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Paléontologie humaine et préhistoire

# De l'origine des anthropoïdes à l'émergence de la famille humaine<sup>☆,☆☆</sup>

*From the origin of the anthropoids to the first appearance of the human family<sup>◇,◇◇</sup>*

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### RÉSUMÉ

L'évolution de l'homme s'inscrit dans la durée, comme celle de la plupart des autres mammifères. Les premiers primates anthropoïdes, les plus anciens représentants de sa lignée, proviennent d'Asie et remontent à 45 millions d'années. Au cours de cette longue évolution, deux stades se sont révélés très importants : leurs débuts et l'émergence des hominidés, autour de 7 millions d'années. Ces deux périodes critiques sont évoquées ici, avec de nouvelles preuves de l'origine asiatique de notre rameau, puis sa dispersion vers l'Afrique, entre 45 et 40 millions d'années, qui a conduit à l'émergence précoce des premiers hominidés, représentés par trois formes distinctes, dont Toumaï, qui apparaît comme le plus ancien et le plus engagé en direction de la lignée humaine.

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<sup>☆</sup> La Mission paléanthropologique franco-tchadienne (MPFT), fondée et dirigée par Michel Brunet, est une collaboration scientifique internationale entre le Collège de France, chaire de paléontologie humaine (Paris), l'université de Poitiers, l'université de N'Djamena et le CNAR (N'Djamena). La MPFT regroupe maintenant plus de 80 chercheurs de 10 nationalités. Ce programme de recherches pluridisciplinaires est financé par le CNRS (INEE) & ANR, le ministère des Affaires étrangères (DGCID Paris, FSP & SCAC de l'ambassade de France à N'Djamena) et la NSF (RH01).

<sup>☆☆</sup> La Mission paléontologique franco-birmane, dirigée par Jean-Jacques Jaeger, a été constituée en 1998 en collaboration avec les ministères de la Culture et de l'Éducation de l'union du Myanmar. Elle regroupe plusieurs dizaines de participants du Myanmar, de France, de Thaïlande, du Maroc, des Pays-Bas et des États-Unis. Elle bénéficie du soutien du CNRS, de l'université de Poitiers, de l'ambassade de France à Yangon, de la National Geographic Society et de la Leakey Foundation for Anthropological Research.

<sup>◇</sup> The "Mission paléanthropologique franco-tchadienne", headed by Michel Brunet, is an international scientific transdisciplinary collaboration between "Collège de France, chaire de paléontologie humaine" (Paris), the University of Poitiers (France), the University of N'Djamena and CNAR (N'Djamena, Chad), including more than eighty researchers from ten countries. This transdisciplinary research program is granted by the French Ministry of Research – CNRS (INEE) & ANR –, the French Ministry of Foreign Affairs and International Development (DGCID Paris, FSP & SCAC of the French Embassy in N'Djamena) and USA NSF (RH01).

<sup>◇◇</sup> The France–Myanmar Paleontological Mission is an international consortium that started in 1998 in collaboration with the Myanmar Ministries of Culture and Education. It is headed by Jean-Jacques Jaeger and associate researchers from several countries as Myanmar, France, Thailand, Morocco, the Netherlands and the United States. It is granted by the CNRS, the University of Poitiers, the French Embassy in Yangon, the National Geographic Society, and the Leakey Foundation for Anthropological Research.

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The human lineage has a very ancient origin, as most of the mammals. Its oldest representatives, anthropoid primates, have been described from Asia some 45 million years ago. During this long evolutionary story, two critical stages have appeared as especially important, their beginning in Asia and the emergence of hominids in Africa, some seven million years ago. These two stages are discussed hereby with new data relative to their Asian origins and their dispersal into Africa between 45 and 40 million years ago. Following this dispersal event, these primates evolved in Africa and gave rise to the early hominids. These appeared around seven million years ago and have three distinct representatives. Among them, Toumaï appears as the oldest and the closest to our ancestry, a point that is evidenced here.

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## Abridged English version

The idea of an ascendance for our species is quite recent (about 150 years ago) (Darwin, 1859, 1871). But which was our ancestral group, when and where did it arise? ... If these questions are more constraints they are still always unsolved.

In the 1980s, early hominids are known in South and East Africa; the oldest one, from East Africa led one to propose an “East Side Story”, the bipedal hominid original savannah hypothesis (Coppens, 1983).

From 1994 the M.P.F.T. digging in the Djurab desert (Northern Chad) unearthed successively a new australopithecine, *Australopithecus bahrelghazali* Brunet et al. 1996, nicknamed Abel (dated to 3.5 Ma), the first ever found west of the Rift Valley (Brunet et al., 1995) and later a new hominid, the earliest yet found nicknamed Toumaï, *Sahelanthropus tchadensis* (Brunet et al., 2002) from the Late Miocene, dated back to 7 Ma (Lebatard et al., 2008; Vignaud et al., 2002). These new milestones suggest that an exclusively southern or eastern African origin of the hominid clade is unlikely to be correct.

Since 1994, our evolutionary roots went deeper, from 3.6 to 7 Ma today, with three new Late Miocene species: *Ardipithecus kadabba* (Haile-Selassie, 2001) (5.2–5.8 Ma, Middle Awash, Ethiopia) and *Orrorin tugenensis* (Senut et al., 2001) (ca. 6 Ma, Lukeino, Kenya), while the oldest (7 Ma) is the Chadian one. These discoveries have a scientific impact similar to that of *A. africanus* Dart, 1925 (Dart, 1925).

*S. tchadensis* displays a unique combination of primitive and derived characters that clearly shows that it is not related to chimpanzees or gorillas, but clearly suggests that it is related to later hominids, and probably temporally close to the last common ancestor between chimpanzees and humans (Brunet et al., 2002, 2005; Zollikofer et al., 2005).

In Chad, the Late Miocene sedimentological and paleobiological data are in agreement with a mosaic landscape (Vignaud et al., 2002). Today, in central Kalahari (Botswana), the Okavango delta appears to be a good analogue with a similar mosaic of lacustrine and riparian waters, swamps, patches of forest, wooded islets, wooded savannah, grassland and desert area (Brunet et al., 2005). Among this mosaic, the studies of Toumaï ecologic preferences are still in progress, but more probably, as for the other known

Late Miocene Hominids, a wooded habitat is contemplated. Moreover, these three Late Miocene hominids are probably usually tree-climbing bipeds. So the models that involve a significant role for savannah in the hominid origin must be reconsidered.

Now, it appears that the earliest hominids inhabited wooded environments and were not restricted to southern or eastern Africa, but were rather living in a wider geographic region, including also Sahelian Africa, at least central Africa (Chad, Niger, Sudan), and maybe also part of northern Africa (Algeria, Libya, and Egypt) (Brunet, 2008).

According to that, the early hominid history is going to be reconsidered within completely new paradigms.

However, these earliest hominids have a long history and were supposed to have evolved in Africa. Their ancestors, the earliest anthropoids, were generally also considered as having very ancient African ancestors. This model was generally accepted because of the abundant fossil anthropoids discovered in the Paleogene beds of Egypt (Simons, 1992). But recent discoveries, both in South East Asia (Beard et al., 1996; Jaeger et al., 2010a) and in Africa (Tabuce et al., 2009) have shown that in the present stage of knowledge, it becomes more accurate to consider an Asian origin, followed, around 45 millions years ago, by their dispersal to Africa (Chaimanee et al., 2012). After their colonization of Africa, anthropoids occupied many empty ecological niches and developed an adaptive radiation from which more derived catarrhines evolved, which subsequently gave rise to hominoids, then to hominids. Subsequently, these Eocene primitive anthropoids, after their arrival in Africa, rapidly also dispersed to South America (Bond et al., 2015) where they radiated again, giving rise to extant platyrrhines. The Asia to Africa mid-Eocene (circa 45 Ma) dispersal event has been previously already recognized for other mammalian groups, like hystricognath rodents (Jaeger et al., 2010b) and anthracotheres, which all clearly originated from Asia. Therefore, the main questions remain the precise dates and conditions of such dispersals and the environmental context that allowed such a unidirectional dispersal. The same questions can be raised concerning the dispersal way followed by South American platyrrhines, directly through the South Atlantic or via Antarctica.

Among the numerous anatomical characters displayed by these most primitive Eocene Asian anthropoids figure

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