THE ORIGIN OF MAN CURRENT STATE OF PALEOANTHROPOLOGICAL RESEARCH

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I. INTRODUCTION

For the last several years, a large number of fossils of the Hominidae family are coming to light. The phylogenetic tree constructed as a hypothesis to understand relationships between fossil falters with each new finding. It is not easy to establish these relationships. Researchers in Paleoanthropology demonstrate them on a provisional basis. They are aware of the fact that the finding of new fossil evidence will deeply change those relationships.

Gone are the days of the late nineteenth and early twentieth century when hypothetical polyphyletic phylogenies were published with very few discovered fossils. In these phylogenies certain current primates (apes) were associated with different human races[1]. Much progress has been made in Paleoanthropology to avoid such simplifications, but the question of 'man ape' is still present in the minds of many scientific commentators. Sometimes, a real desire to demonstrate the "closeness" on matching common ancestors is observed. They go on to say that man happens to be the ancestor of certain monkeys.[2] Some even feel the need to animalize man, and to make him the least possible different from his fossil ancestors. However, the question that matter the paleoanthropologists is not so much the relationship with other existing primates, but the phylogenetic relationships between different groups of fossils of the Hominidae family. This is a family well differentiated of which a large number of fossils have been discovered. They are continuously increasing, thanks to the enormous research effort that is being made in recent years.

Undoubtedly a number of factors have helped to a better knowledge of the Hominization process, understood as morphological sequence variation of morphospecies that seem predecessors of *Homo sapiens*. These factors are the general framework of evolutionary theories; the variations that have occurred in recent years on them; the incorporation of more precise dating systems and so-called molecular clocks. There are, however, scholars who confuse the processes of Humanization and Hominization. Intelligence is an evolutionary acquisition that emerges gradually into the line of hominids. For them Humanization and Hominization are two simultaneous processes. This confusion is what causes a crisis of faith for many Christians, who see no way to reconcile the data that science provides with the contents of the Christian faith. The Church has made very few statements (because are not necessary) about biological evolution. These statements speak only for the need to believe that all humanity comes from

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1. J. S. WEINER, *The Natural History of Man,* Universe Books 1971, p. 254.
2. F. HARROIS-MONIN, F. MONIER, 1987. *Orígenes del Hombre. La gran Revolución.* ABC, Marzo.

a first human couple (monogenism) and the creation of the soul by God. It is left to the specialists to find out the possibility of morphological derivation of man from a preexisting living matter[3]. This is the scope of Paleoanthropology.

Paleoanthropology[4] is the science that studies the fossil remains of man in order to establish its chronology and its relationship with other fossil species of primates. It was born as science in the mid-nineteenth century. It has shown an extraordinary development in recent decades, thanks to the incorporation of methods and techniques provided by other sciences. Its empirical data are the fossils, sometimes associated with tools (axes, chisels, etc.) or constructions (burials, remnants of dwellings).

Its methods are primarily biometry, comparative anatomy, biochemistry and populations' genetics. For dating of fossils, Paleoanthropology uses fossil stratigraphy and chronology. Both, in its purpose and its methods, Paleoanthropology overlaps Archeology in the study of more recent periods.

Paleoanthropology (like the other human sciences) is a science and its philosophical perspective is rooted in positivism. It does not make a specific reference to the content of the Catholic faith about man and his origins. However, very often data belonging to the paleoanthropological record have been used to support contradictory hypotheses, or at least some difficult to reconcile with Revelation. As John Paul II expressed: «The sciences of man, by a deontological reason and because of the limits of its specific purpose, thus respecting their autonomy and their own intrinsic constraints, are unable to answer the last question of man and his existence and expressly renounce to do so. But the methodological

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3. Cfr. PÍO XII, Litt. encycl. *Humani generis* (12-VIII-1950), Dz 2327-2328. In this text the monogenism is not declared as a faith dogma, it is a recommendation as the way to conciliate the polygenism with the doctrine about Original Sin is not understood.
4. Two full texts of Paleoanthropology go deep into the data and discussion presented in this summary. These texts are: E. GENET-VARCIN, *Les hommes fossiles,* Societé Nouvelle des éditions Boubée, Paris 1979, 411 pp.; and G. E. KENNEDY, *Paleoanthropology,* McGraw-Hill, Inc., N. Y. 1980, 439 pp.

silence can never assume, on the straight and serene awareness of the limits of science, a negative position of evolution, but rather positive opening to a higher sphere.»[5]

The Pontifical Academy of Sciences, by the initiative of John Paul II, gathered in May 1982 a group of scientists from various fields (paleontologists, biochemists, and geneticists) to develop a synthesis of the most recent research on the origin of man.[6]

II. PRELIMINARY ISSUES.

1. *Fossil record.*

A fossil is a part of an organism (or any traces that show the existence of life in the past), which has been preserved mineralized in sedimentary rocks or –after decomposition– has left a cast in sediments. Most of the fossils are remnants or internal fragments (bone) or external skeletons (shells, carapaces). They are the parts of hard consistency which become petrified because they escape the process of putrefaction. By contrast, soft-bodied organisms or soft tissues of organisms with skeletons often leave their fossil remains or the mold of their footprints.

The fossilization process occurs mainly in some particular cases of sudden burial by landslides, volcanic ash, sedimentation in water bodies, or those events that protect the bodies from complete destruction. For this reason, the fossil record is fragmentary, partial, irregular and discontinuous.

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[5] JUAN PABLO II, 1980, 5-IX-80, *Insegnamenti di Giovani Paolo II,* 3 (2): 543.

[6] This meeting was echoed by Nature 299:395, section "News and Views', in which was inserted JM Lowenstein's article “Twelve wise men at the Vatican” containing the main conclusions of the meeting. Participants to the meeting were: I. Bone (Belgium); Y. Coppens and J. Lejeune (France); R. Doolittle; I. Greenfield; J. Lowenstein; F. D. Pilbeam and Simons (USA); C. Pavan and C. Chagas (Brazil); G. Sermonti (Italy) and P. Tobias (South Africa).

For instance, one of the lengthiest fossils records, the hominid record in Olduvai, (Tanzania), spans from 2.1 million years to 150,000 in various strata.

When a paleontologist finds a fossil he first tries to associate it to a known and previously nominated species. If successful, he ascribes the fossil to it. If it is not possible to include the fossil under an established taxon, a new *binomial name* (genus and species) is given to it. This is done according to the usual biological nomenclature. Biological nomenclature was created for living species and it does not fit well the needs of Paleontology because there is often an insufficient set of differentiating characters for the definitive establishment of their taxonomy. However, in spite of this downfall, taxonomy is an essential instrument for cataloging fossils and scientific discussion about them.

2. *Dating fossils*

Two complementary systems are used for the dating of fossils [7]:

a) *Relative Dating* consists in finding out the order of the different sedimentary layers, also known as geological strata (lithostratigraphic units), and to identify their characteristics through its composition and the fossilized fauna and flora associated to it. The absolute age of the fossil is not establish through this method, only a temporal succession of strata or sediments. The establishment of correlations between different fossil deposits or stratigraphic series of different regions is a very interesting contribution of relative dating.

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7. For a more detailed explanation of the dating techniques see: J. GRANAT, *Principales méthodes de datation absolue* In E. GENET-VARCIN, *Les hommes fossiles,* pp. 299-321, col. Boubée, Paris 1974 ; and N. de LUMLEY, *Cadre chronologique absolu, paléomagnétisme, chronologie, paléontologique et botanique, esquisse paléoclimatique séquences culturelles,* in *La Préhistoire Française* 1976, T. I, 1 y 2; Ed. CNRS, pp. 5-22.

b) *Absolute dating.* The main methods of absolute dating are three:

1) Thermoremanent magnetization, which establishes the chronology of the strata by observing the magnetic orientation of the ferromagnetic molecules in relation to changes in the Earth's magnetic pole. This method is particularly effective in Palaeontology for ancient lava flows. It is also used in Archaeology for baking furnace technology. It allows dating 4.5 million years old fossils with some precision.

2) *Amino acid racemization.* This method allows dating fossil after 600,000 years through determination of spontaneous changes in the amino acids which are contained naturally in organic residues.

3) *Disintegration of radio elements* or the "Carbon-14" method. It allows dating organic materials up to 60,000 years ago through the gradual natural decay of its radioactive elements. Moreover, the method Potassium-Argon is used for dating volcanic lavas and other minerals up to 300 million years old. This method is only possible to use in materials older than 100,000 years.

The combination of both methods allows Paleontology (and Biology) a fairly reliable approximation to the age of the materials under study.

3. *Biological notions of species and phylogeny.*

Biologists define species as the group of individuals who exhibit common morphological features and who participate in a common gene pool, making them fertile among themselves. As it is not always possible to verify their fertility. Thus, zoologists have created the concept of morphospecies to enclose the group of individuals who, to an expert, have a constant and characteristic morphology. Paleontology uses this last notion of species, because it is obviously not possible to check fertility in fossils. In addition, some paleontologists use the terms of paleospecies or chronospecies for populations of similar characteristics that occur at each time level.

The affinity relations established among various species is called Phylogeny. Establishing phylogenies in Paleontology is to organize morphological sequences in a time succession based on similarity and variation among fossils. Such phylogenies are hypothetical and provisional. They depend on the interpretation that is formulated about the set of fossils. For this reason, new fossil finds can change the phylogenies commonly accepted among scientists, sometimes very deeply.

4. *Situation of man in the animal kingdom*

From a zoological point of view, man is classified within the class of mammals in the order of Primates. The Primates are classified as Prosimian (lemurs, tarsiers, etc.) and Anthropoidea. The last ones are in turn subdivided into Platyrrhini (monkeys of America) and Catarrhini. Catarrhinis are grouped into two superfamilies: Cercopitecoidea, which are made of macaque and baboon, and Hominoidea. The Hominoideans, in turn, are divided into Hylobatidae (gibbons), Pongidae (gorilla, chimpanzee and orangutan) and Hominidae with a single genus (*Homo*) and a single species (*H. sapiens*). This zoological classification of man is based on the set of morphological characters which are commonly used to describe animals. Man becomes separated at family level. Morphological characters that define an animal are part of the expression of the genotype (or set of genes of an individual).

While morphological characters are expressed externally, other characters such as chemical molecules are expressed internally. For example, the various proteins which a specimen has and their chemical structure are biochemical characters. Instead of direct examination, as in the case of the morphological characters, chemical analysis is required to determine its alternative forms.

Proteins, or chains of hundreds of amino acids, are known to be very specific substances which vary in composition from species to species, and may also have variations among individuals of the same species.

For several years, proteins are being used as a system to determine the affinity or relationship between species. They are also used to determine the affinity of man with various living primates.

For example, men, chimpanzees and gorillas, are assembled in a group by the similarity of their albumins but they are separated from the orangutans. The four species mentioned become, in turn, separated from gibbon and siamang[8].

Another example is the lysozyme protein which is identical in humans and chimpanzees, is very close to the orangutan lysozyme, yet very distant to the Gorilla lysozyme[9].

Similar relations have been established using the type of banding in chromosomes which appears when they are treated with special staining systems. It has been possible to establish the number of inversions, translocations and breaks in chromosomes that separate one species over others. In the case of primates, it is known that chimpanzees and pygmy chimpanzees are separated by a translocation and two inversions.

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[8] V. M. SARICH, A. C. WILSON, 1966. *Science,* 154: 1503-1566.

[9] A. C. WILSON, A. C. PRAGER, 1974. *Antigenic comparison of animal lysozimes.* In: *Lysozime,* Ed.: E. F. OSSERMEN, R. E. CANFIELD y S. BEYCHOCK, pp. 127-141. Academic Press, N. Y.

Chimpanzees and men are separated by one translocation and 11 inversions. Gorillas are separated from man by 3 translocations and 11 inversions, etc[10].

These techniques are useful because they indicate affinities and distances between animals. According to them men are related to primates, particularly to chimpanzees. However, results obtained with different proteins are not in agreement.

III. FOSSILS OF HIGHER PRIMATES NO HOMINIDS

There are at present a large number of higher primate fossils; there is much debate among paleontologists on their exact classification. The most recent classification is outlined below.

1. *Family Hylobatidae*

Four different species grouped into two genera have been established from the fossils of this family. The current Hylobatidae Primates (gibbons and siamangs) are ascribed to this family. The first genera, *Dendropithecus macinensis,* [11] have been found in Africa dating between 23 and 19 million years ago. The representatives of this family in Europe (*Pliopithecus*) are between 20 and 10 million years ago.

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[10] B. DUTRILLAUX, 1979, *Chromosomal evolution in Primates, Tentative Phylogeny from «Microcebus murinus» (Prosimian) to man. Human Genetics,* 48: 251-314.

[11] At the time of its discovery it was included in the Family Pongidae with the name *Limnopithecus macinensis*. After careful research, it has been included in the Family Hylobatidae.

2. *Family Pongidae*

In addition to the current genera, which comprises orangutans, chimpanzees and gorillas, their most important fossil representatives, *Proconsul*, *Sivapithecus*, *Ramapithecus* and *Gigantopithecus* generas also belong to this family.

a) *Proconsul*[12]*:* Abundant fossils have been found in Kenya and Uganda, dating between 22.5 and 15 million years ago. Their size varies between gibbon and gorilla. This genus is probably the trunk of pongids' evolutionary diversification. It extended out of Africa around 16 million years ago.

b) *Sivapithecus*[13]*:* Abundant fossil material have been found in the Potwar Plateau (Pakistan) from 1980, dating between 15 millions and 9 millions years ago. Its size is similar to the pygmy chimpanzee.

c) *Gigantopithecus*[14]*:* Fossil material comprises some jaws and more than 2000 teeth from North India and Southern China, dating between 9 millions and 1 million years ago. Their size was about 2.5 meters.

3. *Ramapithecus*

Up to 1980, paleontologists had established the genus *Ramapithecus* within the Hominidae family, from mandibular remains and teeth found in India, Pakistan, China and Europe.

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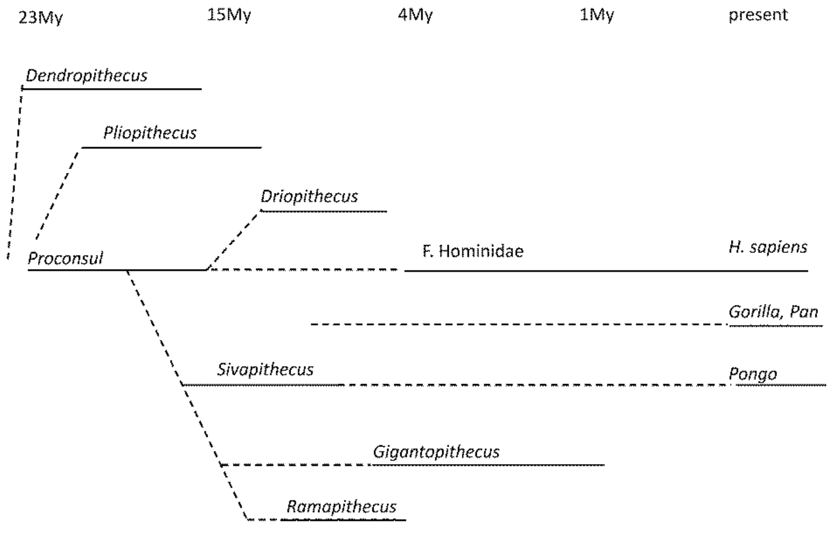
[12] To this genus belong the species *P. africanus*, *P. nyazane*, *P. major*, *P. gordoni* and *P. vancouveringi*. The latter two are included within the subgenus *Rangwapithecus*. Other genera of this subfamily (Dryopithecidae) are *Limnopithecus* (22-14 million years) and *Dryopithecus* (10-8 million years ago). The latter is the European representative of the subfamily.

[13] The species of this genus are *S. darwini* (Europe), *S. meteai* (Greece and Turkey), *S. indicus* (India) and *S. sivalensis* (Pakistan).

[14] The species of this genus are *G. bilaspurensis* (India) y G. *blacki* (China).

It was considered a predecessor of the *Australopithecus* because of the presence, in the preserved remains, of thickened enamel. However, in 1980, M. Solomon, a student at Yale University in the Pilbeam's expedition[15] to the Pot-War plateau in Pakistan, found the frontal part of a *Sivapithecus* with the lower jaw, teeth and part of the skull. In this expedition, part of the postcranial skeleton was also found. This discovery showed that *Ramapithecus* must not be included among hominids, but is, instead, very close to *Sivapithecus*. It also allowed to establish that the *Sivapithecus*, by its morphological and biochemical characters[16], is an ancestor of the orangutan. Thus, the *Ramapithecus* was separated from the phylogenetic lineage of hominids 16 million years ago. The following phylogenetic tree of affinity relationships among Pongids was set (Figure 1).



My. Million years Figure 1

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[15] D. PILBEAM, 1982, *Nature,* 295: 232-234. D. PILBEAM y col. 1977, *Nature,* 279: 689.

[16] J. M. LOWESTEIN, 1982, *Nature,* 299: 345.

Before the discovery of Pilbeam's expedition, the *Ramapithecus* was included between Proconsul and hominids. Furthermore, this discovery forced to trace the origin of the gorilla and chimpanzee to the Proconsul[17].

IV. HOMINID FOSSILS

1. *Most important findings*

Paleoanthropology began with the discovery of a fossil skull older than Neanderthal (Germany) fossils in Java by Dubois in 1891, which he named *Pithecanthropus erectus*[18]. Between 1921 and 1939 the remains of 25 adults and 15 children were found in Chukutien (China), which were called *Sinanthropus pekinensis* [19]. In 1924, Dart[20] discovered the fossilized skull and jaw of a hominid 6 years old at Taung (South Africa) A, which he called *Australopithecus*. From this moment on a great amount of fossil hominid discoveries occurred, particularly in East Africa (Kenya, Ethiopia, Tanzania, etc.).

In 1959, Louis and Mary Leakey discovered the archeological site of Olduvai (Tanzania), where they identified fossils belonging to the Hominidae[21] Family, which were later classified as *Australopithecus boisei*. In subsequent research in Olduvai numerous fossil hominids were found. These fossils were very well dated. Also, they were assigned to two groups: *Australopithecus* and *Homo*.

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[17] There are currently a wide disparity of opinions about the point of attachment of gorilla and chimpanzee line with the Family Hominidae. For some, this distance would be 5-7 million years (P. ANDREWS, 1982, La Recherche, 137: 1211-1214). For others the orangutan would be closer to the group of the gorilla and the chimpanzee (JH SCHWARTZ, 1984, Nature, 308: 501-504.

[18] E. DUBOIS, 1896. *Résume d'une communication sur le «Pithecanthropus erectus» du Pliocène da Java. Bull. Soc. Géologie,* 9: 151-160.

[19] D. BLACK, T. CHARDIN, C. YOUNG, W. PEI. 1933: *Fossil Man in China. Geological survey of China. Memoir Series* A (11).

[20] R. DART, 1925. *Australopithecus africanus: The Man age of South Africa. Nature,* 115: 195-199.

[21] G. E. KENNEDY, *op. cit.,* p. 170.

The genus *Homo* has an estimated cranial capacity of 750 cc and 500 cc in *Australopithecus*. Also associated with these fossils are stone tools that have been named as Oldowan culture, ranging from 2 million years to 300,000 years old.

Since 1967 great amount of fossil hominid specimens and many other mammals have been found in the Omo River valley, near Turkana Lake (Ethiopia). These sites span from 4.5 million years to 1.5 million years ago. In both, Omo valley and Turkana Lake hominids previous to those of Olduvai, dating back to 3 million years old, have been found. Since 1973, in the village of Hadar, north Ethiopia, a fossil site with hominids with an age from 3.6 million to 2 million years ago have been found. Today these fossils are assigned an age of 3.1 million years.[22]. In 1974 a nearly complete skeleton of *Australopithecus*, named "Lucy", together with the discovery of more fossils in successive years, have led to a broad scientific discussion about the taxonomy of the genus Australopithecus and its relationships with the genus *Homo*. South of Olduvai, in Leatoli (Tanzania), between 1975 and 1978, twenty poorly preserved fossil hominids have been discovered. However, the first evidence of bipedal gait was obtained thanks to the discovery of fossil footprints in a layer of volcanic ash, which date back to 3.7 million years old[24].

2. *The Australopithecus*

Two major forms under the generic name *Australopithecus* are currently recognized:

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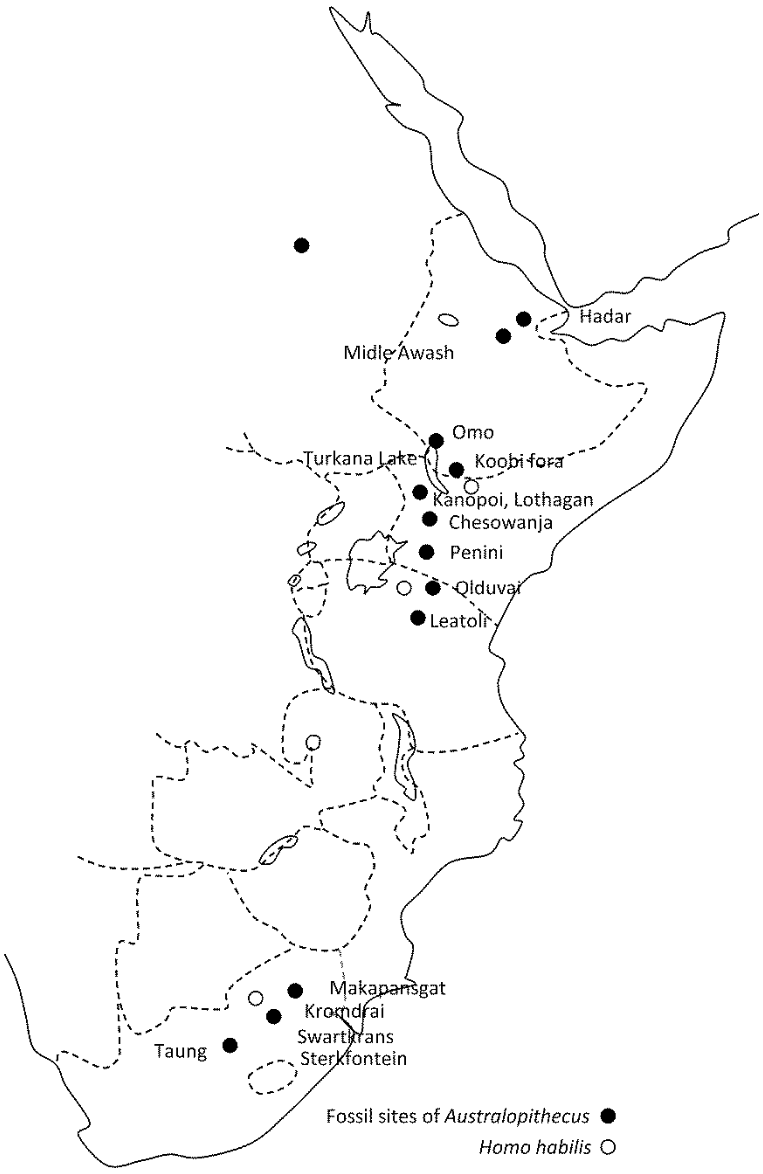
[22] *La Recherche,* 142, Marzo 1983. *Nature,* 300: 631-633, 1982.

[23] D. C. JOHANSON, M. TAIEB, 1976. *Nature,* 260: 293-297.

[24] M. D. LEAKEY, R. L. HAY, 1979. *Nature,* 278: 317-323.


Hadar
Midle Awash
Omo
Turkana Lake
Koobi fora
Kanopoi, Lothagan
Chesowanja
Penini
Olduvai
Leatoli
Makapansgat
Kromdrai
Swartkrans
Sterkfontein
Taung
Fossil sites of *Australopithecus* ●
Homo habilis ○

a) *Robust form of Australopithecus:* It is constituted by the species *A. robustus* and *A. boisei*. They are characterized by a cranial capacity of the order of 500 cc, and the presence of a sagittal crest on the skull that is bell-shaped. Their weight was about 30 kg and their height about 1.50 m. Fossils belonging to this form are very numerous. They are found in the deposits of Omo; Olduvai (OH); Swartkrans (South Africa, SK); Turkana (ER); Chesowanja (Kenya); Taung and Kromdraai (South Africa) [25]. The fossil KNM-WT 17000 is the oldest. It dates back to 2.5 million years ago. It was found west of Turkana and it belongs to *A. boisei*[26]. The most recent fossils date to 1 million years ago and were found in Taung.

b) *Gracile form of Australopithecus:* It is constituted by two species *A. africanus* and *A. afarensis*. They are characterized by a height between 1 m. and 1.10 m, and their weight was between 20-23 kg. They lack the sagittal crest, with a bell-shaped skull, and a cranium capacity of 500 cc. Fossils[27] belonging to this form are also very numerous. They are found in the sites of Leatoli (Tanzania, LH); Hadar (Ethiopia, AL); Omo, Sterkfontein (South Africa, STW); and Turkana (ER). The oldest date back to 3.8 million years ago (Leatoli); and the most recent 1.5 million years (Turkana).

Some think[28] that the diversity of robust and gracile forms could be due to sexual dimorph, but detailed studies of fossil and the fact that the gracile form is around two million years older had dismissed that hypothesis. Paleontologists disagree on the interpretation of the fossils of *Australopithecus*. Le Gros Clark had suggested that in the case of *Australopithecus* two species should distinguished: *A. africanus* (gracile) and *A. robustus*.

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[25] Fossils are denominated by letters and numbers are as follows: KNM-WT 17000, OMO E, OH5, SK45, OMO F, AL 166-9, OH26, KNM-ER906K, KNM-ER732, OH20, Chessowanja, KNM-ER999, OH3, KNM-ER406, KNM-ER407, SK 48 (Swartkrans) OMO G, Kromdraai, Taung. See table.

[26] WALKER et Al., 1986. *2,5 Myr. «Australopithecus boisei» from west of Lake Turkana, Kenya Nature* (London), 322: 517.

[27] LH4, LH5, AL200, AL199, AL188, AL277, AL266, AL128, AL129, OMO (formation USNO) OMO B, AL288 (Lucy), OMO C, STW, OMO D, OMO G, OMO H, KNM-ER732, KNM-ER992.

[28] K. F. WEAVER, 1985. *National Geographic,* 168 (5): 561-623.

Tobias, however, considers three species *Australopithecus*: *A. africanus*, *A. robustus* and *A. boisei*. MD. and R. Leakey believe that some of the gracile form fossils must be included in the genus *Homo*. TD. White, DC. Johanson and Y. Coppens argue that *A. afarensis* is earlier 2 million years than *A. africanus*. E. Genet-Varcin accepts an archaic form (*A. afarensis*) and includes in a typical form *A. africanus*; *A. boisei;* and *A. robustus*, classifying the oldest fossil of Hadar-Leatoli[29]— as pongids[30]. T. R. Olson recognized two species among the oldest fossils Hadar[31].

The recent discovery of *A. boisei* (KNM-WT 17000) with an age of 2.5 million years, which makes it contemporary to *A. africanus*, again, raises the possibility of different sexual morphologies, or the appearance of two parallel branches in *Australopithecus*. One branch would lead from *A. afarensis*, *A. africanus* to *A. robustus*. The other branch would be formed by *A. afarensis* - *A. boisei.*

3.The genus Homo

Fossil remains of *H. habilis*, *H. erectus* and *H. sapiens* are classified as morphospecies of the genus *Homo*. Modern man is included within *H. sapiens*.

a) *Homo habilis*

This name was proposed in 1964 by L. Leakey, P.V.

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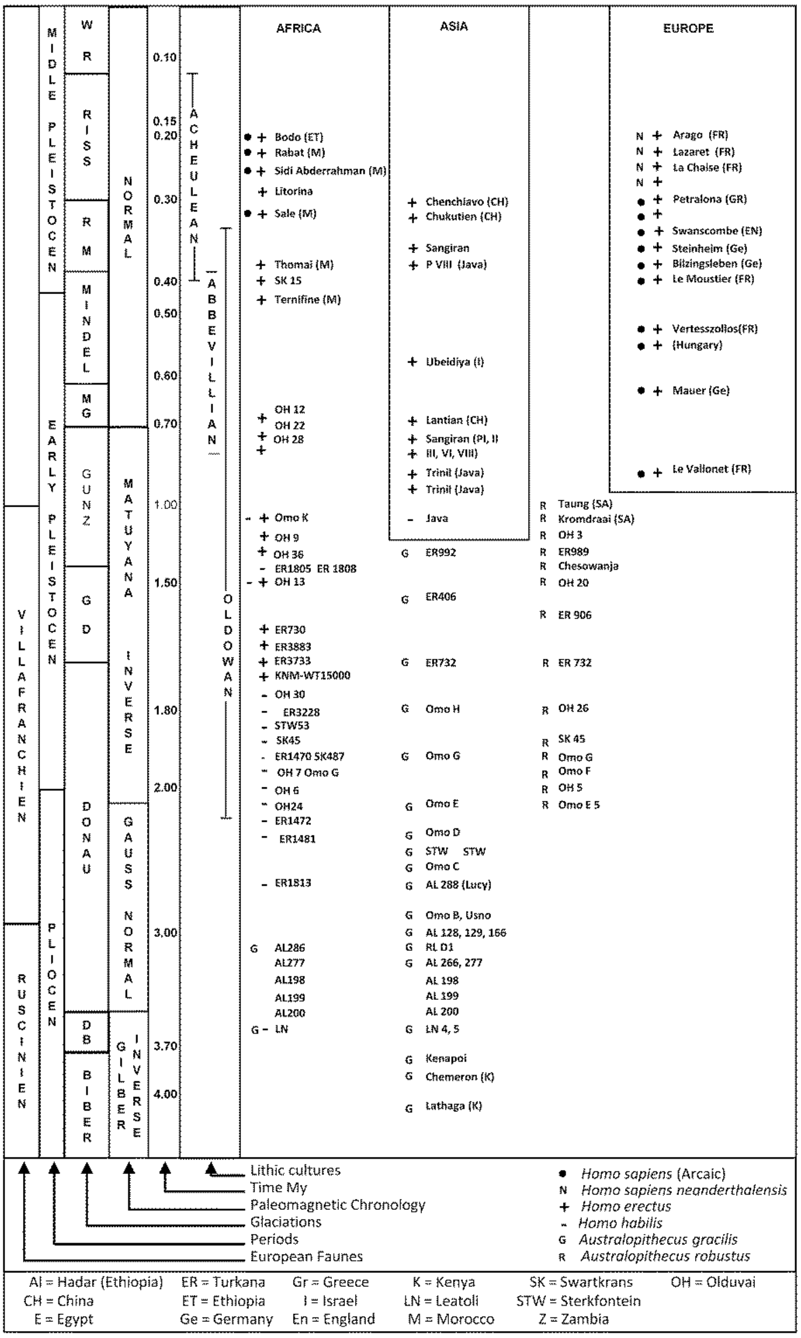
[29] AL198, 199, 200 y LH2.

[30] See GENET-VARCIN, *op. cit.,* pp. 76-78.

[31] T. R. OLSON, 1981. Basicranial morphology of the extant hominoids and Pliocene Hominids. The new material from Hadar formation, Ethiopia, and its significance, in early human evolution and taxonomy in *Aspects of human evolution,* Ed. C. B. Stringer, Taylor and Francis Ltd. London, pp. 99-128.

Fossils of *Australopithecus*, *Homo habilis*, *H. erectus*, and *H. sapiens* archaic



Tobias and J. R. Napier[32] for some of the fossils found at Olduvai. These fossils had a cranial capacity of 687 cc and were assigned to the Olduvai lithic culture. This assignment, after long discussion, has been accepted considering *H. habilis* as a paleospecies of *H. erectus*. Some other fossils from Omo and Turkana have also been ascribed to *H. habilis* [33]. The dating of these fossils expands from 2.5 million years to 1 million years ago.

Some authors consider *H. habilis* difficult to distinguish from the gracile form of *Australopithecus*, though recognizing the usefulness of the name *H. habilis*.

b) *Homo erectus*

This name has its origin in the Dubois *Pithecanthropus erectus*, which it replaced. This morphospecies is characterized by a cranial capacity of 800-1500 cc. It includes the names *Pithecanthropus erectus* and *Sinanthropus pekinensis* mentioned above. Numerous fossils from Europe were assigned to them such as Vallonet 800,000 years; Mauer; Uveidiya; Vertesszollos; Montmaurin; Bilzingsleben; Steinheim; Swanscombe; Petralona; Lachaise; Lazaret. The fossil from Arago has an age of 200,000 years. However, there are authors, such as Genet-Varcin, who consider these fossils from Europe as *H. sapiens* archaic rather than *H. erectus*. Other sites are found in Asia such as Trinil, Sangiran, and Lantian in Java; Chukutien and Chenchiavo in China. These sites date from 1 million years to 300,000 years ago. Sites in Africa are found in Turkana[34], Olduvai[35], Ternifine, Swartkrans[36], Thomai, Sale, Litorin, Rabat and Bodo. These sites date from 1.6 million years to 200,000 years ago.

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[32] L. Leakey, P. Tobias, J. R. Napier, 1964. *Nature,* 202: 5-7.

[33] OMO 44, KNM-ER1470, OH7, OH6, OH24, KNM-ER1813, KNM-ER3733, OH13, OH30, OH27, OH8, OH35, OH4.

[34] KNM-ER3733, KMN-ER730, KNM-ER3803, KNM-WT15000.

[35] OH9, OH36, OH12, OH22, OH28.

[36] SK15.

There is an overlap between *H. erectus* and *H. habilis* sites in Africa. The assessment of this overlap depends largely on the interpretation and dating of different fossils. Everything suggests that *H. habilis* is a paleospecies of *H. erectus*. Therefore, some authors[37] call *H. habilis* a pre-erectus form instead. *H. erectus* is also considered a pre-sapiens (paleospecies) form of *H. sapiens*. Some authors claim the difficulty of separating *H. erectus* from the earliest *H. sapiens* forms because their cranial capacities overlap on all continents; and also because *H. erectus* is associated with lithic cultures.

c) *Homo sapiens*

Several decades ago it was considered that in addition to *H. sapiens* form, other different forms had existed. These forms were Neanderthal and Cro-Magnon. At present, it is clear that all fossils are a unique species, Neanderthal man is regarded a mere extinct form of *H. sapiens* that coexisted with Cro-Magnon in Europe and Asia for the last 100,000 years[39].

Fossils are very abundant in Olduvai and Omo in Africa, expanding from 130,000 years ago to the present. In Europe, the Neanderthal form is found in an area expanding from Ehringsdorf, Germany, dating 90,000 years ago, to Bañolas, Spain, dating 20,000 years. From 30,000 years ago the *H. sapiens* form is widely spread across Europe. In Asia the Solo man of Java is found, which some consider close to Neanderthal. It dates between 120,000 to 20,000 years. Other sites are in Israel, Borneo, Australia, the Philippines and China. The fossil deposits of Montmaurin, France, and Bilzingsleben, Germany, are considered by some authors archaic forms of *H. sapiens*.

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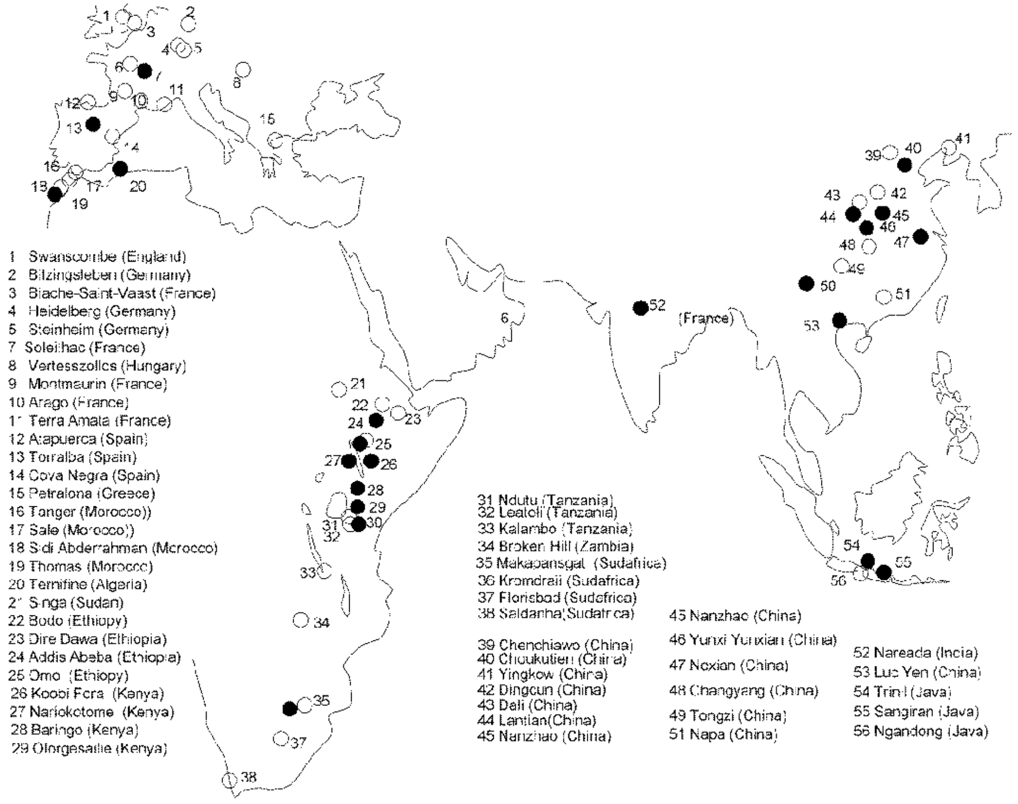
[37] E. GENET-VARCIN (see footnote 4).

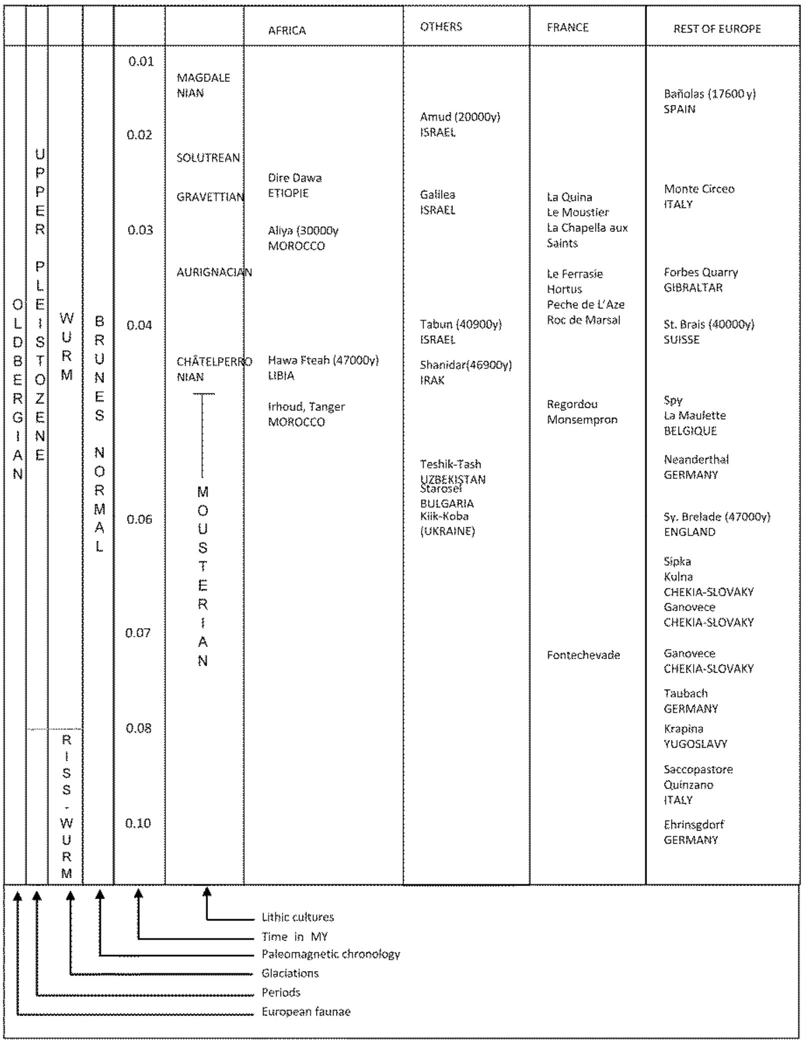
[38] G. E. KENNEDY (see footnote 4).

[39] E. TRINKAUS, 1987. *Mundo Científico,* 63 (6): 1158-1165.

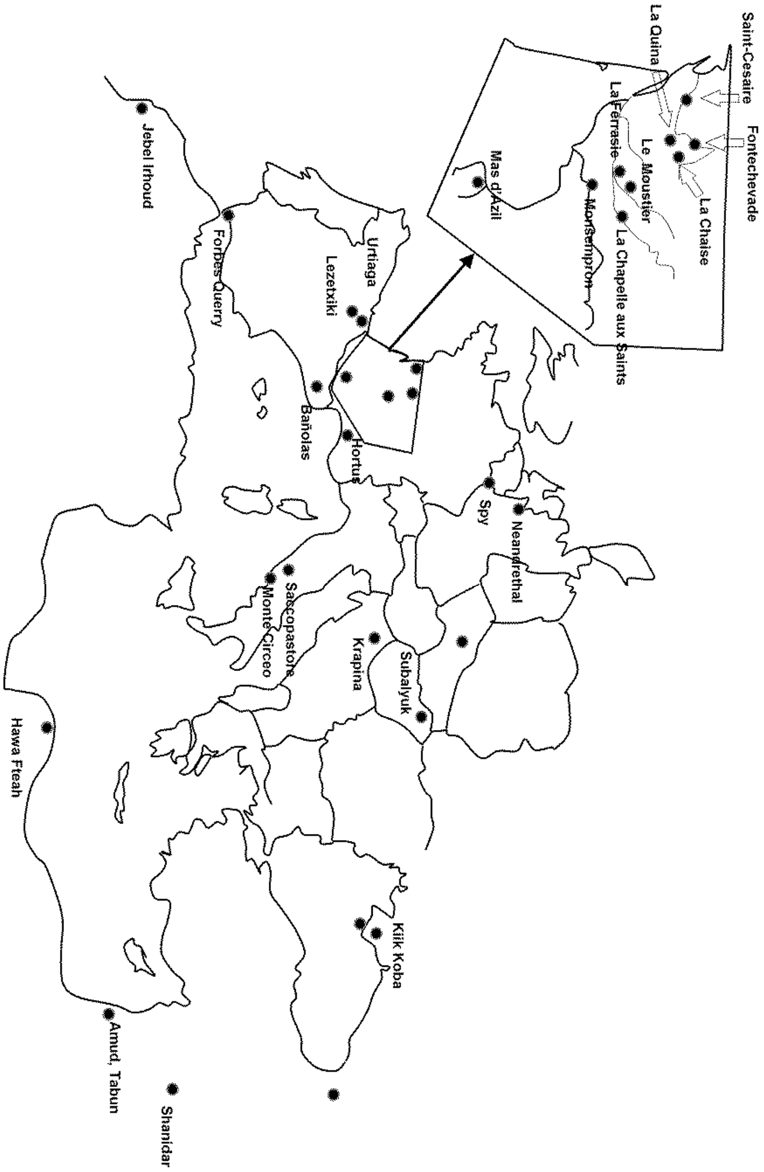
Sites of *Homo erectus* ● Sites of *Homo sapiens* archaic ○



Neanderthal Fossils Sites



						AFRICA	OTHERS	FRANCE	REST OF EUROPE
OLDBERGIAN	UPPER PLEISTOZENE	WURM	BRUNES NORMAL	0.01	MAGDALENIAN				Bañolas (17600 y) SPAIN
							Amud (20000y) ISRAEL		
				0.02	SOLUTREAN				
					GRAVETTIAN	Dire Dawa ETIOPIE	Galilea ISRAEL	La Quina Le Moustier La Chapella aux Saints	Monte Circeo ITALY
				0.03		Aliya (30000y MOROCCO			
					AURIGNACIAN			Le Ferrasie Hortus Peche de L'Aze Roc de Marsal	Forbes Quarry GIBRALTAR
				0.04			Tabun (40900y) ISRAEL		St. Brais (40000y) SUISSE
					CHÂTELPERRONIAN	Hawa Fteah (47000y) LIBIA	Shanidar(46900y) IRAK		
					MOUSTERIAN	Irhoud, Tanger MOROCCO		Regordou Monsempron	Spy La Maulette BELGIQUE
							Teshik-Tash UZBEKISTAN		Neanderthal GERMANY
				0.06			Starosel BULGARIA Kiik-Koba (UKRAINE)		Sy. Brelade (47000y) ENGLAND
									Sipka Kulna CHEKIA-SLOVAKY Ganovece CHEKIA-SLOVAKY
				0.07				Fontechevade	Ganovece CHEKIA-SLOVAKY
									Taubach GERMANY
		RISS-WURM		0.08					Krapina YUGOSLAVY
									Saccopastore Quinzano ITALY
				0.10					Ehrinsgdorf GERMANY



Neanderthal Fossil Sites

4. *The problem of identification and assignment of hominids fossils.*

As discussed in the preceding section, there is a wide variety of forms within the Hominidae family: *Australopithecus afarensis*; *A. africanus*; *A. robustus*; *A. boisei*; *Homo habilis*; *Homo erectus;* and *Homo sapiens*. The problem of assignment and identification of fossils is quite important.

The cranial capacity in addition to the morphological characters are the basic determinations for the assignment of hominid fossils to one species or another. Cronin and colleagues[40] have shown recently that there is a steady increase in cranial capacity in hominids from *A. afarensis* (500 cc) to *H. sapiens* (1450 cc).

All paleontologists identify without major problems the *Australopithecus robustus-boisei* group, as their morphological features are well separated from the graceful form of *Australopithecus.* TR Olson[41] validates the name *Paranthropus* for the robust form of *Australopithecus*, within which group he includes some fossils of *A. africanus* and all fossils of *A. robustus* and *A. boisei*. The rest of the fossils of the Hominidae family are grouped in the genus *Homo*, with the specific names of *Homo* (undetermined species) for some *A. africanus* and *H. habilis* in one group, and *H. erectus* and *H. sapiens* for the rest. This view coincides with R. Leakey similar hypothesis. The discussion is not limited to the internal classification of the genus *Australopithecus*, but there are also different opinions about which fossils belong to each morphospecies of the genus *Homo*. There are difficulties in distinguishing *H. habilis* from *Australopithecus africanus*, *H. habilis* from *H. erectus*, and the latter from the most primitive forms of *H. sapiens*.

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[40] J. E. CRONIN, T. T. BOAZ, C. B. STRINGER and Y. RAK, 1981. *Nature,* 292: 113-122.

[41] Cfr. T. R. OLSON, *o.c.*

This type of discussion has persisted in the history of Paleoanthropology. New discoveries can to change the above denominations. The problem is not about placing new ones but due to the increasing number of morphological data and improved dating, the problem is about modifying the assignments of the known fossils.

History is full of examples of this. For instance, a few years passed since a fossil was designated as *H. habilis* until the existence of this species was accepted. Today, some believe in the possibility to include the genus *Australopithecus* in the genus *Homo*.

When it was discovered in Java the first non-European fossil *Homo*, it was called *Pithecanthropus* because of the differences seen on him. However, in a few years and thanks to new discoveries, it came to be regarded as a subgenus of *Homo*, and later as the type of *H. erectus*. Currently, it is estimated that *H. erectus* is a paleospecies of *H. sapiens*.

5. *Main hypotheses about the hominids phylogeny*[42]

The main phylogenetic hypotheses supported by paleoanthropologists today are grouped into two blocks. The first block considers the most archaic *Australopithecus* (*A. afarensis*) as the starting point for the diversification of family Hominidae in three evolutionary lines: one led by A. *africanus* to *A. robustus*, a second line led to *A. boisei*, and a third led to the genus *Homo* (*H. habilis*, *H. erectus*, *H. sapiens*). Proponents of this phylogeny argue about unification or distinction between *A. afarensis* and *A. africanus*, whose oldest fossils are considered the trunk of this phylogeny.

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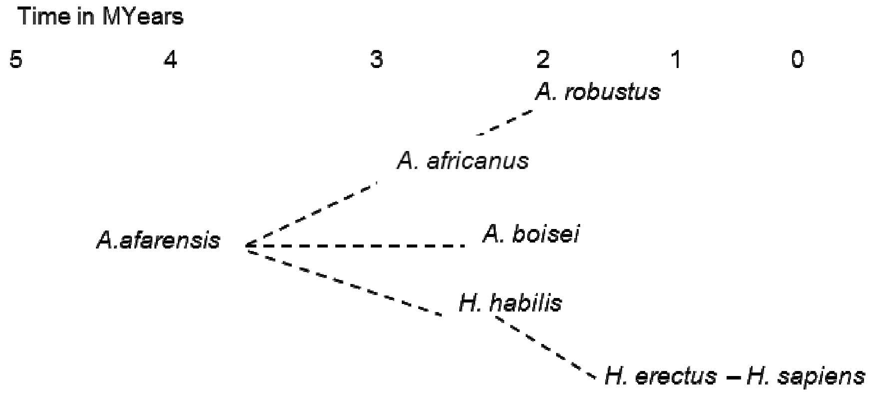
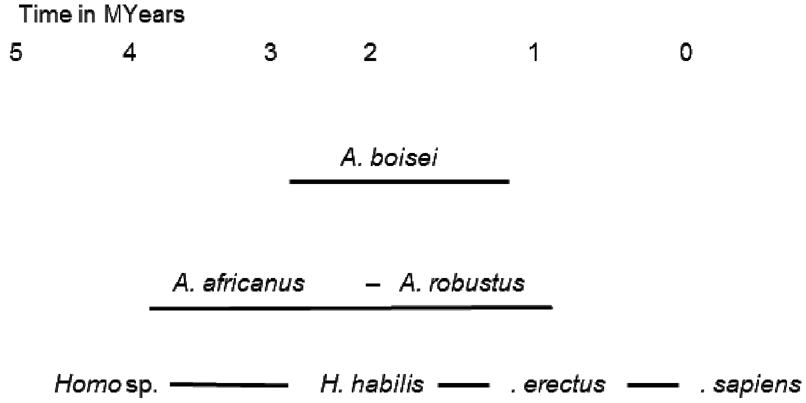
[42] A 1982-1984 hypotheses of different authors, has been added the variation which represents KNM-WT17000, of 2.5 million years old.

A graphic of this phylogeny, supported with differences, by Tobias, Johanson and White[43], is represented below:



The main representative of the second block is R. Leakey. It essential difference from the phylogeny discussed above is that Leaky denies the dependence of the genus *Homo* on the *Australopithecus* genus. This phylogeny is based on the identification of the oldest hominid fossils, 4 - 2,5 million years ago, as belonging to the genus *Homo*, while proponents of the above hypothesis consider them belonging to the genus *Australopithecus* afarensis. A graphic of Leakey's phylogeny is represented below:



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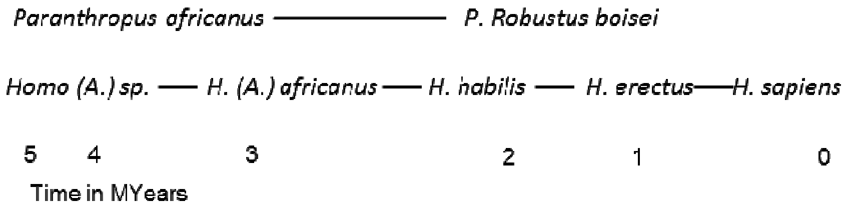
[43] T. D. WHITE, 1982. *La Recherche,* 13: 1258-1270.

A possible synthesis of the two scenarios explained above is to postulate, as does Olson[44], the existence of an unknown ancestor older than 4 million years, from which came both the genus Homo and the genus Paranthropus[45]. The fossils of the gracile form of Australopithecus were distributed between the two genera according to their morphological diversity of the skull base. A graphic of Olson's phylogeny[46] is represented below:



V. MAN

So far we have considered the fossil remains of hominids, their morphology, and their possible relationships. It was also noted their similarity to other primates. But despite these similarities, it is necessary to recognize the profound difference that separates man from other primates. This difference is shown in his reflective thinking, in his language, in his not instinctive behavior, and in his freedom. That is, man's spirituality.

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[44] T. R. OLSON,, *o.c.* en nota 31.

[45] It was originally called by this name *Paranthropus robustus*; later this species was included in the genus *Australopithecus,* nominated by Dart, and therefore renamed *Australopithecus robustus*. If it is now separated at generic level, the Code of Zoological Nomenclature (ICZN) requires the use again of the name originally given.

[46] Cfr. T. R. OLSON, *o.c.*

In Paleoanthropology is difficult to observe the fruits of thought which would allow us to conclude with certainty that a hominid fossil was really a man, i.e., having rationality. The remains are poor, and few are the cultural products left behind. Is it possible to determine that we have sufficient evidence to state that certain fossils are really human and others are not? Are *Australopithecus* hominids humans? Are *Homo habilis* hominids humans? Or can we only consider humans *Homo erectus* and *Homo sapiens*? Or perhaps only *H. sapiens*? An unequivocal testimony is the burial of the dead, an exclusive practice of man, which denotes a sense of the sacred remains and transcendental thought. The Oldest found intentional burials are those of Kiik Koba and Teshik–Tash (USSR) 65,000 years old and of Regordou, Marsel Roc, Le Moustier and La Ferrassie (France) 45,000 years older. They correspond to *Homo sapiens neanderthalensis*.

With this approach we ensure that *Homo sapiens* is really man, at least 65,000 years ago, but it is not a sufficient testimony because, as we have seen, the existence of *Homo sapiens* dates back to 130,000 years old (OMO and OH1). What can we say about older *Homo sapiens*?

In order to answer the above question, other type of evidence will have to be used. The results of activities such as hunting, defense, etc… are most likely manifestations of rationality. Rationality is the intentional manipulation of a mean, or a tool, to an end, since the other currently known primates do not make tools whatsoever. What are the cultural events that are known previous to 65,000 years?

1. *The oldest cultural traces*

A remarkable diversity of successive lithic cultures belonging to *Homo sapiens* are known at present (from 130,000 years). They are called Magdalenian, Solutrean, Gravettian, Aurignacian, Châtelperronian and Mousterian. All these are objects of complex manufactured stone such as chisels, sheet, plate, points, scrapers, etc. There is thus clear evidence of a rational craft.

Prior to *Homo sapiens* are cultures such as Acheulean (400,000-110,000 years), Abbevillian (700,000-400,000 years), and Oldowan (2,500,000-350,000). They are mainly characterized by the presence of some modified boulders ("choppers') and large hand axes. The oldest traces of the use of fire are found in the Acheulian culture 400,000 years old, which belongs to *H. erectus*. The oldest culture, Oldowan, which is attached to *Homo habilis*, dates from about 2 to 2.5 million years. It is a uniform industry that continues without interruption until the Upper Paleolithic, with increasing technical perfection. Thus it can be concluded that individuals who belong to these cultures, *Homo erectus* and *Homo habilis*, show signs of a rational activity. That is, all morphospecies of the genus *Homo* express signs of rationality with their cultures. Wherever and whenever the genus *Homo* is present there is a culture.

By contrast, in older deposits of hominids such as *Australopithecus*, dated 4 million years ago and found in Hadar (Ethiopia) and Leatoli (Tanzania), no lithic industry was found. There is no cultural manifestation, and therefore they are no humans. It can be concluded that man existed for over two million years ago.

2. *Human colonization*

Most paleoanthropologists sustain that each morphological type of man emerged only at a particular point and they eventually spread geographically across continents, where they mingled with more archaic forms which already existed.

As JS Weiner[47] points out, in all sites a replacement of archaic varieties of *Homo sapiens* by more modern ones is observed. There is a permanent mixture of varieties that do not amount to pure breeds or attempt to an exact definition of each group. It is also impossible to determine the source areas and routes of expansion of each variety.

Modern *Homo sapiens* also developed, expanded and differentiated in a network of mixed populations. They gradually dominated other forms of *H. sapiens*. They also experimented regional changes that led to the current races.

With *Homo habilis* and *Homo erectus* could have happened something like as follow. The more modern type of settlements could have been mixed with more primitive types, eventually prevailing over them. For this reason, it is difficult to set precise limits on each of the morphotypes which always show intermediate characters, especially in overlapping periods. This is what is seen, as noted earlier, in the identification of forms belonging to *A. africanus–H. habilis, H. habilis–H erectus,* and *H. erectus–H. neanderthal–H. sapiens.*

The waves of colonization are well known in the lithic cultures, which are scattered throughout Europe, Asia and Africa, for the enrichment of their utensils and production techniques.

The study of successive colonizations is another argument in favor not only *Homo sapiens* as humans, but also of other archaic forms of *Homo* sapiens being human as well. Successive colonization were able to mix with the preceding populations, producing genetic and cultural exchanges between *Homo habilis* and *H. erectus,* and also between *Homo erectus* and *H. sapiens*. Exchanges that would eventually prove their belonging to the same biological species.

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[47] J. S. WEINER, *The Natural History of Man,* Universe Books 1971.

3. *Polyphyletism and monophyletism. monogenism*

Since 1940 it has generally been rejected the polyphyletic theories which attributed different geographical origins to the same animal species. The existence of the same species in remote geographical areas is better explained by their early dissemination, and not because it had different phyletic origins. In the case of man, the polyphyletic theories of the late nineteenth and early twentieth century, who supported racism, have also been totally rejected.

Recent studies using mitochondrial DNA[48] allow us to say that all current populations studied, except African populations, are closely related to each other. Their relation is so close that it is possible to establish a phylogeny, a genealogical tree, which eventually reaches a common branch. This branch connects with the African populations in a common trunk. The paper's authors postulate the hypothesis that all humanity today comes from an African woman 150-200,000 years ago. The importance of this change in thinking about the origin of man cannot be highlighted enough in relation to the question of monogenism vs. polygenism.

The polyphyletic origin, or several genealogical lines with different origins, is necessarily polygenist because it needs the existence of different pairs of progenitors in each area. Whoever assumes that man could have arisen at different times in different locations, they are forced to admit polygenism. But this view is no longer acceptable. It is a fact that the origin of man, as any animal species, is monophyletic.

However, two scenarios can happen within the monophyletism. One is to assume that new species appear as a result of the evolution of a population, or polygenism. The other is to assume that the new species appears in the progeny of a single pair, or monogenism, which is produced either by mutation of the genetical contribution of the individuals or by a direct mutation of the already fertilized ovum.

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[48] R. L. CANN, M. O. STONEKING, A. C. WILSON, 1987. *Mitochondrial DNA and human evolution. Nature,* 325 (1): 31-36.

The Neo-Darwinian biologists usually have a polygenetic explanation both for the origin of species and for the origin of man. They argue that a large population of individuals evolved a set of micromutations which were accumulated over long periods by selection-adaptation. Therefore they postulate a slow and fairly constant variation of the species. Over time, a species ends up being replaced by another that would come from itself.

However, it should be kept in mind that the origin of species could also have been produced by large mutations, also known as macromutations such as chromosomal mutations, large rearrangements, polyploidy, etc. Thus a new species would occur in much shorter times.

So far these are the various scenarios that are handled today to explain the monophyletic evolution of man. However, these explanations are insufficient to account for the human uniqueness which is expressed in his consciousness, rationality and freedom. Obviously mere biological research is unable to provide a full explanation of man because it cannot go beyond its own experimental method, which is not able to reach all human dimensions.

The Christian faith affirms that man appears as a result of a creative act of God, which unites a spiritual element, or soul, with an already existing matter. The former element, or soul, accounts for the peculiarities of knowledge and freedom in man. This statement can also be supported by philosophical reasons, which show the irreducibility of spirit to matter. These two elements constitute an indissoluble unity in man, where both spirit and matter are mutually and intrinsically joined together. Polygenism does not seem compatible with the Catholic doctrine of original sin[49].

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[49] Cfr. PÍO XII, Litt. encycl. *Humani generis* (12-VIII-1950) Dz 2327-2328.

Faith does not illustrate the time when God created man, nor in the particular way He did it. It seems that it is only possible to speak of a pre-existing matter which was united to a human spirit directly created by God at the moment of creation. We are told nothing about the mutual relations established between spirit and matter.

4. *Hominization and Humanization: a hypothesis*

Hominization process is the making of the morphological type of man, that is, the biological sequence of changes that led to the type known today. Biologists apply to this process the same laws that seem to govern the appearance of other animal species. Broadly speaking, these laws are: diversification, adaptation and selection. When a new animal type appears in the animal kingdom it soon diversifies and adapts to different ecological niches. This phenomenon of diversification is called radiation: the same animal type simultaneously evolves differently in different environments. The results are better animal types adapted to every ecological niche. This is the process of adaptation. Among the various modifications taking place only those that involve better adaptation prevail. This is the process of selection. Thus, the most suitable genotypes are selected from those produced by accumulating random genetic mutations.

In the case of man, something very different happened. Within an animal form with some specializations such as bipedal gait, and adaptation to terrestrial life different to arboreal one, two evolutionary branches emerged. One, the *Australopithecus* branch that had a tendency to morphological specialization and a stable cranial capacity. It became extinct a million years ago. The other, the genus *Homo*, is characterized by the steady increase in brain size and the absence of divergent branches in its phylogenetic tree. No adaptive radiation is observed in the genus *Homo* as it occurs in other species.

There seems to be a continuous sequence from *Homo habilis,* 2.5 million years ago, to modern *Homo sapiens* today with a gradual cerebral specialization.

This process appears simultaneously linked to the increasingly sophistication in stone tool manufacture, from the simple choppers of the Oldowan culture through the first crude hand axes, and other instruments, of the Acheulean and Abbevillian styles to the contemporary Upper Paleolithic cultures of modern *H. sapiens*. It is also associated to behaviors such as the use of fire since *H.* erectus; and the intentional burials of *H. sapiens neanderthalensis*. There is a simultaneous process of morphological specialization and cultural enrichment.

The parallel processes of Hominization and Humanization, the latter understood as the appearance of cultural traits, can be interpreted in two ways:

1) The *emergentist* theory point of view, which holds that man is the result of a blind evolutionary chance. Thus, the process of Humanization, related to the psychological abilities required for cultural manifestations, would emerge through gradual development. This process would also have been simultaneous to the process of Hominization, or morphological specialization.

2) The point of view of creation of man. This is a view which accepts that man was constituted as an intelligent being at a certain time point in time, by being given a spiritual soul. The morphological transformation process would be guided by the rational intelligence. This process would have led to a progressive somatic adaptation. The first *H. habilis* or the genus *Homo,* understood as an undetermined species which emerged 3,000,000 years ago, would had been fully human, with all the faculties of the spirit not yet fully manifested. It would be a similar situation to that of man's ontogeny where the fetus contains virtually everything it needs first to develop as a viable baby, and second to reach the maturity of an adult.

This is an alternative hypothesis to the theory of *emergentism*. It is a hypothesis which holds that the process of Hominization, or gradual morphological specialization of man, follows the process of Humanization. First is to be made man by the creation of a spiritual soul, then morphological and functional changes happen. Changes which first occurred at random were followed by natural selection because they gave man a higher degree of survival since they allowed a better expression of his spiritual being through higher cognition. It is the human soul that governs passively human evolution using the same means of natural selection, in order to reach the soul's full expression in the morphology of the human body.

These morphological changes, related to the expression and use of rational thought, might had been established in a population because of the adaptive advantage over those evolving hominids who did not possess rational thought. Therefore these changes were selected. This process can explain the accumulation of changes that are favorable to the expression of rational thought; changes which eventually would lead to a morphology increasingly better adapted to the needs of the spirit.

The body's best adaptation to the expression of the spirit implies, contrary to what happens in the animal kingdom, a morphological despecialization. The superiority of the human spirit and as a result the ability to make tools and other manifestations of culture, meant that man was made independent from the environment. Thus, morphological adaptation to it was no longer necessary. Animals were modified by natural selection in order to adapt to the environment. Man, on the contrary, adapts the environment to his needs. No adaptive radiation happened. Man's morphological fate is linked to his rational thought. Once man was able to control the environment he ceased to be immersed in his biological context and the process of natural selection was altered.

Christian faith holds that the first humans, Adam and Eve, were made in a peculiar state of original justice, a state which also affected the material conditions of human nature. The first couple was in some way exempt from some constraints by the physical and biological laws because, among other things, they could not die. These peculiar conditions probably allowed a proper blending of the spirit in a primitive body. However this adaptation happened, it was lost as a result of the original sin.

Since then man returned to be fully immersed in his biological state from which his body was originated. He gradually emancipated from it through a succession of morphological changes which were selected because they allowed a better expression of his spiritual being.

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SUMMARIUM

ORIGO HOMINIS. STATUS HODIERNUS INVESTIGATIONIS PALEONTOLOGICAE

Explicatis scientificis cirteriis quae fossilibus tempus adaecuatum tribuere permittunt, describuntur eorum cubilia et fossilia maioris momenti familiae hominidae. His praelibatis, diversae hypotheses filogeneticae huiusce familiae, quae ab aliquibus paleanthropologis excogitatae sunt exponuntur. Postea auctor analysi subicit ea facta quibus concludere possumus aliquod familiae hominidae fossile humanum esse, ut postremo quandam struat hypothesim qua de-specializatio morphologica humanae filogenesis explicari possit. Processu tranformationis biologicae quae ad hominem sapientem conducit, posterior esse posset processui humanizationis (existentiae animae humanae). Sequentes mutationes morphologicae processu selectionis explicari possent: illi caracteres qui ad melius exprimendam rationalitatem conferunt, quia utilitatem selectivam portant, selecti essent.

ABSTRACT

THE ORIGIN OF MAN IN MODERN PALAEONTOLOGICAL RESEARCH

This paper explains the concepts of hominization and humanization from a different perspective than the theory of emergentism in human evolution. The introduction deals with the scientific criteria for dating fossils, and the description the most important fossils of the Hominidae *family, and their world locations. The second chapter describes the different phylogenetic hypotheses on these fossils formulated by some paleoanthropologists. Analysis of the fossils show that hominids were human from the beginning. In the final chapter the author offers a personal hypothesis to explain the non-morphological specialization of human phylogenesis. The process of biological transformation leading to modern Homo sapiens could be subsequent to his humanization. Humanization understood as the existence of the human soul. Subsequent morphological changes could be explained by a selection process. The characters which were selected were those that best contributed to express his rational thought because they provided a selective advantage to those who possessed it.*

ACKNOWLEDGEMENTS

This text is a translation of an article published in 1988 in Scripta Theologica under the title "El Origen del Hombre. Estado actual de la investigación paleontológica". The text written almost 30 years ago, and after the accelerated discovery of many fossils of Homo *and of* Australopithecus*, remains largely valid on the interpretations and suggestions made therein. It has been translated, without changes or additions, to English. Thanks to Beatriz Byrne and Max Bonilla for the translation into English and text correction.*

Rafael Jordana