

Paradigms of anthropology as causes of taxonomic controversies

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ABSTRACT The thesis of the paper is that the paradigms espoused by scholars affect their taxonomic decisions, which points to a philosophical source of such controversies. The paradigms the author discusses as holding in anthropology, at various times, include: (1) the “fixity-of-species” paradigm, (2) the “Asian roots” paradigm, (3) the “encephalization” paradigm, and (4) the “mid-Tertiary” paradigm.

KEY WORDS paradigm, taxonomy, hominids

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Introduction

The desire to know one's origin can be considered a natural need of modern humans. In seeking to satisfy it, paleo-anthropologists excavate and examine fossil material, then try to classify it. This is not an easy task; it whips up emotions and leads to drawn-out disputes. What is remarkable is the fact that the same fossil material has often been classified in totally different ways. Worth remembering is the discussion that took place in the 1860s about the Neandertal remains. Some scholars, including C. Blake, R. Virchow and I. Pruner-Bey, believed that the Neandertal remains belonged to a diseased individual of our species. Others, like H. Schaaff-

hausen and W. King, were of the opinion that the fossil from under Düsseldorf should be classified as a separate species. In the 1920s a sharp controversy flared up concerning the Taung remains. R. Broom, W. Sollas and P. Adloff insisted on putting them in the family *Hominidae* while others, such as E. Smith, A. Keith and O. Reche, claimed that the fossil skull from Taung should be classified with the family *Pongidae* rather than *Hominidae*.

The question that arises, therefore, is what was (and can still be) the reason of such controversies. Why have anthropologists classified the same fossil material in different ways? Undoubtedly, one of the major reasons of taxonomic disagreements is the fragmentary nature of

fossil finds. Incomplete bone material can be interpreted in a variety of ways. BLACK [1929] examined a lower molar which had been found in Zhoukoudian in 1927 and on this alone decided to introduce a new genus and species – *Sinanthropus pekinensis* “Chinese man of Peking”. Anthropologists opposed this proposal on the grounds that Black should not have classified such fragmentary material [LEAKEY and GOODALL 1969, KOENIGSWALD 1981]. Another cause of taxonomic doubts may be psychological [HILL 1986]. BIELICKI [2000] is of the opinion that discussion about taxonomy can spring from an anthropologist’s emotional involvement in the research or his wish to become famous. Taxonomic controversies over fossil hominids can also stem from their unclear degree of sexual dimorphism. In the years 1974-79 remains of many individuals were found at Hadar that represent the genus *Australopithecus* [OAKLEY *et al.* 1977]. JOHANSON and WHITE [1979] thought that the material should be included in one species, *A. afarensis*, which was characterized by large sexual dimorphism. On the other hand, R. LEAKEY [1995] and Coppens suggested that the Hadar remains be included, not in one but several species. Personally, I think that we should indicate a fourth important cause of taxonomic controversy, i.e., one that arises from philosophical rather than biological considerations: It is the multitude of paradigms in anthropology.

What is a paradigm? The famous philosopher and historian of science, KUHN [1977], claims that we are not able to see facts as such. Our vision of the world depends on the paradigm of the world we accept. A paradigm is a generally

accepted theoretical conviction which helps us to solve individual problems. The interpretation of facts depends on our paradigm. The same facts can be interpreted differently in the light of different paradigms. A paradigm is not invariable. When we discover facts that cannot be explained by our paradigm, the paradigm should be rejected and a new one developed [CACKOWSKI *et al.* 1987]. While anthropology belongs to the empirical sciences, it is based on theoretical foundations – paradigms. Anthropologists interpret fossil material in terms of the currently valid paradigm. Hence, the same fossil might be classified in completely different ways depending on the paradigm the discoverers believe in.

The “Fixity-of-species” paradigm

The belief in the fixity of species persisted until the mid-19th century. This paradigm was based on the biological authority of Aristotle and his vision of the world in which all creatures had existed in the same form for ages. In his book *De coelo* Aristotle emphasized the main principles which controlled the world, viz. order and stability [HELLER and ŻYCIŃSKI 1990]. In 1735 Linnaeus, the famous Swedish naturalist, published his *Systema naturae*, a book based on the belief in the fixity of species, in which he classified the entire animate world [GRĘBECKI *et al.* 1962]. Worth noting is the fact that the biological paradigm of the fixity of species suited perfectly the theological concept of creationism. Its essence was the scholastic sentence: *Nihil reducitur de potentia ad actum nisi pre ens actu*, which meant

that the cause had to be greater than the effect. These two theses – biological and theological – were joined into one over the centuries [HALACZEK 2000, TOMCZYK 2001].

The reason for the discussion about fossils found in the first half of the 19th century was the paradigm of the fixity of species. In 1829 P-C. Schmerling excavated three human skulls at Engis (Belgium), including one belonging to a 3-4-year-old child. Schmerling did not write much about it; in fact, he only stated that he had found the child's skull near an elephant tooth, and that it had broken into pieces during excavation. The skull must have been that unusual that Schmerling decided to reconstruct it. He thought that people had been undergoing a morphological transformation over centuries [OAKLEY 1964, JORDAN 1999]. C. Lyell, who visited Belgium in 1833, examined the child's skull, but definitely rejected Schmerling's suggestions. In his opinion, the skull was ordinary. Furthermore, it was dated to modern times. Under criticism, Schmerling then sold the Engis fossil to the University of Liège.

Almost twenty years later, in 1848, another human skull was found in obscure circumstances in Forbes' Quarry (Gibraltar). It had a prominent brow ridge and a flat forehead. Unfortunately, the find from Gibraltar was treated only as a natural oddity and handed over to the Royal Museum of Surgery in London [LEAKEY and GOODALL 1969, HALACZEK 1991]; It was not recognized as special until 1865. The above situations had arisen because of the fixity-of-species paradigm. Biologists were unable to face the idea that the recovered fossils could belong to ancient people who should be assigned to a species different

from our own. Rather, they believed that the remains from Belgium and Gibraltar belonged to diseased or mentally handicapped people. Those finds did not fit the accepted paradigm. Hence, biologists could choose from two options: To reject the fixity of species and accept that man had changed over time, or to reject the remains from Engis and Forbes' Quarry and forget about them. Ultimately, they chose the latter.

In 1856 the next ancient human remains were found in Neandertal, Germany. H. Schaaffhausen, an anatomy professor from Bonn, accorded them a detailed anatomical description. His report was published in 1858 and translated into English by G. Busk in 1861. SCHAFFHAUSEN [1861] concluded that the features of the Neandertal specimen were the results of neither artificial nor pathological deformation. He therefore wanted to give the remains a new taxonomic name different from *Homo sapiens*. This interpretation, as is known, was totally alien to the way of thinking of most anthropological authorities of the day. BLAKE [1862], an amateur anthropologist, was convinced that the bones belonged to an idiot. In the opinion of a physician, B. Davis, the big skull with prominent brow ridges bore traces of pathological changes. Schaaffhausen's proposal to classify the Neandertal fossil as a new species was also criticized by A.F. Mayer, who came to the conclusion that the remains belonged to a Cossack who reached Germany in January 1814 when the Russian army was attacking Napoleon's troops [SCHWALBE 1901]. The fossil material was also examined by an Irish anatomist W. KING [1864] from Queen's College. He opined that the Neandertal man ought to

be included in an extinct species for which the taxonomic name *Homo neanderthalensis* he proposed. However, King's opinion was questioned by VIRCHOV [1872], a renowned German pathologist. In 1873, at the International Anthropological Congress in Wiesbaden, Virchow presented the results of his research. In his opinion, the Neandertal remains belonged to a man who had suffered from rickets in childhood and certainly could not be the remains of our ancestor. He repeated this opinion in Ulm in 1892. Furthermore, he claimed that the "cripple" from the Neandertal Valley could not have survived without help from his companions, and altruism is a characteristic only of modern human beings. If, therefore, the Neandertals were altruists, they had to belong to the species *Homo sapiens*. Virchow was a pathologist, so he often examined human bones affected by syphilis or rickets, and he knew the changes effected by these diseases. It is, therefore, surprising that he should have recognized symptoms of rickets in a fossil that did not show any signs of the disease. It seems odd that he should have interpreted the features of these bones incorrectly and appears, therefore, to have based his opinion on philosophical rather than biological grounds. Virchow continued to defend the old paradigm of the fixity of species according to which modern man could not have primitive ancestors. Virchow died in 1902, and until the end believed that the fossil from Neandertal belonged to an ill individual who certainly could not be classified as a separate species.

In 1859 *On the Origins of Species* by Darwin appeared. In it Darwin provided many examples which proved the fixity-of-species paradigm invalid. His thesis

was that all forms of life were related by ancestry. This meant that all species, extinct and living, descended from a single ancient ancestor. Darwin did not mention the Neandertal man in his book, but it was obvious that since man belongs to the animate world, he must have evolved and been controlled by the same rules as other species. Darwin's work, however, did not result in immediate overthrow of the old paradigm [MAYR 2000].

In 1882 the Larousse Encyclopedia, in which can still be found the statement that the world appeared in 4936 B.C. and that all living beings were created then [PRIVAULT 1982], was published. The belief in the fixity of species had very strong and deep roots. This explains why anthropologists did not accept the opinion that the Neandertal fossil should be included as a separate species in the genus *Homo*. However, excavations carried out in Asia (Java –1890/91), Europe (Krapina – 1899, Ochoz – 1905) at the turn of the 19th and 20th centuries, confirmed the theory of evolution and not that of the fixity of species. Ultimately, scientists were forced to reject the old paradigm and accept the new one according to which species kept changing over time. As a result, the ancient remains were included as a new species in the genus *Homo*. The change of the paradigm had caused a change in the interpretation of the fossils [FRAIPONT 1936, TRINKAUS and SHIPMAN 1994].

The "Asian roots" paradigm

In 1924 R. Dart received the skull of a child which was found at Taung, South Africa. Anthropologists discussed whether the fossil should be classified in the

family *Hominidae* or *Pongidae*, or within an entirely new family [STRKALJ 2000]. Today it is realized that the differences of opinion among anthropologists at that time arose from the different paradigms they embraced.

In the late 19th century the vast majority of anthropologists believed that apes were the creatures most similar to man. Darwin thought that man shared many characteristics with the African apes, such as the chimpanzee and gorilla. In his opinion, Africa was the cradle of humanity. In *The Descent of Man*, published in 1871, he wrote: *In each great region of the world the living mammals are closely related to the evolved species of the same region. It is, therefore, probable that Africa was formerly inhabited by extinct apes closely allied to the gorilla and chimpanzee; and, so these two species are now man's nearest allies, it is somewhat more probable that our early progenitors lived on the African continent than elsewhere...* [DARWIN 1871: 199]. A different opinion was advanced by E. Haeckel, who defended the thesis that human beings were more akin to the Asian anthropoid apes (gibbons) than to the African ones. We can read in his argumentation [HAECKEL 1899] that in gibbons' sexual dimorphism is not very pronounced and they form monogamous pairs; moreover, they are able to walk upright. Haeckel, therefore, believed that we should look for the missing link somewhere in Asia, where modern representatives of the family *Hylobatidae* live today.

It is pertinent to remember, however, that in the 19th century many people in Europe believed in the superiority of the „white” variety of man over the „black” one. Europeans were convinced of their

exceptionality, and were contemptuous of African peoples. This attitude manifested itself, among others, in the colonization of Africa. It was, thus, impossible for the Dark Continent to have been the cradle of mankind. Almost all scientists then defended the thesis about man's Asian roots. Further supporting this thesis was the fact that the oldest civilizations had been found, not in Africa, but in Asia [FOLEY 1997]. Out of these two models – the African or the Asian cradle of humanity – the latter got much wider support. No wonder, therefore, that scientists preferred to do research in Asia rather than in Africa. In 1878, R. Lydekker found fossilized simian remains at Siwalik (India) which he classified as a new species of the chimpanzee, *Troglodytes sivalensis*. Lydekker then decided to change this name, finally calling it *Anthropopithecus sivalensis* [KHATRI 1975, SHIPMAN 2001]. In 1887 E. Dubois, a Dutch physician, started excavations in Sumatra, then Java. There, in 1890/91, DUBOIS [1894] found primitive remains he called *Pithecanthropus erectus* – an „upright ape-man”. In his opinion, the fossils belonged to a creature that was the missing link [THEUNISSEN 1985, SHIPMAN 2001]. The Asian paradigm was thus supported by excavations. The clues pointed to Asia, and anthropologists believed they should carry out their excavations there.

The above explains why anthropologists rejected Dart's notion that the first hominids should be sought, not in Asia, but in Africa. As a consequence of the old paradigm, the remains of the Taung australopithecine were classified in the family *Pongidae* [SMITH 1925, KEITH 1925, ABEL 1931]. BROOM [1925] and L. LEAKEY [1934] were among the

few scientists who believed Dart's thesis correct. Later African excavations and improved methods of dating fossil material showed the African paradigm to be correct. In finally rejecting the old paradigm, anthropologists admitted that *Australopithecus* was a hominid. Thus, the change of paradigm caused a change in the interpretation of the fossil material.

The "Encephalization" paradigm

Still another important paradigm in anthropology affecting hominid taxonomy may be referred to as the encephalization paradigm. This maintained that the essence of hominization lay neither in dentition nor upright posture, but in the brain [KEITH 1915]. To interpret the encephalization paradigm correctly, we must return to the discussion about the Taung fossil.

DART [1926], estimated cranial capacity of the Taung child at about 520 cc and calculated an adult to be about 625 cc. It is noteworthy that this value was later frequently revised [e.g., BROOM 1933, DART 1940]. On average, however, the cranial capacity of the adult *Australopithecus* from Taung lay between the brain size of the chimpanzee (400 cc) and that of the adult „*Pithecanthropus*”, as it was then called (850 cc). On the natural brain endocast DART [1929] identified the *sulcus lunatus*, situated at the back of the occipital lobe. It indicated that while the brain of the australopithecine was small, its structure had changed significantly from that of the pongids. The mandible of the Taung child was characterized by a parabolic shape of the dental arcade, small canines slightly projecting above the line of

occlusion, and incisors not forward-protruding, but set vertically in the jaw [DART 1934]. These were human rather than simian traits.

DART [1925] published an article about the Taung remains in *Nature* which he entitled *Australopithecus africanus – Man-ape of South Africa*. Dart's thesis, included in the title, provoked wide discussion among anthropologists of the day. E. SMITH [1925] stated that the remains from Africa be included in the family *Pongidae* rather than *Hominidae*. Moreover, he accused Dart of ignorance as he had not compared the Taung child's skull with those of infant anthropoid apes. Another of Dart's opponents was a well-known anatomist A. KEITH [1925], who believed that Dart was wrong, and that *A. africanus* represented an African ape rather than a hominid. KEITH [1931] assumed that the hominid family could only embrace creatures that were characterized by a big braincase, about 750 cc in capacity, and claimed that while *Pithecanthropus* and Pilt-down man passed the test, the Taung remains did not. He insisted that a braincase of less than 900 cc was in fact characteristic of idiots. The cranial capacity of anthropoids did not exceed 650 cc; besides, their facial skeletons, especially the incisive bones, indicated the simian origin of the australopithecine. Moreover, in shape and size its eye sockets corresponded to those of a chimpanzee. Also, the size of the australopithecine palate resembled that of the anthropoids. O. RECHE [1926] compared chimpanzee and gorilla skulls with the Taung remains and proclaimed that he could not see any differences among them.

Thus, anthropologists could not include the Taung remains into the hominid

family because they had adhered to the encephalization paradigm. Its roots go back to the 19th century. In 1866 E. Haeckel formulated his biogenetic law which held that ontogeny recapitulated phylogeny. HAECKEL [1902] concluded, from the development of vertebrate embryos, that individual development of each organism traced the evolutionary stages of all its ancestor species. In turn, BOULE and VALLOIS [1952] claimed that the recapitulation law should rather state that only some periods of phylogeny are reflected in the process of ontogeny. K. Baer also criticized Haeckel's theory and argued that embryos repeated only embryonic, not adult, stages of their ancestors [HOFFMAN 1997].

With the recapitulation law in mind, J. KOLLMANN [1905] compared the skulls of human and ape fetuses. He noted that the frontal bones were strikingly similar during the fetus period of both forms, and that ape bones flattened after birth. Kollmann assumed that people and apes must have had common ancestors characterized by big heads. According to this concept, the apes, with their small braincases, were a lateral branch of the anthropoid stem. The essence of the encephalization paradigm was the claim that the first step toward hominization was the appearance of a big brain. This view was supported by E. SMITH [1924], who thought that the process of hominization began, not with bipedalism, but with an enlarged cranial capacity. The bone remains excavated in the first decade of the 20th century fitted this paradigm perfectly. Both the Neandertal man and the so-called *Eoanthropus dawsoni* from Piltdown were characterized by big braincases. The australopithecine with its small cranial

capacity could not, therefore, be classified with *Hominidae*.

On the grounds of the encephalization paradigm, anthropologists rejected Dart's theory. Moreover, they uncritically accepted the Piltdown remains. In as late as the 1940s KEITH [1948] still believed the encephalization paradigm correct, although he knew many arguments against it. Keith was aware that "*Eoanthropus*" remains were untypical, but even this did not convince him to repudiate the paradigm. It was only new finds in Africa that corroborated Dart's theory and finally made anthropologists give up the encephalization paradigm and accept a new one which held that bipedalism and changes in dentition were the first symptoms of hominization. Australopithecines were definitely included in the family *Hominidae*, and in 1953 the Piltdown remains were officially recognized as a hoax.

The "Mid-Tertiary" paradigm

In the course of the debate over the Taung fossil, there appeared another, the mid-Tertiary paradigm of the origin of man. DART [1926] estimated the age of Taung child at the Pliocene. BROOM [1930], however, thought that this dating should be corrected to the end of the Pliocene and the beginning of the Pleistocene. Whatever the age of the remains, it did not allow it to be classified as a hominid fossil, because if the australopithecine had lived in the Plio-Pleistocene, in the middle of the Pliocene the evolutionary lines of the hominids and anthropoids should have diverged [BROOM 1933]. Yet this concept was challenged because since the mid-19th century the majority of anthropologists had thought that the human roots went

farther back in time, to the middle of the Tertiary [SCHWALBE 1904, KEITH 1915, WEIDENREICH 1922]. They believed that the evolutionary line of anthropoid apes had already been separate in the Miocene (see Fig. 1), which meant that the ape-hominid divergence must have occurred in the mid-Tertiary, perhaps in the Oligocene [KEITH 1915, HALACZEK 1984].

The mid-Tertiary paradigm seemed to be supported by the chronology of finds. It should be noted, however, that a hundred years ago geological periods were dated differently than today. Haeckel assessed that the Tertiary lasted 3 million years, and the Quaternary, a mere 100 kyr [HALACZEK 1983]. KEITH [1915] was also convinced (see Fig. 1) that the Pliocene lasted 500 kyr and the Pleistocene

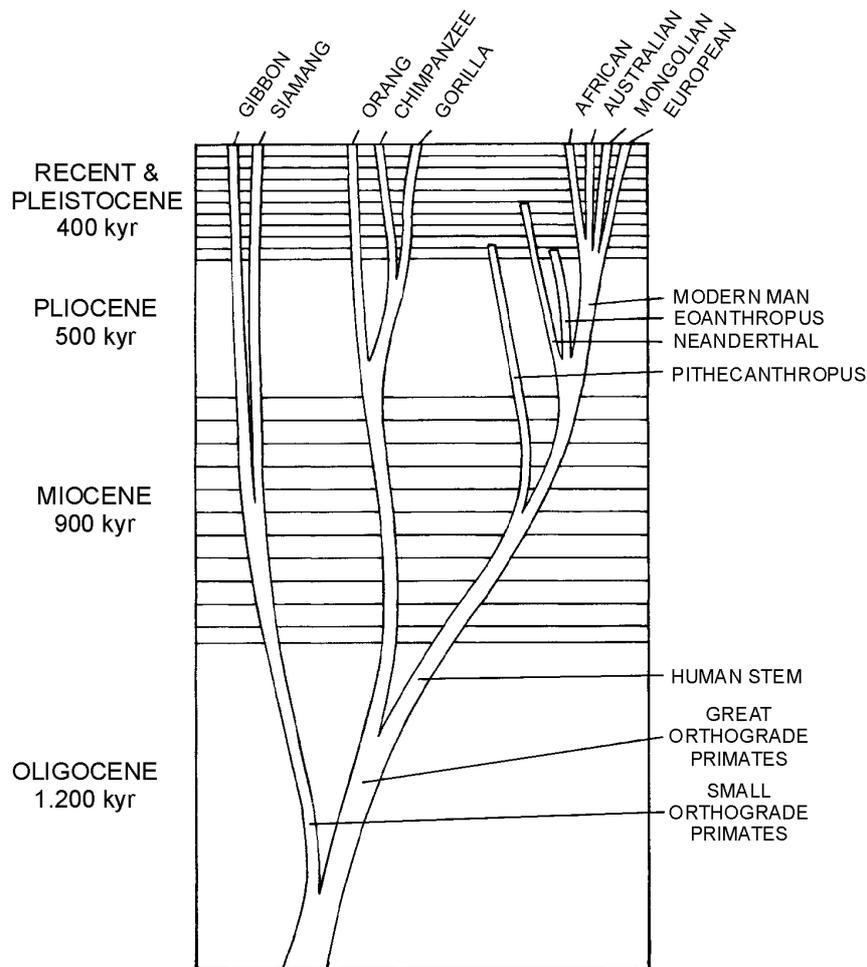


Fig. 1. Arthur Keith's [1915] evolutionary tree. Note placement of the ancestral stems, and condensations of the geological epochs.

only 400 kyr. Hence, the past from 900 kyr ago meant, not the Pleistocene, as it means today, but the Miocene. This “condensation” of the geological epochs explains why scientists looked for the human roots in the distant Tertiary. The age of the remains from Piltdown and Java was estimated at the Upper Pliocene, and if such more advanced forms had existed in the Upper Tertiary, then in the mid-Tertiary (Oligocene) more primitive creatures should have been expected. *A. africanus* was dated to the same age as the Piltdown find, so it seemed obvious that it could not have been a hominid and our ancestor. KEITH [1931] admitted that he could have accepted the hominid status of the australopithecine if it had come from the Miocene, because then it would have been an ancestor to “*Eoanthropus*”.

In the 1950s new dating methods appeared and anthropologists realized that the duration of the geological periods had been underestimated. It turned out that the Tertiary lasted, not 3 myr, but 63 million years. The old paradigm which held that the australopithecine could not belong to the hominid family because it was too young geologically was therefore rejected.

Final remarks

Taxonomic discussions arise not only because of the fragmentary nature of fossil material, discrepancies in the assessment of sexual dimorphism and psychological reasons, but also because of various paradigms of anthropology. Nowadays, the many stormy taxonomic discussions of a hundred years ago have been forgotten. The old paradigms have been rejected, but many new ones have

appeared that are embraced by some and refuted by others. Although anthropologists analyze the same fossil material and the same artifacts, and employ the latest techniques, the conclusions they reach are sometimes completely different. This often follows from their adherence to different paradigms. Paradigms by their nature belong to the philosophical domain. Hence, in order to solve taxonomic problems effectively, we should not limit discussions exclusively to anthropological issues, but extend them to philosophical premises as well.

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Streszczenie

Problemy taksonomiczne z klasyfikowaniem kopalnych przodków człowieka pojawiły się wraz z odkryciem pierwszych starożytnych szczątków z Neandertalu i trwają w zasadzie do dzisiaj, choć przyczyny kontrowersji w tworzeniu nowych taksonów, ich zmian i likwidacji były w różnych czasach różne. Oczywiście przyczyną nieporozumień mogła być fragmentaryczność znalezisk, np. kalota „pitekantropa” z Trinil czy pojedynczy ząb z Zhoukoudian, na którego podstawie powołany został gatunek *Sinanthropus pekinensis*. Inną przyczyną kontrowersji mógł być nieznany zakres dymorfizmu płciowego kopalnych form, jak np. afrykańskich australopiteków. Przyczyny tendencji do mnożenia taksonów mogły mieć również naturę psychologiczną.

Też artykułu jest wpływ paradygmatów wyznawanych przez uczonych na rozstrzygnięcia taksonomiczne, co wskazuje na filozoficzną przyczynę owych kontrowersji. Ponieważ fakty interpretuje się poprzez afirmowany paradygmat, zatem sposób klasyfikowania, np. kopalnych hominidów, jest uwarunkowany przyjmowanym paradygmatem. Do takich paradygmatów w antropologii autor zalicza obowiązujące w różnych czasach: (1) Paradygmat stałości i niezmienności gatunków, uniemożliwiający uznanie, że gatunek *H. sapiens* mógł podlegać ewolucji i posiadać kopalnych przodków, np. neandertalczyka. (2) Paradygmat azjatyckich korzeni człowieka, zgodnie z którym kolebką ludzkości była Azja (np. „pitekantrop”), co wykluczało znaleziska afrykańskie (np. Taung) z pozycji naszych przodków. (3) Paradygmat encefalizacji, zgodnie z którym proces hominizacji rozpoczął się nie od wyprostowanej postawy, czy zmian w uzębieniu, a od wzrostu wielkości mózgu, np. Piltdown. (4) Paradygmat środkowo-trzeciorzędowej antropogenezy, oznaczający przeświadczenie, że bezpośrednich przodków rodzaju ludzkiego należałoby oczekiwać już w środkowym trzeciorzędzie (oligocenie).