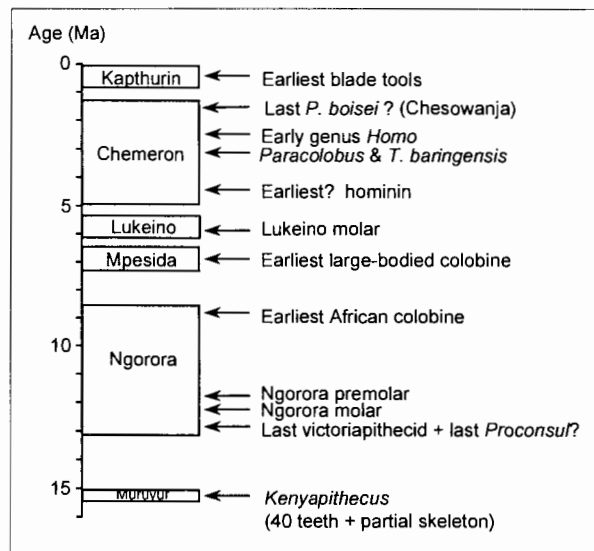
Significant changes in the mammalian fauna can be detected throughout the sequence. The most noticeable faunal shift comes between the highest Ngorora faunal level and the Mpesida Beds and is even more apparent in the better-sampled Lukeino Formation above. This change documents a dramatic first step toward the modern Ethiopian fauna and the effective end of the archaic Miocene fauna of older sites.

Tugen Hills Hominoids and Other Primates

Fossils of hominoids have been found at several levels in the Tugen Hills sequence. The earliest are numerous specimens of *Kenyapithecus*, still largely undescribed but including a partial skeleton, from Kipsaramon. The cercopithecoid *Victoriapithecus*, a large species of *Proconsul*, and the archaic catarrhine *Kalepithecus* also occur there. In the lower part of the Ngorora Formation, isolated hominoid teeth represent *Proconsul* and perhaps another genus; archaic catarrhines and the youngest known *Victoriapithecus* are also present, all ca. 12.5 Ma. The earliest African colobine, *Microcolobus*, comes from Ngeringerowa. Another isolated hominoid molar, from a site in the Lukeino Formation at ca. 6 Ma, is impossible to assign unequivocally to any known species, but it could have belonged to a hominin. If so, it would be the earliest so far known; recent study by P. Ungar and colleagues suggests similarities to *Australopithecus anamensis*, as well as to chimpanzees.

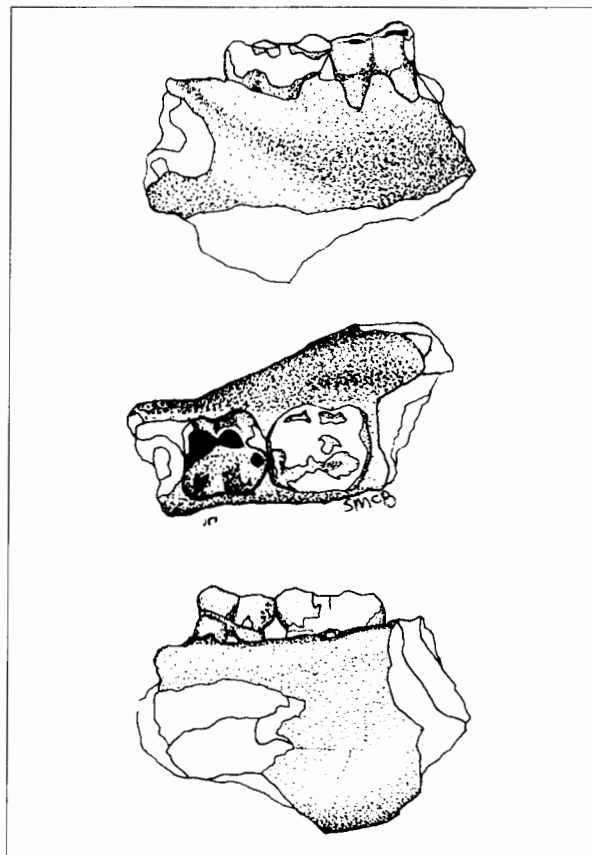
Of three hominid specimens from the Chemeron Formation, all most probably hominins, one derives from the older, Tabarin outcrops dated between 5 and 4.15 Ma. This specimen is one of the earliest well-documented hominins in the fossil record; only the specimens from Lothagam, near Lake Turkana, are a little older. The Tabarin specimen is a piece of right mandible with intact first and second molars. In its dental features and details of subocclusal and mandibular morphology, it closely resembles smaller specimens of *Australopithecus afarensis* and also (as A. Hill has pointed out) the more fragmentary material that has been assigned to *Australopithecus anamensis* and *Ardipithecus ramidus*. W. Ferguson has named the Tabarin jaw *Homo antiquus praegens*, which might have priority if this specimen is conspecific with either *anamensis* or *ramidus*. The other early Chemeron specimen, from a site some kilometers to the north of Tabarin, is a proximal fragment of a humerus that seems likely to represent the same species as that of the Tabarin mandible.

The third hominin, from the upper part of the Chemeron, is much younger than the other occurrences, dating close to 2.4 Ma. This is a temporal bone that comes from a site on the Kapthurin River near its mouth on Lake Baringo. After languishing as Hominidae indeterminate, it has been reanalyzed and identified as *Homo* sp. indet. (cf. H.



Important occurrences of primate (including hominin) fossils and stone tools in the Baringo Basin sequence. Courtesy of Andrew Hill.

rudolfensis?), one of the three earliest representatives of the genus *Homo*, the others being from Hadar (Ethiopia) and Uraha (Malawi). An older site, near the base of the Upper Chemeron, yielded a partial skeleton of *Paracolobus chemeroni* (the type) and a partial skull of *?Theropithecus (Omopithecus) baringensis* (also the type); these fossils remained undated for many years, but they are now closely es-



The partial hominin mandible from Tabarin (with right M1-2), dated between 5-4.15 Ma; from the top: buccal, occlusal, and lingual views. Courtesy of Andrew Hill.

estimated to date to 3.1–3 Ma. Other sites in the much younger Kaphurin Beds (dated ca. 500 Ka in early 1999) have produced two hominin mandibles and several postcranial bones, as well as an important late Acheulean artifact assemblage featuring prepared-core technology and large blades.

The isolated Chesowanja site on the east side of the lake has yielded specimens of *Paranthropus boisei*, including a partial cranium, in association with a sequence of artifacts. The absence of a toolmaker (*Homo*), if the *Paranthropus* is excluded from consideration, is reminiscent of the situation in the Bed I sites at Olduvai Gorge (Tanzania) just prior to the discovery of *Homo habilis*.

See also Africa; Africa, East; Ardipithecus ramidus; Australopithecus afarensis; Australopithecus anamensis; Chesowanja; Hominidae; Homininae; Homo; Kaphurin; Rift Valley. [E.D., J.A.V.C., A.H.]

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REPRINTED FROM:

Encyclopedia of Human Evolution and Prehistory, 2nd ed; E. Delson, I. Tattersall, J. A. Van Couvering and A. S. Brooks, eds. Garland: New York. 2000

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