

# ENVIRONMENT

## Water quality test is unreliable

Health officials have used the coliform index as a rough indicator of water quality to guard against classic water-borne diseases such as typhoid. The test looks for generally harmless organisms rather than disease-causing pathogens because the latter are usually too hard to measure. But key assumptions of the test — that positive readings indicate coliforms are present and that the presence of coliforms implies pathogens are also present — are erroneous. Scientists have suspected as much, but University of Maryland microbiologist Rita R. Colwell says she and colleague Brian Austin are the first to analytically prove it.

Working with Chesapeake Bay water, sediment and oyster beds, the pair found that a variety of normally safe bacterial species gave false positives. As many as 25 percent of the "positive" samples contained bacteria native to the Bay, not the fecal coliform that was sought.

Positive readings occur when bacteria ferment a lactose-sugar broth in which they are cultured for two days. Colwell and Austin found that some harmless bacteria possess that ability and others may acquire it via plasmids — pieces of extracellular DNA that can be passed among many bacterial species. What's more, they found that bacteria in oyster-bed sediment generally correspond to those in oysters, but differ markedly from those in water above the sediment. As such, sediment cultures appear to be better predictors of shellfish quality than do water samples, Colwell told SCIENCE NEWS.

## Hot times on old sites

In June the Department of Energy announced that it was conducting radiological surveys of sites where work with radioactive materials had, but no longer, occurred. To date, some 26 sites have been identified as having "enough radioactive contamination to warrant at least some cleanup," according to Dick Kennedy of the agency's environmental-control-technology division.

All were abandoned years ago by DOE's predecessor agency, the Atomic Energy Commission, or one of its contractors. Now at least some of the sites are privately owned and actively used; for example, Kennedy said there is a small industrial park on one site. Preliminary DOE estimates indicate cleanup costs could run into the millions of dollars per site, one source says, but who will be responsible or pay for cleanup is still in question for all but one of the sites.

That site, in Canonsburg, Pa., contains mill-tailing wastes — residue from an early step in processing uranium ore — and as such qualifies for inclusion in a program to clean up abandoned mill-tailing sites that the President just signed into law.

There are 22 such sites. Estimates of their cleanup range from \$120 million to \$180 million, with the feds providing 90 percent and individual states the remaining 10 percent.

Cleanup on even those sites will be stalled until the Environmental Protection Agency promulgates standards for what constitutes "clean," Kennedy said. The legislation gives EPA one year to develop the standards.

## Marketable sulfur from stack gas

Conversion of sulfur dioxide from powerplant stack gases is under demonstration in West Germany. In the process, developed by Foster Wheeler Energy Corp., as gases pass through a bed of crushed coal at 1,200°F to 1,500°F, the pollutant, sulfur dioxide, reacts with coal to form elemental sulfur and carbon dioxide. Although other processes can achieve the same end result, the RESOX process uses coal, not natural gas, as its reactant.

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# SPACE SCIENCES

## The measure of Pallas

When Pallas, believed to be the second largest asteroid, passed in front of the star SAO 85009 last May 29, a veritable army of astronomers turned out for the event in hopes of being able to determine just how large the object really is. At the recent Pasadena meeting of the American Astronomical Society's Division for Planetary Sciences, Lawrence Wasserman of Lowell Observatory reported on the success of the army's maneuvers. Nearly 30 observers aimed their instruments at the happening, of whom seven — ranging from Wyoming to the eastern seaboard — reported positive results.

Pallas, Wasserman reported, is no simple sphere, or at least the object blocking the star's light did not appear to have a circular cross-section, even allowing for errors in timing the disappearance and reappearance of the star. The combined observations, according to James Elliot of Cornell University, seem best to describe a tri-axial ellipsoid whose axes measure  $558 \pm 6$  kilometers,  $526 \pm 10$  km and  $532 \pm 30$  km. The mean diameter of Pallas would thus be  $538 \pm 12$  km, subject to some error from the uncertainty in the 266-km figure since the terrestrial observers, Elliot reported, were "only 20° from looking at it pole-on."

Other measurements indicated a geometric albedo, or reflectivity, of  $0.103 \pm 0.005$  for the face visible during the occultation, and a density (based on an earlier mass calculation from gravitational perturbations among several asteroids) of  $2.8 \pm 0.5$  grams per cubic centimeter. The large uncertainty in the density ( $2.3$  to  $3.3$  g/cm<sup>3</sup>) makes it difficult to draw firm conclusions about what Pallas is made of, since it ranges from water-rich carbonaceous chondrites on the "light" end (supported by recent infrared spectra) to water-poor types at the middle (supported by other spectral studies) to heavier materials like those of earth's moon. According to Clark Chapman of the Planetary Science Institute in Arizona, "We now know a little less than we did before."

## An icy satellite of Uranus

Although the satellites of Uranus are so small as seen from earth that almost nothing is known about them, Richard Greenberg of the Planetary Science Institute in Arizona has concluded that at least one of the innermost two — Miranda and Ariel — is likely to be icy.

Their measured brightnesses could be taken as an indicator of their sizes if one made certain assumptions about the reflectivity (and thus composition) of their surfaces. Avoiding the assumption, Greenberg adds another datum: Often, as the moons circle their host planet with periods of a few days, Ariel and Umbriel pass through conjunction with Uranus; that is, they and the planet are in a line. According to the scientist, the angle between that line and the equally imaginary line joining Uranus with Miranda changes very slowly — it takes about 12 years for the Uranus-Miranda line to move through 360° relative to the Uranus-Ariel-Umbriel line. Not quite a perfect "resonance," which it would be if the angle were always the same, but close enough that (by the reasoning of the mathematician Laplace) the gravitational perturbations among the three moons are somewhat enhanced. Any such perturbations, says Greenberg, ought thus to be visible to earth-based astronomy — yet they're not. The implication is that the products of the moons' masses, particularly the Miranda-Ariel pair, are relatively small.

There are two possible interpretations of this perception, Greenberg says. One moon of that pair (it will take more and better observations to determine which one) is either large and low in density or small. In either case, the observed brightness suggests ice: a small moon covered with the stuff or a large one that is lightweight because it is virtually made of it.

369