Given that shallow tube wells tap into arsenic-laden sedimentary layers and the concentrations of this toxin in water may increase, it seems sensible to look elsewhere for clean water supplies. The heterogeneous nature of arsenic distribution in shallow groundwaters means that well-switching[10] — many villages lie close to low-arsenic wells — is a useful short-term remediation strategy (A. Van Geen, LDEO-Columbia Univ., USA). Furthermore, the older and deeper aquifers, made up of Pleistocene deposits (laid down more than 10,000 years ago) are often low in arsenic, possibly because they contain a high proportion of mineral surfaces able to sequester the poison. Thus deep tube wells, which tap into groundwater well below the arsenic-affected layers, are a potential source of arsenic-free water.

But as highlighted repeatedly at the meeting, even water in these deep aquifers may not remain arsenic-free. There are growing concerns that extensive deep water extraction will draw arsenic-rich water from the top of the aquifer to depth (W. Burgess, UCL, UK), polluting otherwise pristine waters. Modelling of regional-scale water flow in the Bengal Basin does indeed suggest that the extraction of large volumes of water from deep aquifers may draw down shallow, high-arsenic groundwaters (H. Michael, Univ. Delaware, USA). The model also suggests, however, that contamination of the deeper aquifers can be limited by careful groundwater management, for example by ensuring that the water is used only to meet non-irrigation needs.

The future of groundwater in southern Asia lies in the balance, and serious consideration should be given to alternative water supplies. The unregulated construction and use of tube wells may well intensify arsenic contamination of shallow groundwater and draw arsenic into previously uncontaminated deeper groundwaters. Proper management, guided by water-flow modelling studies (R. Beckie, UBC, Canada; A. Desbarats, GSC, Canada) and long-term campaigns to monitor well water, which will provide much needed information on the impact of water withdrawal on arsenic levels, will be required if we are to prevent this problem escalating further beyond our control. ❐

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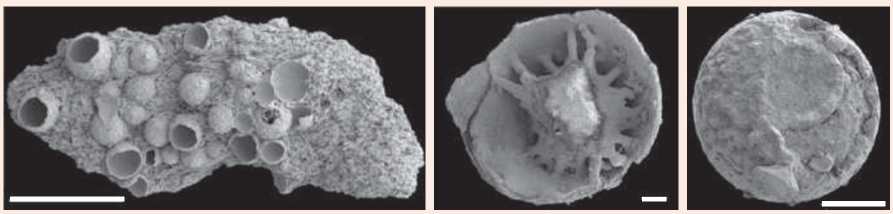
PALAEONTOLOGY

Aging well

Long before the reign of complex animals, the Earth's crust stretched and thinned, creating a marine basin in what is now central India. The Vindhyan basin was flooded with sea water, and subsequently filled with sediments. But it is unclear just when these events happened. Radiometric ages from zircons and diamonds, as well as the orientation of magnetic grains, suggest that the basin began to fill between 1.7 and 1 billion years ago. However, purported fossils hidden in the lower rock layers hint at the presence of simple animals that are consistent with a much later origin for the layers — in the Ediacaran or Cambrian periods (about 640 to 500 million years ago).

The ensuing debate has seen some researchers question whether these 'fossils' are actually of biological origin, whereas other groups have suggested that the radiometric ages reflect the source of the sediments, rather than the creation of the basin's lower layers. Stefan Bengtson of the Swedish Museum of Natural History and his colleagues have jumped into the fray, with new fossil specimens and new ages for the surrounding rocks (*Proc. Natl Acad. Sci. USA* doi: 10.1073/pnas.0812460106; 2009).



100 nm 100 μm 100 μm

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The miniscule fossils are mostly contained within phosphorous-rich nodes. The nodes revealed the remains of bacterial colonies, which generally show up as small clusters of filaments that form distinctive shapes. The group also found segmented tubes, less than 200 μm in diameter, which could be the remnants of algae. But they failed to find the most contentious microfossils from previous studies: embryos from primitive multicellular animal life. Instead, they suggest that the tiny spherical shapes are air bubbles produced by bacterial activity, trapped in the sticky film covering the microbial mats. Overall, they contend that the fossil assemblage probably represents a pre-Ediacaran ecosystem.

Direct dating of the phosphate-rich material surrounding the fossils using lead isotopes minimized potential sources of contamination. Their analyses converged on an age of roughly 1.65 billion years — well in line with previous mineral-based estimates — leading the group to conclude that the rocks, and the fossils within, are indeed from the Palaeoproterozoic era.

Although the rocks no longer seem to reveal early animals, Bengston and colleagues are quick to point out that the exceptional preservation of the fossils provides a unique window into life 1.6 billion years ago. Interpretation of the segmented tubes as algae would push back the earliest appearance of multicellular eukaryotes by up to 600 million years, and the bacterial clumps show a rare glimpse of pre-Cambrian calcifying cyanobacteria — proving that there is still much to learn from these controversial rocks.

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