

with pottery as at Bromhead's site. The occupation level beneath this, and separated from it by three barren layers, including one of æolian sand, consisted of a sparse Kenya Stillbay industry (formerly called late Kenya Mousterian) without pottery. Beneath this was the so-called third occupation level, which is the level from which the skeletons were obtained, and the industry is late upper Kenya Aurignacian.

Beneath this again, and separated from it by a layer of fallen rock, was a thick occupation level with a very rich upper Kenya Aurignacian industry. Both these upper Kenya Aurignacian levels yielded a few pieces of crude pottery—a surprising but unquestionable fact.

Most of the skull measurements quoted by Sir Arthur were, unfortunately, taken from provisional reports prepared in the field, the measurements having perforce been taken without accurate instruments and before the skulls were properly cleaned, and in many cases they have proved to be misleading. The cranial capacities quoted were also first approximations obtained in the field by using the Lee-Pearson formula. As the authors of the formula have pointed out, its average error for the individual skull is 3-4 per cent and it may be so much as 10 per cent. In the case of the Kenya skulls, the thickness of the bone and other considerations rendered the error still greater, as subsequent direct measurements have proved. For example, the capacity of Elmenteita A was found to be only 1290 c.c., instead of 1480 c.c. as estimated by formula and quoted in Sir Arthur's book.

On p. 169 we read: "In Gamble's Cave, Mr. Leakey found evidence of man living there before the last great pluvial period and of repeated occupation throughout the whole length of the period". This was once my assumption, at the time when I had mistaken the æolian sand-beds for silts, and before the discovery of the beach gravel with *Corbicula africana* as the lowest deposit in the cave. This interpretation was abandoned in 1927. The evidence shows that the cave was formed by the high 510-ft. lake during the second maximum of the Gamblian pluvial, which I tentatively equate with the Würm glaciation. It was occupied during the decline of the second maximum of the Gamblian pluvial by the makers of the upper Kenya Aurignacian culture, and later by the race who made the Kenya Stillbay culture. Later still, during the Makalian post-pluvial wet phase, which is separated from the decline of the Gamblian pluvial by an arid period, represented in the cave section by more than a foot of æolian sand, it was occupied by the makers of the Elmenteitan culture.

On p. 120 Sir Arthur says: "Now at the Elmenteitan sites (i.e. the upper occupation level of Gamble's Cave II. and Bromhead's site) were discovered pottery and stone bowls, evidence I think that the ancient occupants of these floors were already agriculturalists. The Nakuru site is later, it is post-pluvial." Now the Elmenteitan culture certainly has pottery but no indication of agriculture, nor has it stone bowls, as I have explained above, which do not occur until the Nakuran wet phase c. 850 B.C. Moreover, we now know that the wet period which was contemporary with the Elmenteitan culture was not a pluvial period, although I did formerly regard it as that, but only a post-pluvial wet phase which I call the Makalian. The evidence which I have obtained certainly convinces me that pottery was in use in Kenya long before the dawn of agriculture, and somewhat earlier than in Europe, or even in Egypt, and that by the Makalian wet phase (which equals, I think, Bühl Stadium c. 12,000-10,000 B.C.) pottery was fairly well advanced. When, however, we remember that in predynastic Egypt the Badarians and Tasians had very fine pottery, much more advanced than my

Elmenteitan pottery, at a date which Sir Arthur on p. 227 gives as c. 5000 B.C., and that—to quote his words—"Even at this early time the Egyptians were a settled people, living in villages, sowing, reaping, grinding, spinning, weaving, and making pottery of the highest finish" (the italics are mine), it is surely not so improbable that in Kenya we should have cruder pottery at an earlier date.

Of Sir Arthur's reasons for hesitation (p. 171) in accepting the antiquity ascribed by me to certain stone age cultures of East Africa, "particularly those discovered at Nakuru and in the later sites at Elmenteita", the chief seems to be the belief that I am dating agriculture in Kenya back to 12,000 B.C. But this is not my view at all. Pottery is certainly present in the Elmenteitan culture and earlier, but the earliest date I suggest for agriculture in Kenya is c. 850 B.C., when it is associated with imported beads, possibly of Egyptian or Mesopotamian origin.

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April 16.

As I regard the discoveries made by Mr. Leakey in East Africa as of the highest importance for those of us who are inquiring into the antiquity of man, I should be sorry if in any way I have misrepresented his facts or his inferences. For my purpose his chief discovery is represented by the deepest burials in Gamble's cave. I am relieved to find that in attributing to these burials—the oldest found by him—an approximate contemporaneity with those of the Cromagnon people of Europe, I have not misled my readers. I did take extreme pains by a close study of his field reports and of all his published communications to ascertain not only his facts but also his inferences, and my failure must be due in part to the rapid evolution which Mr. Leakey's own knowledge has undergone, and must continue to undergo, in the light of his additional discoveries. I am very glad he has been given this early opportunity of putting his present opinions, as well as corrections of my errors, before readers of NATURE.

One point to which Mr. Leakey directs attention is of particular interest. Hitherto, I have followed the opinion of orthodox archæologists and have supposed that pottery was born of agriculture. When pottery was found associated with human remains, I have hitherto supposed that people who practised the art of agriculture were represented. In the light of discoveries made in Kenya by Mr. Leakey, and in palæolithic Europe by other archæologists of the highest repute, it does seem probable that the invention of pottery may have antedated the discovery of agriculture and that there may be no necessary correlation between these two arts.

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Potential Temperature and Entropy at the Base of the Stratosphere over the British Isles.

THE English upper air data have lately been examined to discover what correlation exists between the potential temperature of the air at the boundary between the troposphere and stratosphere and some of the other variables of the upper air. Since the entropy of dry air is proportional to the logarithm of its potential temperature, we may, in so far as correlation coefficients are concerned, use the terms entropy and potential temperature indifferently. The actual data below are given in terms of the latter, but in the