A Late Triassic Trove of Fossil Plants

ALTHOUGH IT COULD BE ASSUMED FROM Erik Stokstad's News Focus article "Utah's fossil trove beckons, and tests, researchers" (5 Oct., p. 41) that the only fossils found in the Grand Staircase–Escalante National Monument in southern Utah are the remains of dinosaurs, mammals, and other tetrapods, nothing is farther from the truth.

Limited research has already shown that the Mesozoic strata exposed there (~65 to 250 million years old) also contains abundant fossilized remains of invertebrates (*1*) and land plants (*2*) and that the potential for significant discoveries is large (*3*). For example, personal experience indicates that plant fossils from the early part of the Age of Dinosaurs are widely distributed in the terrestrial Chinle Formation of Late Triassic age in the monument (*4*). Such fossils have been known in the area of the monument since the early 1900s (*5*) and include petrified wood, leaf compressions, and palynomorphs.

A large trunk of the extinct Late Triassic conifer *Araucarioxylon arizonicum* exposed in the Wolverine Petrified Forest in the Grand Staircase–Escalante National Monument, Utah.

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In more recent years, some of these fossils have been discussed briefly (*6*), and it is clear from these few accounts that the new monument contains important deposits of Late Triassic plant fossils. In fact, it contains the remains of the second largest Late Triassic petrified forest in the world (*7*), known informally as the Wolverine Petrified Forest, which is just now being studied for the first time. A comprehensive study of the Chinle Formation flora will provide new knowledge about the land flora that grew near the west coast of Pangea during the Late Triassic and formed the base of the terrestrial food pyramid in that region. Also, it has the potential of providing new data on the paleoclimate of the region. Preliminary study of the wood structure in the logs in the above-mentioned petrified forest indicates that the logs do not have annual rings, which is unexpected because the area appears to have been under the influence of a strong megamonsoon during the Late Triassic (*8*).

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References and Notes

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Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the previous 6 months or issues of general interest. They can be submitted by e-mail (science_letters@aaas.org), the Web (www.letter2science.org), or regular mail (1200 New York Ave., NW, Washington, DC 20005, USA). Letters are not acknowledged upon receipt, nor are authors generally consulted before publication. Whether published in full or in part, letters are subject to editing for clarity and space.

The Pros and Cons of Nuclear Fuel Recycling

IN "PLUTONIUM AND THE REPROCESSING OF spent nuclear fuel" (Policy Forum, *Science*'s Compass, 28 Sept., p. 2397), Frank N. von Hippel reiterates the standard arguments against reprocessing in response to the National Energy Policy Development Group report that advocates a reexamination of U.S. policies on reprocessing R&D. The report also states that "the United States will continue to discourage the accumulation of separated plutonium worldwide" (*1*). Most of us who advocate a resumption of U.S. R&D in advanced reprocessing and remote fuel fabrication methods that avoid plutonium separation agree.

All fuel cycles must use enrichment or reprocessing, and both technologies provide routes to proliferation. There currently exists a 30% global excess of enrichment capacity, and any nation acquiring enrichment facilities today appears suspicious on economic grounds. This situation will reverse in the next two decades as U.S. gaseous diffusion enrichment plants retire and as current excess military and civilian enriched uranium supplies are consumed.

The natural trajectory for enrichment technology is toward methods that are more efficient and therefore easier to conceal; for reprocessing, it is toward methods that make the waste stream as clean as possible and the fuel quite dirty and therefore hard to steal. Thus, the emergence of a global market for new enrichment technologies and services deserves concern, particularly at the scale implied by the use of seawater uranium for the expansion of once-through reactor systems.

These concerns also relate to storage issues. Only a few long-term methods can be envisioned for managing nuclear waste. The strategy of highly dispersed and protracted surface storage may continue indefinitely. Conversely, a small number of geologic repositories might be sited to take this waste. I doubt we will site a "mega-repository" capable of holding centuries of global spent fuel, such as the proposed Pangea site in Australia, or that tens or hundreds of repositories will ever be sited worldwide. Thus, for sustainable fission energy production, the scarce resource will not be uranium, but will almost