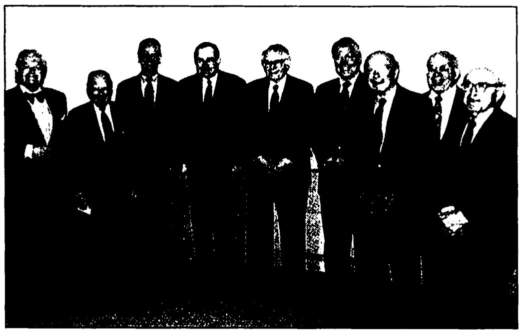


Advice meisters. Past science advisers include, from left: D. Allan Bromley; Ed David; MIT president Charles Vest, who hosted the affair; Neal Lane; Guyford Stever; George Keyworth; Donald Hornig; Jack Gibbons; and William Golden.

(Eight of the 18 formal or informal advisers made it to the meeting; only two of the living advisers did not show.) In addition to discussing their role in shaping U.S. policies on basic research, defense, health, and the environment, the officials worried that the Bush Administration may not be interested in giving the same opportunities to their successor. "There are too many litmus tests," complained D. Allan Bromley, who advised the current president's father, George H. W. Bush.

Some advisers and senior scientists see the empty office in the Old Executive Office Building as an ominous sign that the White House prefers not to hear advice that may conflict with its ideological goals. "It's clear that science policy is not one of the Administration's priorities," says William Golden, who advised President Harry Truman. But Administration officials insist that the delay is due to the truncated transition following the contested election and onerous paperwork requirements. "We are behind the curve, and this is only one of many positions," says Sean O'Keefe, deputy director of the Office of Management and Budget.

The former advisers ticked off several recent actions by the new president that they feel could have benefited from input from a science adviser. They include the decision to abandon the process spelled out in the Kyoto Treaty to limit greenhouse gases, reduce spending on energy R&D, reverse water-quality standards, and move ahead with a new missile defense system (see p. 1035). Decisions on the use of stem cells in research and oil drilling in the Arctic loom on the horizon, they added. "These are all issues with a strong R&D component," says MIT President Charles Vest. "But I don't know with whom they are consulting."

Although he declined comment, Vest is believed to be one of several persons approached who have asked not to be considered for the science adviser's job. And the post may become less appealing with every passing day. Any nominee is likely to face detailed questions at a Senate confirmation hearing about the candidate's stance on global warming, stem cell research, and other controversial topics, notes Bromley. Proposed tight budgets for all research agencies except the National Institutes of Health also diminish the attractiveness of the job. Even so, Bromley says he believes that the White House may be ready to announce a candidate within a few weeks. —ANDREW LAWLER

MICROBIOLOGY

Shale-Eating Microbes Recycle Global Carbon

Once again, microbes are proving just how versatile they can be. Key players nearly everywhere—from deep-sea vents to termite guts, and perhaps even on the Red Planet—microbes carry out biochemical reactions that help recycle the elements of life, such as carbon, nitrogen, and oxygen. On page 1127, geochemist Steven Petsch and his colleagues at the Woods Hole Oceanographic Institution (WHOI) in Massachusetts now describe a new role for microbes: promoting the release of organic material locked up in sedimentary rocks. "It has never before been demonstrated that the organisms are involved [in this process]," says Don Canfield, a biogeochemist at Odense University in Denmark. "And what [Petsch and colleagues] have done is pretty neat." The work also fills a gap in the global carbon and oxygen cycles.

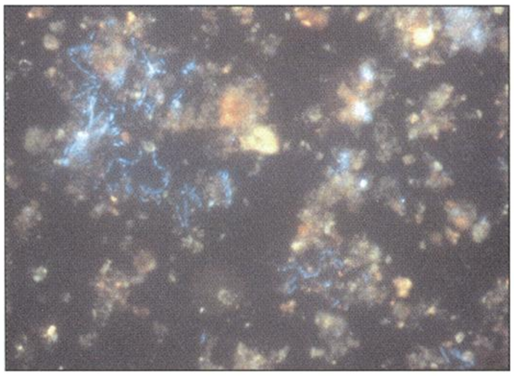
The researchers worked on the common sedimentary rock shale. As shale forms, it traps carbon in a complex material called kerogen, which is held in microscopic pores in the rock—thus holding the carbon out of the carbon cycle. In shale exposed to air, however, the carbon is slowly oxidized to carbon dioxide and released. Indeed, says John Hedges, a marine organic geochemist at the University of Washington, Seattle, the weathering of shales "is one of the big sinks for oxygen." Even so, because kerogen is insoluble and hard to work with, few researchers had tried to figure out how kerogen is oxidized.

For his experiments, Petsch, working with WHOI colleagues geomicrobiologist Katrina Edwards and organic geochemist Tim Eglinton, collected samples of shale in various states of degradation from an outcrop in Kentucky. Back in the lab, he ground up and sterilized some of the collected shale, and extracted any remaining accessible carbon. He then inoculated samples of the ground-up shale sediment with material taken from deep within cores dug out from each of six depths along the outcrop. In theory, any microbial life those cores contained would have had "no energy source except shale" in the treated rock, Edwards points out.

After several months of culturing these samples, the researchers detected signs of microbial life under the microscope. They also searched for phospholipids, fatty molecules found in cell membranes. "The lipids tell us that, yes, these are bacteria," Petsch explains. In addition, he and his colleagues used accelerator mass spectrometry to determine the relative amounts of two unusual forms of carbon, carbon-13 and carbon-14, in the cultured samples. The ratio of the two indicates the age of the microbes' food source as carbon-14 decays over time.

The researchers found six types of phospholipids in the cultures and 41 in the samples from the weathered outcrop, suggesting that microbes lived in both, but that only a subset thrived in the lab tests. Because the phospholipids from the cultures contained almost no carbon-14, Petsch knew that the microbes were consuming the shale's kerogen—formed with the shale about 365 million years ago—and not sneaking much nourishment from a younger food source, which would still have contained carbon-14. "[The work] is a beautiful combination of an established technique and the right experimental question," comments Hedges. "It's going to bring a focus of more biology on this aspect of geochemistry."

Even so, Cynthia Riediger, a petroleum geochemist at the University of Calgary in Canada, cautions that it remains to be seen just how important this newly unearthed microbial contribution is to the carbon and oxygen cycle. To find out, researchers will need to quantify the amount of shale as well as the relative role of the microbes in weathering. But "the next big question that looms out of this study is who are these organisms," Hedges notes. Petsch may soon have that answer. He says he has already isolated DNA from the cultures and is well on his way to finding out just who's been eating the shale all these millions of years. —ELIZABETH PENNISI



Shale diet. Microbes (blue) found among shale particles degrade carbon compounds in the rock pores.

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