



ANTONIO ASCENZI, ALDO G. SEGRE

DISCOVERY OF A *HOMO ERECTUS* CALVARIUM AT CEPRANO, CENTRAL ITALY

ABSTRACT: On March 13th, 1994, during digging for the construction of a highway through the Campo Grande area near Ceprano, a town in southern Latium situated about 55 miles from Rome, highly mineralized fragments of a calvarium damaged by a bulldozer were found in situ by Italo Biddittu, a member of the Italian Institute of Human Palaeontology. The remains come from a clay layer below sandy volcanoclastic gravels whose age is estimated by K-Ar to be 700 Kyr. So, the age of the calvarium is to be estimated as over 700 Kyr and probably slightly over 800 Kyr. The shape and the capacity of the calvarium show the basic features of *Homo erectus*.

KEY WORDS: Calvarium – *Homo erectus* – Lower Palaeolithic – Earlier Pleistocene – Ceprano – Italy

GEOLOGICAL OUTLINE

The town of Ceprano in Southern Latium (Central Italy) lies about 55 miles south of Rome in the Sacco-Liri river valley (Figure 1). There was one of the oldest pioneer prehistoric (Nicolucci 1868) and geological exploration fields (De Lorenzo, D'Erasmo 1932) and it has been the subject of more recent studies as well (Devoto 1965, Sevink *et al.* 1984, Settepassi, Verdel 1985). Other systematic explorations and excavations on middle and lower Quaternary sites have been carried out at Ceprano and other sites of the Sacco-Liri valley by the Italian Institute of Human Palaeontology (Blanc 1956, Biddittu 1972, Biddittu *et al.* 1979, Segre, Biddittu 1981, Biddittu, Segre 1982a,b, Segre, Ascenzi 1984).

The prequaternary basement of the 45 mile-long Sacco-Liri valley lies in a displayed suite of buried paleomorphological basins established by a late tectonic fault system. After the Miocene (latest Messinian) sea regression, Villafranchian sediments with *Stephanorhinus*

etruscus, *Leptobos* sp. were preserved in the Cenomanian limestone paleocarst. The presence of middle Miocene littoral sediments rising to a height of about 1000 m in the mountains on one side of the basin, together with the absence of Pliocene deposits, stand as evidence of later acute neotectonic phases. This activity continued during the Early and Middle Pleistocene, as shown by a small scattered set of Ernician leucititefrit (Civetta *et al.* 1981) fracture volcanoes which were active between 700 and 100 Kyr (Basilone, Civetta 1975, Sevink *et al.* 1984, Fornaseri 1985). Their pyroclastic sands are mixed in the widespread upper part of the Pleistocene series (Figure 2) over the whole basin's surface. Hardened conglomerate deriving from tectogenic activity forms a dissected fan-shaped terrace on the right side of the mountain district bordering the basin, with chopper artefacts at its summit. These are the same kind of quartzite and flint archaic stone artefacts that are preserved in the lowest layers of the Middle Pleistocene basin (Figure 2, C); this is because the last neotectonic Middle Pleistocene activity deeply dissected

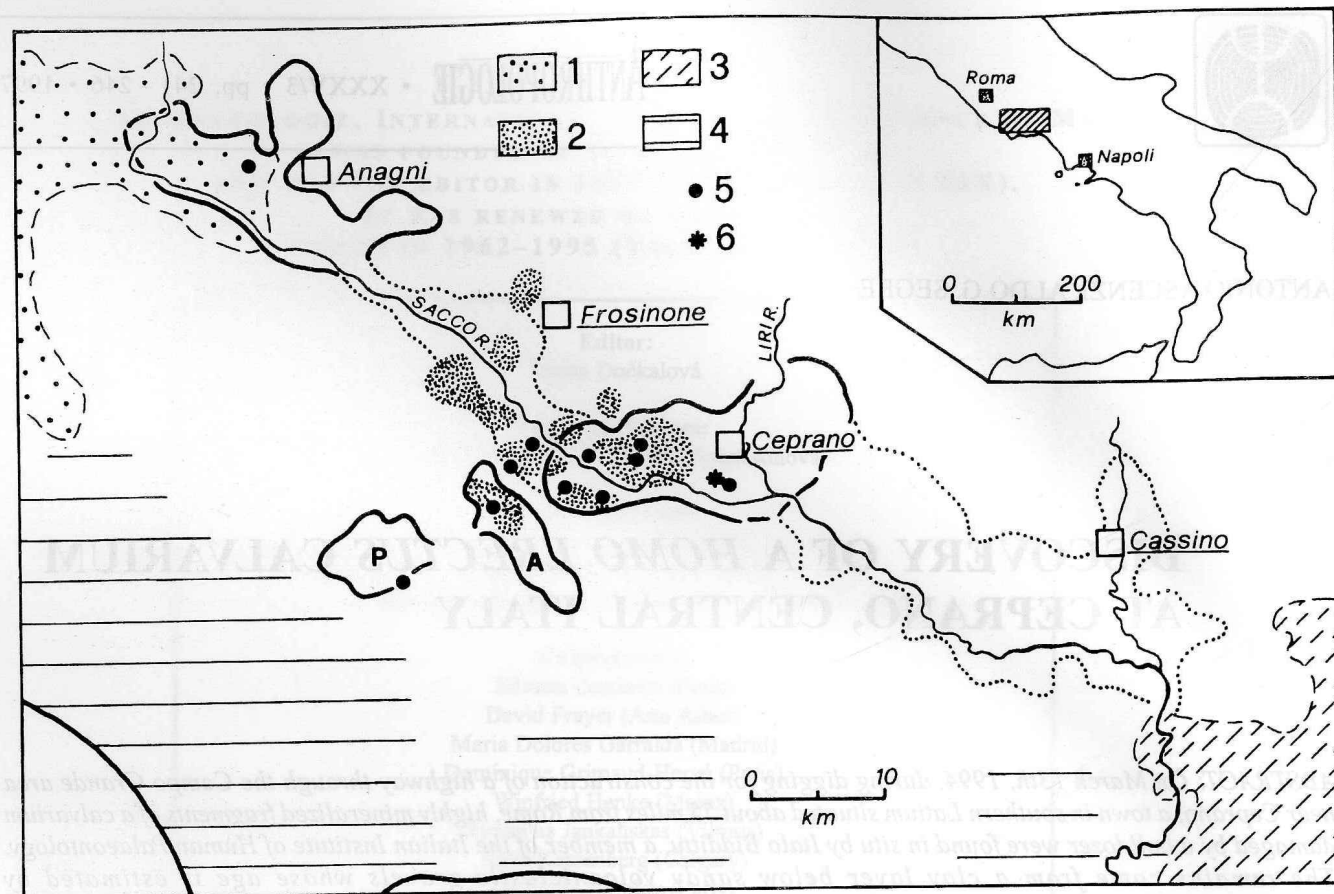


FIGURE 1. The Sacco-Liri Valley (i. e. Valle Latina). A – Amaseno and P – Priverno basins. Marks – signs: 1 – Latian-Alban volcano pyroclasts. 2 – Ernican fissure scattered volcanoes. 3 – Roccamonfina volcano pyroclasts. 4 – Coastal plain Quaternary. 5 – Position of K-Ar dated samples. 6 – Ceprano hominid calvarium site.

and terraced the fans mentioned above. The lowest, more fresh-water limnical clay and silt uniform facies ends the basal sedimentary series (Figure 2, PL).

The upper 23 m of the sedimentary sequence just summarised consist of two local outcrops, while the remaining 30 m has been revealed by industrial drilling (Figure 2). Two deposition ensembles are recognisable: a higher fluvio-colluvial (Figure 2, FC) and a lower, essentially paleolimnic facies (Figure 2, PL).

The first includes well-sorted, rounded fluvial limestone gravels, cross-bedded sands, convolute folding silt, travertine and upper Acheulian artefacts, together with *Palaeoloxodon antiquus*, *Bos primigenius* and *Cervus elaphus* fauna. Below these there is a paleovalley system with tuffite boulders, exfoliated marl layers, coarse gravels, *Unio (auricularia) sinuata*, shells and lower Acheulian stone and bone artefacts, together with *Palaeoloxodon antiquus*, *Dama clactoniana*, *Megaceroides verticornis*, *Stephanorhinus hemitoecus*. Further down, analcimized leucite sands and ferromanganesiferous duricrust mark an unconformity. Immediately below this, a grey-green clay layer of paleocolluvial origin from a slope deposit located within an anoxic swamp contained a single isolated fossil, the human calvarium. This layer is followed by yellow

sands and travertine incrustations on an unconformity surface. The first ensemble ends with fluvial silty sands containing small *Unio*, *Limnaea* and *Pisidium amnicum* freshwater mollusc fauna lying over-cross bedded sands with some chopper tool artefacts, *Mammuthus trogontherii* teeth and bone fragments, which are being explored and studied. The lower paleolimnic ensemble consists essentially of clay and silts, with two peaty-lignitic levels and freshwater *Bithynia-Limnaea* malacofauna (Figure 2).

The Ceprano *Homo erectus* calvarium was discovered in situ on March 13th, 1994 in the locality named "Campo Grande" by Mr Biddittu, a scientific collaborator of the Italian Institute of Human Palaeontology, during a long break from the construction of a local highway. The fossil was damaged by a bulldozer, which was cutting a little hill made up of pleistocene sediments. No volcanic pyroclastic minerals have been found in the layers between S1 and S2 (Figure 2); as a result, the skull is not directly K-Ar datable. So the age of the Ceprano calvarium can be estimated from the stratigraphy of the sedimentary basin filling and form correlations with the K-Ar ages of the Ceprano-Pofi Middle Pleistocene volcanic district whose oldest age is 700 Kyr (Basilone, Civetta 1975, Fornaseri 1985). In the superimposed gravel and sandy layers, the lower Acheulian

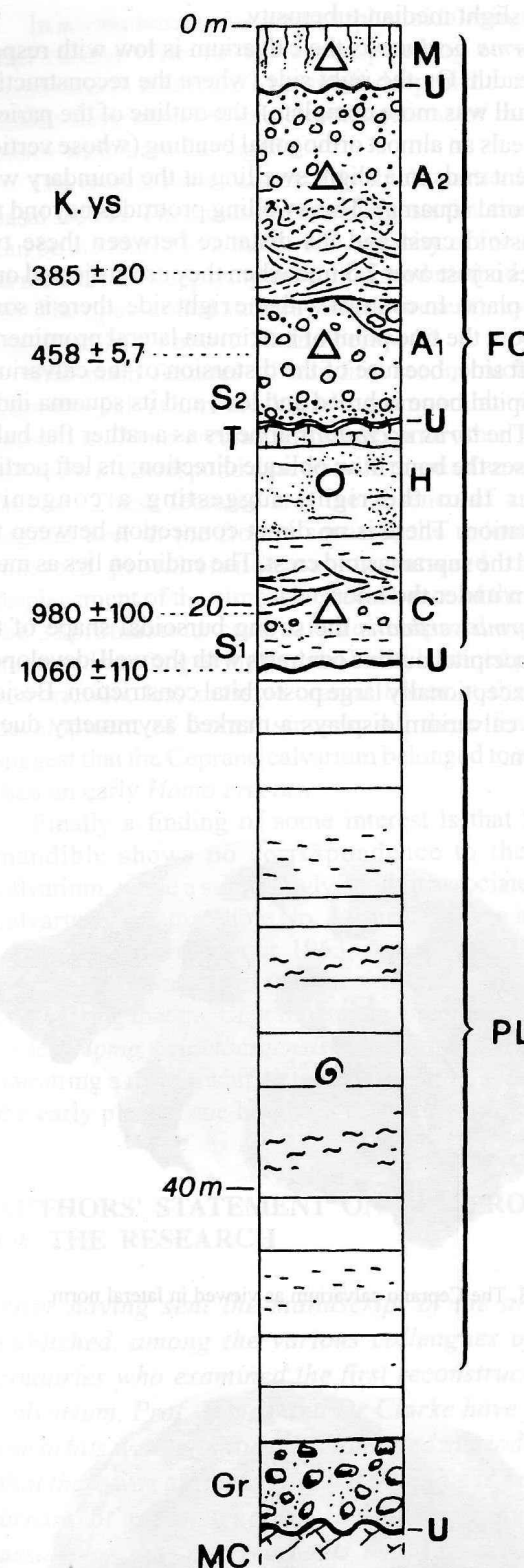


FIGURE 2. Simplified, generalised composite stratigraphic column for the central Ceprano Basin. M – Mousterian. A2 – Upper Acheulian. A1 – Lower Acheulian. H – Position of the Ceprano hominid calvarium. C – Chopper-tool archaic industry. U – Main unconformities. S2 – Lowest limit of sandy leucitic pyroclasts. T – Limestone concretion level. S1 – Sand with oldest volcanoclasts (augite only). Gr – Lower coarse gravels and pebbles. MC – Basal upper Miocene sandstone and Cretaceous limestones. FC and PL – Explanation in text.

(Figure 2, A1) may be supposed to be of the same age as the Fontana Ranuccio site in the Anagni basin: K-Ar 458 ± 5.7 (Biddittu *et al.* 1979, Segre, Ascenzi 1984, Ascenzi, Segre 1996). This estimate is supported by fauna assemblage, artefact facies and also by a higher sand outcrop, dated K-Ar 377 ± 4.0 Kyr (Guillou 1996), which has a much higher position than the calvarium and is separated from it by an evident unconformity with limy concretions (Figure 2, T). An additional factor to be considered is the similar age, between 460 and 430 Kyr, of the Amaseno basin volcanics (Figure 1) (Rommelzwaal 1978, Sevink *et al.* 1984, Fornaseri 1985). Further evidence is given by a dated tephra (Rommelzwaal 1978, Sevink *et al.* 1984) from the nearby Priverno basin (Figure 1): this correlation is strengthened by the great similarity of the main stratigraphic sequence, and of the pyroclasts subsequence in the Priverno and Ceprano basins. So, the age of the lower augitic sands (Figure 2, S1) may be estimated by correlation at 980 and 1100 Kyr by K-Ar dating of Priverno. The fact that the fossilisation character of the calvarium is not in accordance with the clay that contains it is supported by its complete isolation and the absence of any other organic remains, including pollens. It should therefore be assessed that the Ceprano male calvarium was washed away from an outcrop located within the underlying layer group but destroyed long ago (Figure 2, S1-C). This view is supported by the finding that exogenous clay pebbles belonging to the limnical series lying far below (Figure 2, PL) were eroded and became included in the superimposed, much later layers; the same is true of the tephra pebbles found in the higher paleovalleys between the two Acheulian levels (Figure 2, A1 and A2). It is very likely that the hominid remain should be associated with the chopper artefacts which contain no handaxes at all; these are spread over the Ceprano basin terraces and are included in the lower layers too (Figure 2, C) (Ascenzi *et al.* 1995, 1996, Ascenzi, Segre 1997). The age of the calvarium is to be estimated as over 700 Kyr (the oldest known age of the Ceprano basin Volcanoes) and probably slightly over 800 Kyr, correlated near or within the lower Cromer complex limit. Further research now under way will provide further information on this subject.

As to the question when did the Ceprano man reach this part of Central Italy, the authors believe that *Homo erectus* appeared there at the lower part of the Middle Pleistocene, a supposition supported by the finding of the oldest known chopper artefacts whose location ranges from Sicily to northern Apennines (Piperno 1972, Biddittu, Piperno 1972, Biddittu 1972, 1994, Segre, Biddittu 1981, Biddittu, Segre 1982a, 1993). This calvarium appears to be the oldest evidence of human groups in Italy, a long time after the disappearance of the Villafranchian faunas. If any hypothesis can be put forward about the route followed by the Ceprano man in reaching Central Italy, our preference goes to the view that this passed through the early mid-quaternary disjoined and submerged lands of the channel between Africa and South-Italy. This

hypothesis is supported geologically by the great topographical complication of the sea substratum, which shows many faults, and the complexity of the lands and islands that emerged, and of the neovolcanism and active seismicity.

PALEOANTHROPOLOGICAL PRESENTATION

As the calvarium had been deeply fractured into about fifty pieces of bone, the reconstruction was carried out in two stages. In the first, both the pieces which could be assembled immediately and the isolated bone fragments showing specific features indicating their likely position were fixed using small plexiglas strips. In the second stage the plexiglas strips were progressively removed and the gaps were filled with plaster.

Considering the restored calvarium as a whole, its appearance is that of an incomplete specimen. It comprises the frontal bone which includes gaps, especially on the left side; the incomplete parietal and temporal bones; the occipital bone mainly consisting of the squama; and the greater sphenoidal wings.

In *norma lateralis* (Figure 3) the calvarium appears to be low. At the front the *torus frontalis* and at the back the *torus occipitalis* are very prominent. Thus the opistocranium and inion coincide, and the maximum length coincides with the glabella-inion axis. Behind the *torus frontalis* there is almost no sulcus and the outline of the calvarium rises towards the bregma. A *sulcus supratotalis* is hardly appreciable on the occipital. Beyond the torus, the contour bends sharply, forming an angle between the occipital squama and the nuchal plane. The Schwalbe's angle which indicates the inclination of the frontal bone, is of 50°; this turns out to be almost identical to the inclination angle of the occipital squama, which is of 51°.

The impossibility of determining the exact dimensions of the coronal and temporal margins of the parietal bones means that no accurate description can be given of their shape. The impression is that their height may exceed their length. The temporal line emerges from an appreciable *torus angularis*. Radial impressions of the temporal muscle are distributed near the temporal margin.

The temporal bone shows a low position within the calvarium. The squama appears somewhat elongated with respect to its height. The mastoid is large. Its surface lies below the level of the supramastoid crest, extending prominently backward and bending inward. On the medial side, the *incisura mastoidea* is wide along its whole length. The supramastoid crest is connected to the root of the zygomatic arch. The glenoid fossa is deep.

In *norma frontalis* (Figure 4) the frontal torus constitutes a continuous bulky ridge that extends into the glabella region. The maximum height of the two supraorbital portions is 20 mm. The left chamber of the frontal sinus is less developed than that of the right sinus. Behind the frontal torus the squama which is flattened on both sides,

shows a slight median tuberosity.

In *norma occipitalis* the calvarium is low with respect to its breadth. On the right side (where the reconstruction of the skull was more complete), the outline of the parietal bone reveals an almost orthogonal bending (whose vertical component ends in a slight swelling at the boundary with the temporal squama). This swelling protrudes beyond the supramastoid crest and the distance between these two structures is just over 2.5 mm when they are projected onto a frontal plane. In contrast with the right side, there is some doubt about the true point of maximum lateral prominence of the left side, because of the distortion of the calvarium. The occipital bone is broad and low, and its squama index is 48.1. The *torus occipitalis* appears as a rather flat bulge and crosses the bone in an oblique direction; its left portion is larger than the right, suggesting a congenital malformation. There is no direct connection between the torus and the supramastoid crest. The endinion lies as much as 22 mm under the inion.

In *norma verticalis* the strong bursoidal shape of the parieto-occipital outline contrasts with the well-developed, but not exceptionally large postorbital constriction. Besides this, the calvarium displays a marked asymmetry due to distortion.

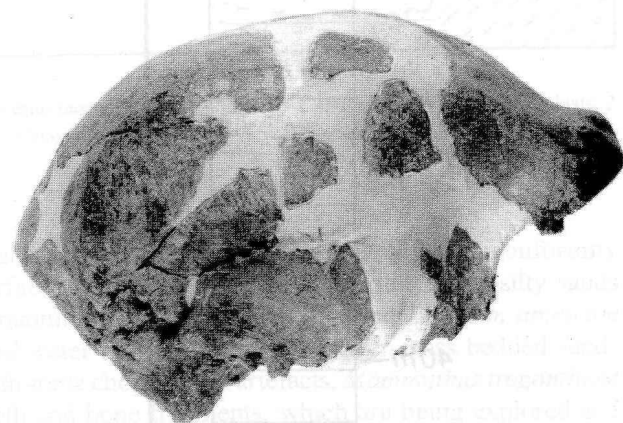


FIGURE 3. The Ceprano calvarium as viewed in lateral norm.

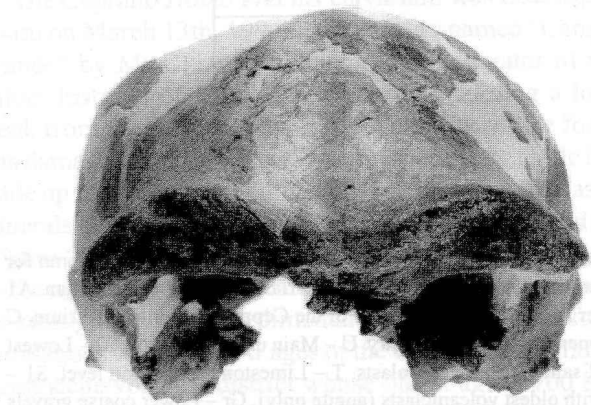


FIGURE 4. The Ceprano calvarium as viewed in frontal norm.

In *norma basalis* the greater sphenoidal wings are thick and robust. The cavity corresponding to the *facies cerebralis* is restricted to a small deep niche. No surface details have survived of petrous portions of the temporal bones which are damaged.

The cranial bones are usually thick, particularly in the basal sectors. Their massive size suggests that the calvarium can be attributed to a male. The capacity of the calvarium, as measured by applying the millet seed method, is of 1185 ml. The open-ended sutures (where present) reveal an age that is probably above 20 and below 40.

The main features of our first reconstruction of the Ceprano calvarium are broadly comparable with those present in *Homo erectus*, although some other features do not seem to correspond exactly with those of an early *Homo erectus*. These features are: the absence of any distinct sagittal keel in the frontal squama; the reduction of the mastoid protuberance as an outward bulge; the displacement of the utmost lateral salience of the skull from the supramastoid crest of the temporal squama; an increased bending of the parietal bone; lessened post-orbital constriction; less massive cranial bones at the vault; the development of frontal sinuses. All these features may suggest that the Ceprano calvarium belonged to a late rather than an early *Homo erectus*.

Finally a finding of some interest is that the Mauer mandible shows no correspondence to the Ceprano calvarium, while a surprisingly good fit associates the same calvarium with mandible No. 3 from Ternifine in Morocco (Arambourg, Hoffstetter 1963, Arambourg 1963). This justifies the conclusion that there is much less reason for considering that the Ceprano remain belongs to the species called *Homo heidelbergensis* (Rightmire 1990) than for admitting a relationship between the Ceprano hominid and the early pleistocene hominids from North Africa.

AUTHORS' STATEMENT ON THE PROGRESS OF THE RESEARCH

After having sent the manuscript of the article here published, among the various colleagues of different countries who examined the first reconstruction of the calvarium, Prof. Tobias and Dr Clarke have found that the orbits were unnaturally elongated mesiodistally and that there was asymmetry of the skull due in part to some errors of reconstruction. Dr Clarke having given assurance that improvements could be made, he was invited to correct the first reconstruction of the skull. The results obtained from this new reconstruction reveal that the Ceprano calvarium possibly does not correspond to a late *Homo erectus*, but rather to an archaic *Homo erectus*. The investigations on this point are now in progress and they will be published as soon as possible.

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Prof. Antonio Ascenzi
"La Sapienza" University
Department of Experimental Medicine
and Pathology
Section of Morbid Anatomy
Policlinico "Umberto I"
Viale Regina Elena, 324
00161 – Rome
Italy
Fax: ++39-6-4940896