Abstractions

FIRST AUTHOR

Earth is believed to have lost most of its primordial gases by two processes: a catastrophic event early in its history and 'degassing' — regular release of gas over time. But scientists have found evidence suggesting that an argon isotope used as a marker of degassing is not as easily expelled from Earth's deep mantle as was thought. Bruce Watson and his colleagues at Rensselaer Polytechnic Institute in Troy, New York, characterized the behaviour of this isotope as it interacted with mantle minerals (see page 299). Watson talks to *Nature* about their findings.

Why is how Earth degasses important?
Probing the mechanisms that control global cycling of specific elements helps us to understand other large-scale Earth processes, including those of importance today involving carbon dioxide and methane. Noble gases such as argon are useful for studying the mechanisms that bring gases to Earth's surface and into the atmosphere because they are not chemically reactive or biologically processed.

What does your work involve?
I try to design experiments that enhance our understanding of deep-Earth chemical processes. Geochemistry is typically based on observations of natural samples, and I devise experiments to aid our interpretation of these observations.

What's new about your latest work?
We heated mantle minerals in an argon atmosphere and measured how much argon they took up directly. Previous studies used a less direct route, thermally degassing the minerals into a mass spectrometer. Until now, no one had characterized argon diffusion — that is, how fast the atoms move around — in mantle minerals. Knowledge of this process helped us estimate the time required for these atoms to equilibrate.

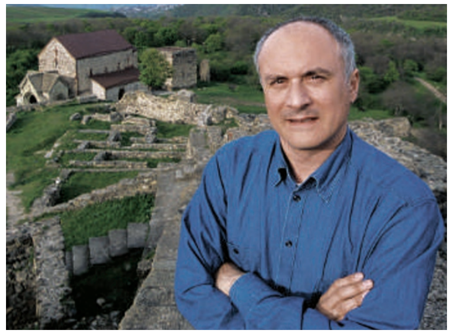
How do your findings contradict previous work?
They suggest that argon could stay in a region of mantle that has undergone partial melting and not be lost to the atmosphere. This might extend to other gases — we can no longer assume that a partly melted region of the mantle will have completely degassed.

So how does argon get into the atmosphere?
Our data suggest that argon shouldn't be in the atmosphere, but it is, so there must be a mechanism for its release. We propose that release occurs near divergent plate boundaries, where Earth's rigid outer layer is continually forming. We think argon may be trapped in unmelted residue in this layer and be released through mineral weathering. ■

MAKING THE PAPER

David Lordkipanidze

Georgian site yields more about Eurasia's first human inhabitants.



On finishing his doctorate in Russia in 1991, David Lordkipanidze opted to return home to Georgia, a country facing political and economic uncertainty in the wake of declaring independence from the dissolved Soviet Union. There, the palaeoanthropologist, who is now director of the Georgian National Museum in Tbilisi, started work at an archaeological site beneath the medieval city of Dmanisi in southeastern Georgia, where crude stone tools and bones from prehistoric animals such as sabre-toothed tigers had been found.

Later that year, his homeland loyalty paid off when a well-preserved, clearly human jaw bone was found in the prehistoric layers. Although the find's significance took years to become apparent, it began Lordkipanidze's 16-year devotion to the site of humanity's first known forays outside Africa.

With Lordkipanidze's persistence and recruitment of international scholars, the site has yielded skulls and partial skeletons from at least five individuals, including one adolescent. These have been dated to 1.77 million years ago — the oldest indisputably human remains ever found in Eurasia. "Dmanisi is not only the oldest site outside Africa, but also the most prolific — a treasure trove of prehistoric archaeology," says Lordkipanidze.

The Dmanisi finds changed prevailing views about when humans left Africa and who they were. The Dmanisi people were not the tall, big-brained, sophisticated tool-makers *Homo erectus*, who were originally thought to have been the first species to migrate from Africa to Europe. But neither, show Lordkipanidze and his colleagues on page 305 of this issue, should they be classified strictly as *Homo habilis* — the oldest species with modern human attributes found in Africa.

The brains of Dmanisi people are intermediate in size between those of *H. habilis* and *H. erectus*. Their skeletons show that they had legs and feet adapted for long-distance walking and running similar to those of modern humans, but hands and arms reminiscent of those of our tree-dwelling ancestors.

Only 5% of the 13,000 square-metre site has been excavated so far, and for many years it was poorly protected from the elements and looting, covered by just a simple plastic tarpaulin roof. Through fundraising and outreach, Lordkipanidze has ensured the site's integrity. A permanent dome has been built over the site, and includes laboratory space and an open-air museum. This is scheduled to open to the public in October.

"Archaeology should be a source of national pride and part of the economy," says Lordkipanidze. "If Georgia is to be a successful country, science needs to be part of the culture and not just for a small club of scientists." He hopes that Dmanisi's updated protection will qualify it for classification as a UNESCO (United Nations Educational, Scientific and Cultural Organization) World Heritage Site. At Dmanisi, he adds, "you can travel back through time, first through a medieval city, then the Bronze Age, and finally prehistory."

Lordkipanidze's dedication to his country's scientific progress is inborn — his father founded the country's Center for Archaeological Research, which is based in Tbilisi. But Lordkipanidze chose not to follow his father's footsteps into classical archaeology, being drawn instead to probe man's origins. ■

FROM THE BLOGOSPHERE

Larry Benson's view that papers should not need Supplementary Information (*Nature* **449,** 24; 2007) has elicited lively debate on Nautilus (see http://tinyurl.com/2lfkx4).

Rather than being a way to place important-but-not-essential data at the readers' disposal — as originally envisaged — Supplementary Information (SI) has proliferated: ten pages are not unusual, and *Nature*'s average is about five, writes Benson.

"Maybe the Editor(s) need to clamp down on the SI abuse?", opines Richard Grant in response. Massimo Sandal, however, disagrees, saying that it is not the raw information that is the main problem, but that SI is "usually not as carefully crafted as the paper itself". He concedes that he has read SI that was "wonderfully made and useful", citing as an example a paper by P. W. K. Rothemund (*Nature* **440,** 297–302; 2006).

Matthieu Vermeren sums up the mood, saying SI was initially "a great way to link a paper with files that are difficult to print such as movies". But, he adds, it now contains "vast amounts of data that could either be part of the paper or not shown". ■

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