New fossil skull find may revolutionize view of early human evolution

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Scientists last week unveiled the discovery of another early human cranium, at Dmanisi in the republic of Georgia, which indicates greater variability among populations of human ancestors than previously recognized. The cranium, which was matched to a lower jaw found previously, has been dubbed “Skull 5” and belonged to an adult male individual with a brain smaller than all four others previously found at Dmanisi.

The team of archeologists, led by David Lordkipanidze and his colleagues in Georgia, were joined by a Swiss research group including Christoph Zollikofer, by paleontologist Yoel Rak in Israel, and by Philip Rightmire at Harvard. They published their findings in the journal *Science.*

The researchers conclude that the five individuals at Dmanisi died within a few hundred years of one another about 1.8 million years ago, and belonged to the ancestral human species *Homo erectus*. The rich assemblage of fossils at Dmanisi has caused great excitement among researchers over the past decade because the specimens, which are exceptionally well preserved, show that *H. erectus* dispersed into Eurasia very shortly after its first appearance in Africa.

H. erectus is characterized by tall, human-like body stature, stone tools, and relatively large brain size compared to earlier species. Skull 5 had an estimated body stature comparable to small humans, but at 546 cubic centimeters (ccm), its brain is much smaller than modern humans, whose brains are typically 1200-1600 ccm in volume. In fact, Skull 5 is only slightly larger than Australopithecines like Lucy, or *Australopithecus sediba,* the hominin recently found in South Africa. The largest cranium at Dmanisi is 730ccm, comparable to many other *H. erectus* specimens.

“The Dmanisi assemblage is so important,” coauthor Philip Rightmire wrote to the *World Socialist Web Site*, “because it does, for the first time, offer insight into the paleobiology of an early *Homo* population.” Because other fossils from early human ancestors tend to be found in sediments that are hundreds of thousands of years apart, they “do not give us any real sense of the variation to be expected in just one group of ancient hominins. As it turns out, that variation is substantial.”

Speaking to Ann Gibbons at *Science,* anthropologist Ian Tattersall proposed that Skull 5 may belong to a new species. Another researcher, Ron Clarke, told Gibbons that the skull might be that of another and older species, *H. habilis*. But Lordkipanidze and his team argue that the skull’s close proximity to the other finds, in both time and space, place it in a single, diverse population of *H. erectus*.

“The Dmanisi assemblage does display some characteristics that are *H. habilis* -like,” Rightmire told the WSWS . But “the Dmanisi fossils also share some characteristics that can be considered derived [or specialized] for *H. erectus* .” Some of those physical features include large, robust brows, and aspects of cranial shape. “It’s fair to argue that Dmanisi is close to the base of the *H. erectus* lineage.”

While the variation at Dmanisi may be considered surprising, the scientists note that it is no greater than the variation found among modern humans. Writing to the WSWS, coauthor Christoph Zollikofer noted that the “brain size variation seen at Dmanisi is just normal.” Asked about the possibility of different cognitive capacities at Dmanisi, Zollikofer writes, “Einstein was close to 1200ccm, which is the same as late *H. erectus*. The 550ccm *H. erectus* might have been no less (or more) clever than the 700ccm *H. erectus* .” Brain structure, in addition to size, is one of many variables that contribute to intellectual capacity.

One of the most widely reported, and perhaps controversial, findings of the new paper announcing Skull 5 is that widespread variation--like that found at Dmanisi, or in modern humans--is expected. The implication is that early human populations and precursors to *H. erectus* may have been similarly diverse. Fossil discoveries attributed to paleontological species including *H. ergaster*, *H. rudolfensis*, and even *H. habilis* may instead belong to a single *H. erectus* lineage. “What does that mean for *H. habilis* ,” asks Zollikofer? “It might be very simple: *H. habilis* probably never existed, and just represents an early *H. erectus* .”

“Human species are variable; we know this is the case in modern humans, now we know this is the case in *H. erectus* ,” Zollikofer explained. “Variation is the source of evolution; if all of us were the same biologically, we would die out.”

In their paper, Lordkipanidze, Zollikofer and colleagues cite Darwin’s insight, from his monumental volume *On the Origin of Species*, that recognizing species diversity comes “at the expense of admitting much variation” within species. Applying the species concept to fossil specimens can be notoriously difficult. Biologist Ernst Mayr’s *biological species* concept, which recognizes two individuals as a part of the same species if they are able to mate and produce fertile offspring, cannot be applied to fossils. Many fossil species are represented by individuals who may have lived millions of years apart.

Recognizing paleontological species therefore involves hypothesizing about historical population structure: did certain populations interbreed? Did they have limited or no gene flow, over time? “How to read this evidence,” Rightmire said, in relation to the similarities between the Dmanisi skulls and fossil taxa like *H. erectus*, “gets to the essence of questions about transitional populations… covering this ground adequately will require more analyses.”

The recent skull found at Dmanisi is just the latest in a series of spectacular finds, over the last 15 years, that have shifted our previous understanding of human evolution and raised many questions about the history of the emergence of our species that remain, as yet, unanswered.

If Lordkipanidze and his colleagues are correct, the skull at Dmanisi shows that the populations that dispersed from Africa 1.8 million years ago, relying on primitive stone tool technology and increased body sizes, did so with variable, and sometimes smaller, brain sizes. Their findings may also suggest that populations throughout Africa and into Eurasia may have been more linked, in terms of long-term gene flow, than previously thought.