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Giuseppe Iurato

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Discussing on the origins of symbolism from the latest paleoanthropological research: the case of *Homo naledi*

Giuseppe Iurato

E-mail: giuseppe.iurato@community.unipa.it

Abstract. From an historical-critical comparison of some data and certain results coming from paleoanthropology and neurosciences, we would like to do some possible remarks and putting forward some simple suggestions about the early origins of symbolic function starting from the recent discovery of a new species of the genus *Homo*, called *Naledi*.

The recent, interesting paleoanthropological discovery of the species *Homo naledi*, allows to open a fruitful discussion on the possible origins of human symbolic function. Indeed, if we accept all the hypotheses put forward by the paleoanthropologist Lee R. Berger and his team (Berger et al., 2015), which we deem quite reasonable¹, then new insights may come from the outcomes emerging from the analysis of the historical reconstruction around *Naledi*.

Following, almost verbatim, John Hawks (2016), this remote chamber contained a large bone bed of an extinct population, finding more than 1,500 fossil specimens, one of the most significant finds in the history of human evolution. That remarkable discovery has triggered a fiery discussion within anthropological community, above all because these new species' traits seem do not fit well into the human evolutionary tree. So, it has been hypothesized that these be the remnants of a new species of the genus *Homo*, said to be *Homo naledi*, featured by a bodily mass and stature similar to those of modern species of the genus *Homo*, but with a smaller endocranial volume similar to that of *Australopithecus* species, with a skull shape conformally similar to early *Homo* species, but with a volume approximately half that of modern human skulls, quite equal to that of the latest hominins.

The skeletal anatomic pattern of the specimens of this find is quite unique, with a confusing mix of seemingly primitive and derived traits that, in evolutionary biology, is known as *anatomic mosaic*. This species has several anatomical details already known in early species of our genus, such as *Homo habilis* and early members of *Homo erectus*, but it has a much smaller brain size with respect to that typical of these latter species, as in several aspects of its teeth *Naledi* resembles some species that branched from our family tree much earlier in the timeline, such as the 3.2-million-year-old *Australopithecus afarensis*, i.e., the species of the famous “Lucy” fossil skeleton. Until now, however, the fossils have not been chronometrically dated, but estimates, derived from a first statistical analysis of cranial traits, have yielded a range of 912,000 years to 2 million years (with \pm 0.5 million years). However, more accurate chronological datings are in progress.

Paleoanthropologists have already learned, since the late of the past century, that human evolution was not a gradual progression from a very apelike ancestor to modern humans, even to suppose a kind of *shrub* growth of species. For instance, our small canine teethes and a more upright posture evolved very early in our lineage, while the bipedalism pattern came next. At the midpoint of the human evolutionary tree, in our ancestors evolved larger molar and premolar teethes, a trend that appeared around when the first members of the genus *Homo*, just started hunting and making stone tools. Only in this time, they developed that first forms of social sharing which led to the language,

¹ Above all, by the geological features of this discovery (Dirks et al. 2015). Indeed, *Naledi*'s fossils were just found in a South Africa cave, called the *Dinaledi Chamber*, placed at about 1,450 meters underground. It is hardly attainable, and is still today accessed only through a complicated series of steep, twisting, and narrow tunnels. This is quite enough to corroborate a volunteer and intentional aim to reaching this place, not due to other motifs (of protection, shelter, etc.).

characterizing today all the people around the world. The brain evolved late, the legs early, with every species in our ancestry equipped with its own set of characterizing features.

Nevertheless, *Naledi*'s mosaic seems to be in conflict with this storyline, with wrists and fingertips more humanlike than those of *Homo habilis*, but combined with very curved fingers, comparable to those of both the very earliest hominins and to living apes. At the same time, *Naledi* seems to show a shoulder canted upward on the trunk typical of a climbing species, but with an upper arm twisted in a way unlike other human relatives. With a narrowed upper thorax cage, *Naledi* appears to have been a climber and a possible toolmaker, even if any stone artifacts, into the *Dinaledi* chamber, have not been found out. Then, legs are long and comparatively slender, with some evidence for an elongation of the lower leg, but the hips substantially share an anatomical pattern with the much-shorter-statured Lucy's skeleton.

Adult individuals of *Naledi* weighed between 40 and 55 kilograms, and were between 140 and 160 centimetres in stature, with males and females differing only slightly in size. But to be emphasized is that *Naledi* had a very small brain for this size. The overall picture provided by all the results so recollected, is that *Naledi* walked more or less like humans do, seems to have had hands well made for handling and manipulating objects, and had teeth that indicate a high-quality diet, all elements these that link this species to our genus. Yet, it had a trunk, hips, shoulders and fingers that contrast with this picture, and, above all, it had a brain similar in size to that of some of the latest branches of the hominin lineage, like *Australopithecines*. In many respects, *Naledi* was adapted like a human, but without anything like a human brain.

Berger's team has not revealed in *Naledi*'s bones any trace of carnivore activity, as well as noted that the sediments in *Dinaledi* chamber represent an isolated depositional environment, different from the nearby chambers, which were not carried into the chamber by water action, so Berger and colleagues hypothesised that *Naledi* were using this chamber just to deposit their dead. Therefore, according to this hypothesis, *Naledi* would have already had ritualistic behaviours highly symbolic, so that they had gained a certain degree of the symbolic function notwithstanding the reduced brain size, inasmuch as sacred rituals, like the funerary ones, require a certain development of symbolic capability socially shared².

This hypothesis would entail a certain numbers of interesting historical consequences. Firstly, the birth of symbolic function would date back even the earliest steps of human evolution, just at the beginnings of the first species of the genus *Homo*, contrarily to the current hypothesis according to which symbolic culture was born with the rising of *Homo sapiens*, around Neolithic³. Secondly, the symbolic function precedes every other abstract mental functions, like writing and counting, as, for example, first countings bring back to the late Paleolithic when the coming of agriculture gives rise to the crucial passage from hunter-gatherer societies to farmer ones, almost at the same time of the rising of writing, but independently of each other⁴.

Furthermore, according to Jean Piaget⁵, symbolic function should also precede language as meant in its widest sense, in that, any possible form of language (oral, spoken, mythological, gestural, etc.) always presupposes the preliminary existence of a symbolic underpinning as a main communication support or substratum⁶. In turn, language should precede writing and counting⁷ in that there exist

² Cf. (Barnard 2012) and (Segalen 1998, 2002).

³ Although, as early in *Homo erectus* we may find first expressions of the symbolic function (according to Claude Levi-Strauss), in earliest cooking practices and clothing usages (starting from underwear: e.g., *koteka*).

⁴ See (Iurato2016a) and references therein.

⁵ Already (Hallpike 1979, 1984) had applied, with success, Piagetian theories on symbolism to the study of primitive societies, reaching to interesting and original conclusions coherent with many points of our presentation.

⁶ See also (Barnard 2016) and the question he posed (at page 238) about the possible influence of mythology in the birth of language, to which we might answering, on the basis of this latest paleoanthropological discovery, in favour of a possible net precedence of symbolic function with respect to any other abstract psychic function (like language, writing, counting, etc.). All this, in agreement with Piaget's theory, already called into question in (Hallpike 1979, 1984) about functioning of primitive mind.

⁷ Which seem to be arisen almost at the same time (Iurato 2016a).

languages devoid of any writing system, and, on the other hand, as cognitive neurosciences say⁸, there not exist precise counting systems which have not a corresponding verbal system of counting.

As recent neurosciences say us⁹, one of the chief neuronal circuits of consciousness seems to involve mainly frontal and parietal cerebral zones, above all in the exploitation of symbolic function. Now, Berger and colleagues (Berger et al. 2015) have inferred that *Naledi*'s skull is much closer, in cranial volume, to *Australopithecine* one, but with a cranial structure more similar to that of genus *Homo* than to that of *Australopithecine*, particularly in its slender features, with presence of temporal and occipital bossing (which are a weak indicators of the occurrence of such cerebral zones), and with a slight post-orbital constriction¹⁰. So, we would be tempted to put forward the hypothesis for which, already in *Homo naledi*, all the cerebral areas were present according to a geometrical-anatomical disposition topographically homotopic but not isometrically homeomorphic to that of the latest species of genus *Homo*, and that it might have been undergone subsequently to an evolutionary process of non-uniform enlargement of cerebral areas, like the parietal ones (as, it seems that, from recent paleoneurological inferences based on correlations between cranial and cerebral anatomy, just parietal lobe dilation is responsible for the major differences in neurocranial morphology between modern and non-modern humans¹¹) and the occipital¹² ones (in that, it seems too that *Neanderthals* had relatively larger occipital lobes with respect to modern humans¹³). Likewise, it has to be considered too the relevant rising of the cerebellum in *Sapiens* with respect to *Neanderthal*¹⁴.

Furthermore, since the earliest studies in paleoneurology, the parietal lobes have been recognized to be surprisingly variable among hominids, showing too marked differences among human species when analyzed with traditional or geometrical approaches. It is worth to highlight that, although lower parietal regions, like the supramarginal and the angular gyrus, have a relevant cognitive role in our species (like in speech understanding), until now however the paleoneurological research has evidenced no identified differences, in their rough morphology, between modern humans and other large brained hominids, like *Neanderthals*. Instead, morphological changes in the parietal regions among hominids are probably associated with deep and upper parietal volumes, like the precuneus or the intraparietal sulcus (IPS), which are largely involved in visual-spatial integration and, the latter, in symbolic function (to be precise, in numerical symbolism¹⁵).

The evolution of human brain has always represented a challenge in biology, which, in different periods throughout the long phylogenetic history of the human genus, has identified a generalized encephalization process associated with increasing behavioural complexity. So, the variations of the brain volume from about the 500 cc of *Naledi* and *Habilis* to the 1,100 cc of *Erectus*, hence to the 1,500 cc of *Neanderthal*, until reaching the 1,350 cc of *Sapiens*, might be, for instance, interpreted as an evolutionary process regarding the architecture of a brain pattern (to be precise, the *Naledi*'s one) with roughly the same anatomic structure, characterized approximately by the same (conformal) geometry of cerebral regions and layers (in its tripartite model), but, above all, subjected to either volume and surface transformations of these latter (besides to changes in biochemical composition), with an increasing complexity in either (above all, neocortex) neuronal connections (as well as neuronal density) and ruffle/folding of cortex surface (with an increasing in number and complexity of cortex sulci/gyri and of the specific cerebral surface).

⁸ See (Dehaene & Brannon 2011).

⁹ See (Dehaene & Brannon 2011).

¹⁰ Which is a physical anthropology parameter estimating the breadth of frontal zone.

¹¹ See (Bruner et al. 2014).

¹² This may explain why, in the human brain, about the 50% of the neurons, is more or less promptly correlated with visual images (Maffei 2014).

¹³ See (Bruner et al. 2014).

¹⁴ See (Barton & Venditti 2014), in which it is argued that cerebellum underwent a rapid size increase throughout the evolution of apes, including humans, expanding significantly faster than predicted by the change in neocortex size.

¹⁵ See (Dehaene & Brannon 2011).

Coming back to *Naledi*, with it we have therefore an early species of the genus *Homo* with a body quite similar to the latest species of the this genus, but with a brain similar, in dimensions, to that of latest hominins notwithstanding its skull be morphologically quite similar to that of genus *Homo*. This new species, therefore, has deeply revolutionized human evolution lineage, changing too our knowledge about human symbolic function. Just reflecting on the agile and well-developed corporal constitution of *Naledi*, as well as on its raw capability to make use of symbolic function, we are led toward those psychoanalytic theories which give a pre-eminence to human body (and its perception) in the formation and development of the Ego¹⁶ (*bodily Ego*) and its psychic functions, this being coherent, as has been said just above, with the great development underwent by parietal and occipital cerebral areas, occurred along the main trait of evolution lineage of the species of the genus *Homo*, i.e., from *Habilis* to *Erectus*, until *Neanderthal* and *Sapiens*, coherently too with the great growth of cerebellum along this evolutionary pathway, until up to may speak of an *embodied cognitive evolution* of humans¹⁷.

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¹⁶ See (Iurato 2016b) and references therein.

¹⁷ See (Barton 2012).