on Economic Trends.

"The court's decision basically came out as NIH argued at the appeals hearing," says Bernard Talbot of NIH. At that time, NIH agreed to prepare environmental assessment statements on individual experiments, but opposed Rifkin's argument that statements were necessary on a 1978 revision of the NIH guidelines regulating recombinant DNA research and on NIH's overall program for approving experiments involving environmental release of genetically engineered organisms. The other defendant, the University of California, opposed all three points.

The impact of the decision still rests on future court decisions. The district court must rule on what constitutes an adequate environmental assessment, and on whether any individual assessment is satisfactory if NIH does not prepare a "programmatic" environmental impact statement (EIS), covering its entire policy regarding deliberate-release experiments.

The court's opinion is critical of NIH. "NIH, no less than any other federal agency, must ensure that its decisions meet the standards of environmental concern and reasoned decision-making required by law," the court says. "The complexity and uncertainty of the issues before NIH do not diminish these responsibilities one iota."

The court decision states that in NIH's consideration of the proposed University of California experiment, the agency "completely failed to consider the possible environmental impact from dispersion of genetically altered bacteria, however small the number and however subject to procedures limiting survival."

NIH will probably submit its environmental assessment document on the frost-free bacteria experiment to the district court as soon as possible, according to Talbot. But Rifkin says, "We will challenge the assessment in the district court."

In the decision regarding a programmatic EIS, the appeals court says such a document would be "helpful," but the court is not prepared to argue it is essential if "NIH gives adequate environmental consideration to each deliberate release experiment...." The court follows this statement with a stronger opinion: "...if NIH does not at least consider the advisability of a programmatic EIS, its approval of individual deliberate release experiments is likely to violate established principles of reasoned decision-making."

One of the three appeals court judges disagrees on the advisability of a programmatic statement. Judge George E. MacKinnon says, in a concurring opinion, "...because the possibilities of genetic engineering, an industry still in its infancy, extend to so many areas, and because the development of a programmatic EIS would be vulnerable to delaying tactics, composing a programmatic EIS at this time would be neither justified, practical nor prudent."

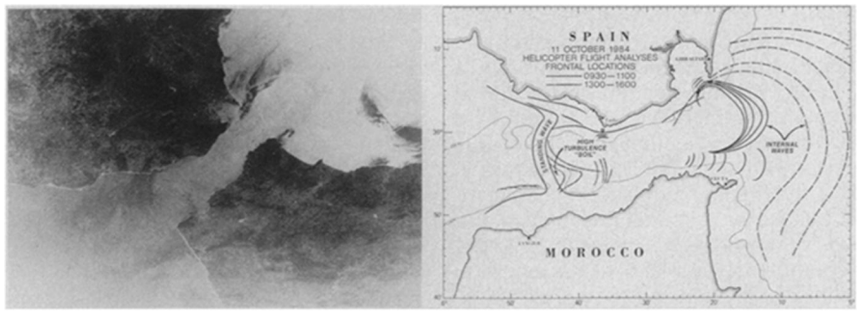
MacKinnon also admonishes the Foundation on Economic Trends for not presenting its arguments to NIH at the time the agency invited public comment on the deliberate-release experiments. "The use of delaying tactics by those who fear and oppose scientific progress is nothing new," he says. Rifkin responds that it is NIH's disregard for environmental law that has delayed the experiment.

"I think this [appeals court] decision ought to be read closely by the EPA, FDA and the other agencies," Rifkin says. "It will set guidelines for the genetic age."

—J. A. Miller

New wave at the Rock: Standing in the Strait of Gibraltar

There's a particular section of the Strait of Gibraltar — the 15-mile-wide channel linking the Atlantic Ocean to the Mediterranean Sea — where strange things sometimes happen to ships. Even when the waters appear innocuous and smooth, ships can lose their heading, swing around or heave to one side, inviting water to rush over their decks. "For 50 or 60 years, something has been occurring there but no one has really documented it to see exactly what is going on," says Robert A. Arnone at the Naval Ocean Research and Development Activity (NORDA) near Bay St. Louis, Miss.



Scully-Powers/NASA map: NORDA

A space shuttle view of the Strait of Gibraltar and a corresponding map of the region show the location of the standing and moving internal waves.

But now, with the help of a helicopter, satellites and the space shuttle, Arnone and fellow NORDA oceanographer Paul E. La Violette are developing a picture of the deep circulation patterns that not only may aid ship navigators but also will increase understanding of the hydrology of the strait. They plan to present their data in May at the American Geophysical Union meeting in Baltimore.

While astronaut Paul Scully-Powers photographed the strait early last October from the space shuttle, La Violette and Arnone went up in a helicopter to look in detail at some of the patterns on the surface of the strait. In particular, they tracked the movement of "internal waves," subsurface changes in the temperature profile of the water.

At the surface, these internal waves show up as alternating rough and slick areas on otherwise smooth water. The researchers discovered packets of about 13 crescent-shaped, kilometer-wide internal waves that periodically migrated east through the strait at about 3 knots. And at the spot where these crescent waves began, they found a standing, or stationary, internal wave spanning the western end of the channel in a north-south direction. According to Arnone, internal waves have been noted before in other parts of the world where the land chokes the sea, but this is the first observation of internal waves springing off from a standing internal wave.

La Violette and Arnone have also collected data on the thermal structure of the water in the strait and on the distribution of phytoplankton and chlorophyll. These data differ slightly from what the recent photographs show, and the oceanographers are currently working on a model that explains these differences. So far, however, they think they have a partial handle on what causes the internal waves.

The Mediterranean loses a lot of water to evaporation, says Arnone, leaving behind extra-salty water that sinks to the bottom. This heavy water flows out of the Mediterranean through the strait. At one point, it encounters a sill, or sudden rise in the seafloor, which deflects the water up to the surface. There it meets Atlantic surface water coming into the strait.

The interaction between the incoming and outgoing water over the sill, the researchers believe, sets up the standing wave. At one stage in the tidal cycle, the movement of the outgoing salty water causes fluctuations in the position of the temperature gradient of the water, releasing the series of internal waves that move to the east. Still to be worked out, say the researchers, is how the semidiurnal tides influence the strength and size of both the standing and moving internal waves.

—S. Weisburd