

Oldest known example of abstract symbolic representation discovered in Indonesia

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9 January 2015

A recent article in the scientific journal *Nature* reports on the discovery of what appears to be a clamshell bearing intentionally produced geometric engravings dating to approximately half a million years ago (radiometrically dated to between 430,000 and 540,000 years before the present). If confirmed, this would be the oldest symbolic representation by human ancestors yet discovered, documenting an early stage in the development of modern human cognition.

The shell, from a freshwater mussel, genus *Pseudodon*, was recovered from a context associated with *Homo erectus* fossils, thought to be the earliest form of human ancestor to leave Africa, about two million years ago. The specimen exhibits a set of incisions, some of which appear to be a pair of parallel lines next to a pair of “V” markings, combining to form an “M” shape. Additional incisions are less regular. When fresh, the shell would have had a black surface. Engraved lines would have been light in color, strongly contrasting with the background.

The artifact was identified seven years ago by a graduate student during the examination of a collection of materials held at the Naturalis Museum, Leiden, The Netherlands. The markings are very faint and had been overlooked until the student photographed the shell with angled light. It has subsequently been subject to detailed analysis, including microscopic examination, before the discovery was made public in the *Nature* article by a team of 21 co-authors from the Netherlands, France, and Australia, led by Josephine Jordens, Faculty of Archaeology, Leiden University.

The collection containing the engraved shell had been recovered from the Trinil locality, Java, Indonesia by Dutch paleontologist Eugène Dubois in the 1890s. Trinil is the site of the original discovery of *Homo erectus* fossils by Dubois in 1891. The identification of

Homo erectus was a major step in the ~~evolution~~ understanding of human evolution based on Darwinian evolutionary theory, which was then only a few decades old. *Homo erectus* is thought to be the common ancestor of *Homo sapiens* (modern humans) and Neanderthals.

The Leiden collection includes evidence of human consumption of freshwater shellfish (small perforations apparently used to cut the muscle that holds the shell closed, forcing the shellfish to open), at least one shell intentionally shaped for use as a tool for cutting and/or scraping (the oldest known example of a shell tool), and the engraved shell itself. Both the perforations and the engravings appear to have been made using a shark’s tooth. The fact that amongst this large collection of recovered specimens (248 pieces of shell were examined) only one bears the engraved markings strongly suggests that these are not the result of either natural agents or the processing of the shellfish by *Homo erectus* to obtain meat.

The researchers attempted to replicate the markings and found that only consistent, well-controlled pressure could result in incisions of equivalent depth and form. Furthermore, the apexes of the “Vs” meet cleanly, with no gaps or overlaps. This “suggest[s] that attention was paid to make a consistent pattern,” according to the authors of the article. Microscopic examination also indicated that the grooves had weathered before burial, further supporting the interpretation that they were not the product of some natural process after the empty shell was deposited.

The next oldest known human-produced geometric engravings, including “V” motifs resembling those on the Trinil artifact, were made on pieces of red ocher found in Blombos Cave, South Africa, dating to 100,000 years ago. These artifacts are attributed to *Homo sapiens*, but the age of the Trinil artifact

suggests that the origin of such abstract representations, and the cognitive and motor skills needed to produce them, predates our own species.

The large time gap between the Trinil and Blombos Cave artifacts raises concern among some researchers. The lack of any other known objects bearing such designs during a span of roughly 400,000 years could indicate that the Indonesian specimen is a fluke, not an intentional representation. However, it must be remembered that the South African discovery was made only a decade ago and the Indonesian specimen lay unrecognized for over a century. The apparent long interval between the ages of these two artifacts may well be the result of a lack of sufficient focused research, combined with the vagaries of preservation of physical materials over hundreds of thousands of years.

Although the specific meaning being expressed by the maker of the design is unknown, and probably unknowable, the indication that half a million years ago human ancestors were creating abstract representations is highly significant. Recent research demonstrates that regions of the brain that control the motor skills needed to make stone tools overlap with those important in the production of speech. This suggests that the beginning of abstract thought (necessary for speech) is over a million years old, as demonstrated by early stone tool manufacture (see: “Evolutionary links between the development of language and stone tool technology”).

The development of a sense of aesthetics beyond purely functional criteria, as indicated by the refinement of form in Acheulean handaxes compared to older Oldowan tools, beginning about 1.75 million years ago, for example, suggests increasing sophistication of abstract thought. However, the creation of symbols, without direct bearing on immediate practical activities, implies that early humans, dating back at least a half million years, were already engaged in the production of abstract mental representations of some aspects of their world. In the words of the article’s authors, “The manufacture of geometric engravings is generally interpreted as indicative of modern cognition and behaviour.”

The engraved shell from Trinil represents an early stage in the development of graphic symbolic images which led, by about 40,000 years ago, and most likely earlier, to the cave art of Europe, Indonesia, and probably to similar such efforts in other parts of the

world as yet undiscovered. The existence of these engravings indicates that abstract symbolic thought was evolving relatively early in the development of the genus *Homo*. If so, this has important implications for the evolution of social organization and language.

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