RANDOM SAMPLES

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Taking the Long View at Yucca Mountain

The disposal of U.S. high-level radioactive wastes is looking more and more like the ultimate test of scientists' predictive powers. Last week in Washington, a National Research Council (NRC) committee released a congressionally mandated report* on the disposal of radioactive wastes at a proposed repository under Yucca Mountain in Nevada. The report was to provide scientific guidance in setting a health standard for disposal plans. It concluded that researchers would likely have to predict the state of Yucca Mountain hundreds of thousands of years from now.

The Environmental Protection Agency (EPA) now requires that a repository meet safety standards for 10,000 years, but the NRC committee concluded that the EPA should look far into the geologic future, when risk is heightened by the breakdown of waste containers. "You want to calculate [risk] when risk is highest," said committee chair Robert Fri of Resources for the Future, a Washington think tank, "which will likely be many tens of thousands or hundreds of thousands of years in the future."

Very long-range forecasts are feasible, the report says, because the Yucca Mountain area is liable to be geologically stable for the next million years. Earthquakes will shake it, volcanoes may erupt there, but the underlying forces driving geologic change should remain the same as today.

True enough, say some observers, but that puts a whole new complexion on the problem. "Even the 10,000-year time scale made me kind of nervous," admits one geologist familiar with the report. "When you start moving it out toward 1 million years, then you're really pushing the boundaries of your uncertainties."

Technical Bases for Yucca Mountain Standards (National Academy Press, Washington, D.C., 1995).

KENNETH COALE

Sea change. Experiment turned water green with phytoplankton.

Oceanographers' Green Thumb

It takes a knack to grow plants under difficult conditions, particularly if you're trying to turn the ocean green. Oceanographers learned this 2 years ago when they ran a so-called "Geritol" experiment to see if iron fertilization might green up a small patch of the equatorial Pacific Ocean. The idea was to see if a dearth of iron might be limiting plankton productivity in parts of the ocean, but the experiment was also being watched because it might be possible, on a huge scale, to grow enough phytoplankton to consume extra carbon dioxide in the atmosphere and thereby avert global warming (*Science*, 25 February 1994, p. 1089). The experiment worked, but not very well.

On a second try this spring, however, "the ocean actually turned green," says chief scientist Kenneth Coale of Moss Landing Marine Laboratory. The trick to fine ocean gardening may have been how often the fertilizer was sprinkled. Coale says this time the scientists applied the iron in three batches days apart, rather than in one lump. That kept the surface concentration of iron high even as the metal inevitably coagulated and sank. Productivity quadrupled this time, says Coale, dramatically supporting the iron deficiency hypothesis.

But green does not mean a go for the iron fix for greenhouse warming. Oceanographers warn that large-scale messing with ecology is a risky business. Besides, they say, modeling suggests that even massive fertilization would have a modest effect on rising carbon dioxide. Says modeler Tsung-Hung Peng of the National Oceanic and Atmospheric Administration in Miami: "They did good work proving iron increases biological productivity, but it's not a greenhouse solution."

Gene Gives Old Mice Better Immunity

Although the immune system weakens with age, new animal research suggests that gene therapy can rejuvenate it. Immunologist John Mountz and colleagues at the University of Alabama at Birmingham report in the July *Journal of Experimental Medicine* that a bioengineered gene in mice mitigated defective regulation of immune cells, a problem associated with aging.

Programmed cell death, or apoptosis, helps keep immune cells called T cells functioning properly by regulating levels of the cells and destroying flawed ones. "While it has been known that the immune response becomes weaker with age because inactive T cells build up," Mountz says, his research now suggests that abnormal apoptosis causes the buildup, and a worn-out gene is the culprit.

The group focused on a gene called *fas*, which codes for a receptor on a cell's surfaces that helps to set off a process that ends in the cell's death. They found that *fas*-mediated cell death declines as mice age, because the gene's expression is not sustained.

When the group gave the mice an engineered copy of *fas* with a regulatory region to maintain the gene's expression over time, *fas*-mediated cell death continued in old age. And the mice kept up T cell production and function in the thymus and spleen, areas usually compromised in aging.

Apoptosis expert Douglas Green of the La Jolla Institute of Allergy and Immunology in California is enthusiastic about the work, calling it an "interesting observation which will take us a while to unravel." It remains to be proven, he says, that forced expression of *fas* was responsible for removing inactive T cells in the mice; also, the better immune response might have resulted from some other mechanism.

Booster Shot for Fast Peer Review

In rapidly moving fields like immunology, 6 months can seem like an eon. Yet that's typically how long it takes for hot results to wend their way through revisions, printing, and mailing at peer-reviewed publications such as the *Journal of Immunology* (JI). Now, however, top immunology papers are getting published faster than ever—and are reaching more scientists—thanks to the Internet and "The Cutting Edge."

A new section of JI, "The Cutting Edge" is available free on the World Wide Web (http://journals.at-home.com/JI). A "fast-track" peer-review process—authors are not asked to revise their manuscripts—cuts turnaround time from 6 months to about 6 weeks, explains Peter Lipsky, JI's editor-in-chief. And "Cutting Edge" appears on-line days before the printed journal comes out. "We were amazed at the rapidity," says Barbara-Jean Boorman, an immunologist at Boehringer Ingelheim Pharmaceuticals in Ridgefield, Conn., and an early contributor. "The emphasis is on novelty and interest rather than perfection," Lipsky says. But submissions must be "in the top 10 percent" to warrant such treatment, adds JI executive editor Joanna Matthews. What makes "The Cutting Edge" itself novel, says Lipsky, is that "the information [is] available quickly over the World Wide Web, and to individuals who don't necessarily subscribe to the journal."

Boorman's team submitted its article, on intercellular adhesion molecules, in May; it appeared in print and on the Web in early July. Publishing in "The Cutting Edge" has not only generated "a remarkable response" in e-mail from colleagues, Boorman says, but also helped her lab beat another group to the punch. "We were looking for a format that would let us get our information out as soon as possible," she says.