



Press Release

Where did Stone Age hunter-gatherers get the raw material for their tools?

International research team from the University of Tübingen and the Senckenberg Nature Research Society finds early humans in southern Africa traveled long distances to get the right stone color

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A new study has shown that as early as the Stone Age, people in Africa traveled long distances to procure colorful stone, forming the raw material for the manufacture of tools. The study was led by Dr. Gregor D. Bader from the Department of Early Prehistory and Quaternary Ecology and the Senckenberg Centre for Human Evolution and Palaeoenvironment at the University of Tübingen. The researchers investigated worked stone tools from sites up to 40,000 years old and natural rock deposits in what is now the Kingdom of Eswatini on the borders of South Africa and Mozambique, formerly Swaziland. They found that thousands of years ago, hunter-gatherers traveled between 30 and a hundred kilometers to collect certain rock materials with striking colors, such as red jasper, green chalcedony and black chert. The study has been published in the *Journal of Archaeological Science*.

In order to reconstruct the movements and migrations of early humans, it helps to look at entire landscapes, so the international research team included several sites with tools and potential sources of raw materials in its study. "Eswatini, with the collections of the National Museum in Lobamba, provided good conditions for this. Artifacts from numerous archaeological sites are kept there," Gregor Bader says. In their study, the researchers examined stone artifacts from the four sites of Hlalakahle, Siphiso, Sibebe and Nkambeni.

By working closely with Dr. Brandi MacDonald from the research reactor in Missouri, USA, Bader's team used neutron activation analysis to determine the origin of the stones. In this process, the stone samples are irradiated with neutrons, resulting in an interaction between the atomic nuclei in the sample and the neutrons. In this process, the resulting products

University of Tübingen
Public Relations Department

Christfried Dornis
Director

Janna Eberhardt
Research reporter
Phone: + 49 7071 29-77853
[janna.eberhardt\[at\]uni-tuebingen.de](mailto:janna.eberhardt[at]uni-tuebingen.de)

[presse\[at\]uni-tuebingen.de](mailto:presse[at]uni-tuebingen.de)
www.uni-tuebingen.de/aktuell

Senckenberg Nature Research Society
Press Office

Sabine Wilke
Director

Judith Jördens
Press & Social Media
Phone +49 69 7542 1434
[judith.joerdens\[at\]senckenberg.de](mailto:judith.joerdens[at]senckenberg.de)

[pressestelle\[at\]senckenberg.de](mailto:pressestelle[at]senckenberg.de)
www.senckenberg.de/presse

and the radiation released reveal the quantitative composition of the stone sample, the elements it contains and their isotopes, which are similar atoms of different masses. The specific pattern – in research this is also referred to as a geochemical fingerprint – is characteristic of stone materials of different types and their respective places of origin. “Although the method is destructive, only tiny sample quantities are required and the results are excellent,” Bader explains. “By comparing the analysis patterns of the stone used and the rocks found in the region, we can pinpoint the origin of the raw stone.”

Preference shifts to red jasper

Man-made tools made of green chalcedony and red jasper from the sites had the same geochemical fingerprint as corresponding rock deposits in the Mgwayjza Valley, 20 to a hundred kilometers away. “We have calculated whether the stones used may have been transported via the local Komati and Mbuluzi rivers. However, this could only have happened as far as Hlalakahle, and the other three sites of Siphiso, Sibebe and Nkambeni are a long way from there. Even if we assume that the hunter-gatherers took the shortest routes, we still find considerable distances between the rock deposits and the places where the stones were used. In addition, an exchange of materials with other early human groups is conceivable,” says Bader. The stones were transported over long distances. “Colorful and shiny materials seemed attractive to early humans; they often used them for their tools. We can only speculate as to whether the colors had a symbolic meaning.”

What is particularly interesting is the finding that color preferences shifted over time, says Bader. While black and white chert and green chalcedony were frequently used in the Middle Stone Age in Africa 40,000 to 28,000 years ago, red jasper was particularly popular in the later Stone Age around 30,000 to 2,000 years ago. “Both colors occurred close together in the same valley and in the same river deposits, so we can assume a deliberate selection of different materials at different times,” says Bader.





The Mgwayiza Valley in Eswatini. Photo (top): Adam Rogers, photos (center and bottom): Gregor Bader



Natural outcrop of green chalcedony in the Mgowiza Valley, Eswatini. Photo: Gregor Bader



Natural outcrop of red jasper in the Mgowiza Valley, Eswatini. Photo: Mbongeni Dlamini

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Contact:

Dr. Gregor D. Bader
University of Tübingen
Institute of Prehistory and Medieval Archaeology
Early Prehistory and Quaternary Ecology
Senckenberg Centre for Human Evolution and Palaeoenvironment
Phone +49 7071 29-74993
[gregor.bader\[at\]uni-tuebingen.de](mailto:gregor.bader[at]uni-tuebingen.de)