

📖 Topic Page: [Homo erectus](#)

Definition: **Homo erectus** from *Philip's Encyclopedia*

('upright man') Species of early human, presumably evolved from *Homo habilis*, dating from c.1.5 million to 0.2 million years ago. **Java Man** was the first early human fossil to be found, late in the 19th century. Both it and **Peking Man**, another early discovery, represent more advanced forms of *Homo erectus* than older fossils found more recently in Africa. Our own species, *Homo sapiens*, probably evolved from **Heidelberg Man**. See *also* human evolution



Summary Article: **Homo erectus**

From *Encyclopedia of Life Sciences*

Image from: [Although the fossil record is not complete, we... in Philip's Encyclopedia](#)

abstract

Homo erectus is an extinct hominin species belonging to the genus *Homo*. Its temporal range is around 1.8-0.2 million years ago.

keywords

hominin

Homo erectus

Zhoukoudian

Trinil

Pleistocene

Fossil Evidence

The first evidence of an early hominin to be found outside Europe was discovered in what is now Indonesia by a Dutch medical doctor, Eugene Dubois. In 1890, during a field survey of promising sites in Java, Dubois found a mandible fragment at a site called Kedung Brubus. Less than a year later, in 1891, at excavations he had initiated on the banks of the Solo River at Trinil, workers unearthed a calotte, or skullcap, that was to become the type specimen of a new, and what, when compared to *Homo neanderthalensis*, was a significantly more primitive, species of fossil hominin. See also *Homo Neanderthalensis*, *Fossils and Fossilization*, and *History of Palaeontology*

In the initial, 1892, publication of the Trinil remains the skullcap was placed in the genus *Anthropopithecus*, but 2 years later, in 1894, Dubois transferred the new species to *Pithecanthropus*. What made the discovery of the Trinil braincase so significant was its small, ~850 cm³, cranial capacity relative to that of modern humans, and the primitive shape of the skullcap, with its long, low braincase and quite sharply angulated occipital region; it was these features that caused Dubois to think initially that he had recovered the remains of an ape. Thereafter, excavators recovered a thigh bone, limb bone fragments, and teeth. The search for hominins at Trinil continued for a decade, with the last hominin fragment being recovered from the site in 1900. See also *Apes*

The focus for the next phase of the search for hominin remains in Java was upstream of Trinil, where the Solo River cuts through the Plio-Pleistocene sediments of what is called the Sangiran Dome. It was

here in 1936 that a palaeontologist, Ralph von Koenigswald, began his search for evidence for hominin evolution. The cranium he recovered resembled the distinctive shape of the Trinil skullcap, but the brain size, $\sim 750 \text{ cm}^3$, was even smaller than that of the Trinil specimens. More relatively better-preserved remains, both skullcaps and mandibles, were recovered until World War II curtailed research. Von Koenigswald deliberately reburied the fossils for safe keeping, and fortunately they were recovered, intact, at the end of hostilities.

Meanwhile, a Swedish palaeontologist, Gunnar Andersson, and a junior colleague from Austria, Otto Zdansky, had excavated for two seasons (1921 and 1923) at the Zhoukoudian (formerly spelled Choukoutien) Cave, near Beijing, in China. However, although they had recovered quartz artefacts, their judgement was that the fossil primates they collected were apparently the remains of an extinct 'ape'. However, in 1926 in Uppsala, in the course of reviewing the material recovered from the excavations, Zdansky realized that two of the 'ape' teeth were hominin. The teeth, an upper molar and a lower premolar (together with a well-preserved left permanent first lower molar tooth (Ckn. A.1.1) found in 1927), were described by a Canadian, Davidson Black, who was Professor of Anatomy in the Peking Union Medical College, and assigned by him to *Sinanthropus pekinensis* (Black, 1927). In the same year Black, together with Weng Wanhao and Anders Bohlin, resumed excavations at Zhoukoudian. The first cranium from the site was found in 1929, and excavations continued until they were interrupted by World War II. The fossils recovered from Locality 1 were consistent in their morphology, which in all important features resembled that of *Pithecanthropus erectus* recovered in the previous century from Java. The fossils were meticulously documented and interpreted by Franz Weidenreich in a series of monographs published before and during World War II. His attention to detail was prescient, for as is well known all the pre-war fossil discoveries from Zhoukoudian were lost during World War II.

Fossil evidence resembling the hominins from Zhoukoudian has been found at other sites in China, at Lantian in 1963-1964; Indonesia (e.g. Sambung-Machan and Ngawi); southern Africa, at Swartkrans, 1949 and thereafter; East Africa, at Olduvai Gorge, 1960 and thereafter, West and East Turkana, 1970 and thereafter, Melka Kunture, 1973 and thereafter, at Buia, Eritrea, 1995 and 1997; and in North Africa, at Tighenif, 1954-1955. Many researchers also include the remains from Ngandong, Indonesia that were initially referred to *Homo (Javanthropus) soloensis*, in this group (Santa Luca, 1980). More recent discoveries at Dmanisi, in Georgia, in 1991 and 1999, have been added to the hypodigm of *Homo erectus sensu lato* (Gabunia and Vekua, 1995; Rosas and Bermúdez de Castro, 1998; Gabunia *et al.*, 2000).

Despite the relatively large numbers of crania from Java, China and elsewhere, all that was known about the postcranial morphology of *H. erectus sensu lato* was the femur from Trinil, and the shafts of other long bones from Trinil and Zhoukoudian. It was discoveries from East African sites that provided crucial evidence about the postcranial skeleton. This came in the form of a pelvis and femur from Olduvai Gorge (OH 28), and two fragmentary partial skeletons from East Turkana (KNM-ER 803 and 1800). An especially rich source of evidence was the unusually well-preserved skeleton from West Turkana (KNM-WT 15000). See also Human Evolution: Overview

The correct way to refer to the species is '*Homo erectus* (Dubois, 1892) Mayr, 1944' (see the 'Taxonomy' section below for the reasons for this).

Morphological Characteristics

The crania of *H. erectus* do not have the dome-shaped braincase typical of later *Homo* taxa. They lack

a forehead, and the greatest width is low down on the cranium. There is a substantial, essentially continuous, torus above the orbits, behind which is a depression, or sulcus. Typically, the bone along the midline sagittal suture is raised as a torus, and a ridge of bone runs down across the temporal bone towards the mastoid process. The occipital profile is sharply angulated, with a well-marked occipital torus, and a supratotal sulcus. The inner and outer tables of the cranial vault are thick, and thickened cortical bone is a feature of all parts of the skeleton. Cranial capacity varies from $\sim 725 \text{ cm}^3$ for OH 12, to $\sim 1250 \text{ cm}^3$ for the Solo V calotte. The greatest width of the face is in the upper part. The palate has similar proportions to those of modern humans, but the bony buttressing of the face is more substantial. The body of the mandible is more robust than that of modern humans and the symphysis lacks a well-marked chin. The tooth crowns are generally larger than those of modern humans, with the third molar usually being smaller, or the same size, as the second. The roots of the maxillary and mandibular premolar teeth tend to be more complicated than those of modern humans. See also Morphology and Disparity through Time

The limb bones are modern human-like in their proportions, but they typically have robust shafts relative to those of modern humans, with the shaft of the femur being especially flattened from front to back (platymeria), whereas the tibial shaft is flattened from side to side (platycnemia). Like other fossil *Homo* taxa, the pelvis has a relatively large acetabulum compared to modern humans and it has a characteristic 'iliac pillar', which is a thickened region of the iliac blade superior to the acetabulum (Day, 1971). The pelvic inlet is relatively wide transversely and shallow anteroposteriorly compared to that of modern humans (Ruff, 1995). Some of the hypodigm displays morphology which is later *Homo*-like (e.g. Ngandong (Santa Luca, 1980) and Buia (Abbate *et al.*, 1998)), but these tend to be either isolated, or the minority of, characters in what are otherwise *H. erectus*-like crania or calottes. More detail about the characteristic morphology of *H. erectus* is given in Wood 1984, 1991 and Rightmire 1990.

Behavioural Implications

There are morphological differences between this material and *H. sapiens*, but all the dental and cranial evidence points to a modern human-like diet, and the chewing teeth and the mandible are similar in relative size to those of modern humans, and are reduced in relative size compared with the australopiths. The postcranial elements are consistent with a habitually upright posture and with an obligate, long-range, bipedal gait. The shape of the pelvic cavity suggests that, during birth, the neonatal head was oriented transversely so that it would not have needed to rotate as it does in modern humans (Ruff, 1995). There is no direct fossil evidence relevant to assessing the dexterity of *H. erectus*, but if *H. erectus* was responsible for the manufacture of Acheulian artefacts then a modest degree of dexterity would be implicit.

Dating and Palaeohabitat

Recent proposals have extended the temporal range of *H. erectus sensu stricto* from $\sim 1.8 \text{ Ma}$ (Swisher *et al.*, 1994) to $\sim 200 \text{ ka}$. This would be extended up to $\sim 50 \text{ ka}$ if suggestions for the very recent date for Ngandong (Swisher *et al.*, 1996) are confirmed. *H. erectus sensu lato* (or perhaps *H. ergaster* - see below) is the first hominin to be found 'out of Africa' in regions that were more seasonal and temperate than East and southern Africa (Gabunia *et al.*, 2000). See also Human Evolution: Radiations in the Last 300 000 Years

Taxonomy

Until its taxonomy was rationalized, the two main regional subsets of *H. erectus* grade fossils were attributed to three genera. They were *Pithecanthropus* and *Meganthropus* in Java, and *Sinanthropus* in China. A fourth genus, *Atlanthropus*, was used for the North African material. The process of rationalization began in 1940 when Le Gros Clark suggested that *Sinanthropus* be subsumed into *Pithecanthropus*, and in 1943 Franz Weidenreich made a formal proposal to this effect. Mayr continued the rationalization process in 1944 by sinking *Pithecanthropus*, *Meganthropus* and *Telanthropus* into *Homo*, and finally, Le Gros Clark 1964 proposed that *Atlanthropus* be transferred to *Homo*. Over the years several authors have suggested that morphological continuity between *H. erectus* and later *Homo sapiens* effectively invalidates the specific status of the former, resulting in the proposition that *H. erectus* be sunk into *Homo sapiens* Linnaeus, 1758. Recent advocates of this course of action include Wolpoff *et al.* 1994 and Tobias 1995, but the majority of researchers consider that the range of morphology subsumed by such a taxon would be too great for one species.

The taxonomy of the earliest remains attributed to *H. erectus sensu lato* is more controversial. Some researchers take the view that fossil evidence from East Africa and the Caucasus that dates from earlier than 1.5 Ma is sufficiently distinct to merit recognition as a separate species. One of these specimens, the mandible KNM-ER 992 from Koobi Fora, Kenya, was designated the type specimen of a new species, *Homo ergaster* (Groves and Mazák, 1975). Two crania, KNM-ER 3733 and 3883, also from Koobi Fora, and the well-preserved skeleton of a juvenile from West Turkana, KNM-WT 15000, have also been assigned to *H. ergaster*. Researchers who support this scheme claim that while these specimens are clearly *H. erectus*-like, they lack some of the cranial specializations seen in both the *H. erectus* remains from the Far East, and in later *H. erectus* remains from Africa (Wood, 1984). However, while the majority of researchers appreciate these differences, they interpret them as manifestations of regional variation within the same species, *H. erectus*, rather than evidence justifying the erection of a new species. See also Human Evolution: Early Radiations

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Glossary

Acheulian

Stone tool industry dominated by handaxes.

Calotte

Calvaria minus the cranial base, i.e. the braincase.

Calvaria

Cranium minus the face.

Cranium

Skull minus the mandible.

Skull

Cranium and mandible.

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