would otherwise die, or it could encourage new connections between neurons. But in either case, rats that endured traumatic early days are somewhat more sensitive to pain as adults. Some animals that had experienced the painful injection as pups were injected again as adults. Compared to rats that were injected for the first time as adults, the previously treated ones pulled their paw away from a hot floor faster. Their spinal cord neurons also fired more rapidly in response to a tail pinch in the treated adult rats.

As for how this study relates to human newborns, Charles Berde, a professor of pediatrics and anesthesiology at Harvard Medical School, says the rat pup is a "useful model," even though a few days in a rat's life correspond to months of development in a newborn human. Animal research that shows early pain causes hardwired changes might help convince skeptics of the importance of managing pain in newborns, says Berde.

Kanwaljeet Anand of the Arkansas Children's Hospital in Little Rock, a pediatrician and neuroscientist whose surveys show that babies in intensive care aren't always getting the analgesics they need, agrees. "What we need now," says Anand, "is an NIH[-sponsored] consensus panel to provide evidence-based guidelines and help standardize the way premature and full-term babies receive analgesic management." This sort of research, he says, should help dictate those standards.

–LAURA HELMUTH

OCEAN SCIENCE

Academy Panel Backs Sea-Floor Observatories

The National Academy of Sciences wants marine scientists to go deep. An expert panel last week strongly endorsed a network of remotely operated sea-floor observatories to monitor everything from water chemistry to bacteria. The backing may help ocean researchers win a boost in next year's budget proposal now being crafted by the outgoing Clinton Administration.

The new report* is in response to a request last year by the National Science Foundation (NSF), which asked whether submerged stations packed with sensors—an approach promoted by some marine scientists—are technically feasible and scientifically desirable. The eight-member panel, led by seabed mapper William Ryan of Columbia University's Lamont-Doherty Earth Observatory in Palisades, New York, answered "yes" on both counts. "Sea-floor observatories present a promising, and in some cases essential, new approach for advancing basic research in the oceans," it concluded.

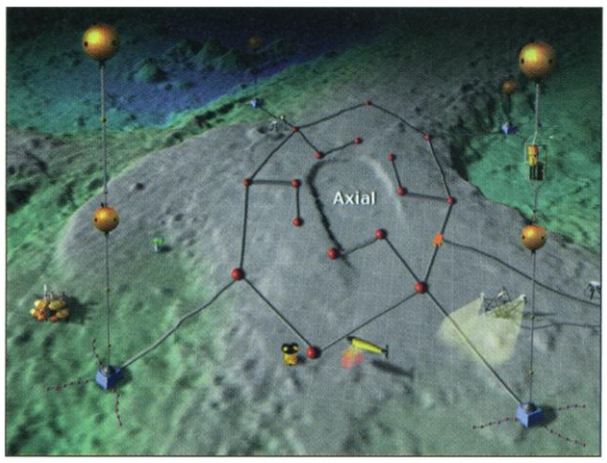
The panel urged NSF to get on with plans for long-term monitoring stations hung beneath a buoy or hitched to abandoned sea-floor cables that can provide power and communications. Such stations, which might be assisted by automated submarines that scan surrounding seas, would augment traditional short-duration, ship-based expeditions and help researchers get a clearer picture of long-term changes in marine environments, says panel vice chair Robert Detrick, a geophysicist at the Woods Hole Oceanographic Institution in Massachusetts. He suggests that NSF could phase in the new program by field testing new sensors and power supplies at a few sites, such as the University of Washington's planned NEPTUNE system that would wire sensors to 3000 kilometers of fiber-optic cable in the northeastern Pacific (see below).

Expanding such test-beds into a "comprehensive" network of deep and shallow water bases would be expensive, however. The panel estimated that it would cost several hundred million dollars to build and tens of millions a year to operate. NSF's budget couldn't accommodate that "extremely ambitious vision" immediately, says NSF's Mike Purdy, head of ocean sciences. But advocates are hoping that NSF will propose spending up to $30 million in start-up funds as part of its 2002 budget request, to be submitted this fall.

Some recent high-profile interest in marine research may help their cause. On 28 June President Bill Clinton suggested that Congress consider "shifting another few hundred million dollars to explore the deepest depths." The speech came a few weeks after Marcia McNutt of the Monterey Bay Aquarium Research Institute in Moss Landing, California, bent his ear on the topic during a White House "millennium" event. And last week, the leaders of a new Congressional Oceans Caucus, including Representatives Tom Allen (D–ME) and James Greenwood (R–PA), told a sea science conference that they will work to strengthen the field next year.

Another endorsement could come this fall, when the Commerce Department's National Oceans Service is due to deliver a White House–ordered wish list for federal oceans research. Some scientists are pulling for sea-floor research to float to the top of the list.

–DAVID MALAKOFF



CREDIT: NEPTUNE/UNIVERSITY OF WASHINGTON

NEPTUNE's realm. Ocean studies would benefit from automated sea-floor observatories like this proposed Pacific Ocean system.

* *Illuminating the Hidden Planet*: The Future of Seafloor Observatory Science, National Research Council.

DEVELOPMENTAL BIOLOGY

Embryonic Lens Prompts Eye Development

A blind cave fish is providing new insight into how eyes come to be. In work reported on page 631, developmental biologists Yoshiyuki Yamamoto and William Jeffery of the University of Maryland, College Park, show that the lens plays a leading role in eye development in this fish. If it doesn't form properly, the researchers found, the embryo will not go on to make the cornea and other eye structures.

During the 1960s, work in Russia and Spain had suggested such a role for the lens, but this new study "nails it," says Peter Mathers, a developmental biologist at West Virginia University School of Medicine in Morgantown. What's more, he adds, because the eye develops similarly in all vertebrates, including humans, "the implications are much broader than [for] just the cave fish."

The Maryland team has been studying the fish, which is called *Astyanax mexicanus*, for the past 6 years. Several dozen isolated populations of the species exist in northeastern Mexico, with some living in surface ponds and streams and others in caves and underground waterways. Over the past million years or so, the eyes of the underground fish have degenerated to varying degrees, while the surface fish have retained their large eyes.

To begin to understand this difference, Jeffery and Yamamoto first monitored eye development in the blind fish. They observed a precursor lens and the rudiments of the optic cup forming during the embryo's first 24 hours. But soon afterward, they found, the cells in the embryonic lens underwent programmed cell death. Other eye structures, such as the cornea and the iris, never appeared, and the retina never developed distinct, organized layers, as it does