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A sea of activity: Project aims for by-the-moment account of ocean floor

By Sharon Pian Chan
Seattle Times staff reporter

If Jules Verne had written "20,000 Leagues Under the Sea" in this century, Captain Nemo would not have gone to the ocean. The ocean would have come to him.

Because 20,000 leagues above the seafloor, a scientist at the University of Washington is about to open a window into the ocean with a Hubble telescope-style eye on the deep sea. An oceanography professor, John Delaney, plans to lay a vast Internet network on the seafloor that he believes will fundamentally change how scientists study oceans and the planet.

Delaney has been dreaming of a deep-sea observatory for more than 20 years. And his watery dream is almost reality.

At a price tag of $250 million, the North-East Pacific Time-Series Undersea Networked Experiments, or "Neptune," would wire the entire Juan de Fuca Plate, which runs along the Washington coast between Oregon and Vancouver Island. About 2,000 miles of fiber-optic cable would stream data from the seafloor at gigabit-per-second speeds across a land mass the size of Oregon.

Every 70 miles or so, sensors, cameras and robots wandering up, down and around would plug into the network to send data back to scientists on dry land. On the Internet, the public could access that information, just like the images coming from the rovers on Mars. For instance, students could watch an underwater volcano erupting or blue whales migrating via live video.

enlarge KEN LAMBERT / THE SEATTLE TIMES

University of Washington professor John Delaney is directing the Neptune project, which would increase understanding of the ocean floor off Washington's coast. Behind him is a digital mosaic poster of the Faulty Towers West Face on the Juan de Fuca Ridge.

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"We'll be exploring one of the great frontiers," says Delaney. "And we'll be doing it with the public looking over our shoulder."

Delaney will be speaking at the American Association for Advancement of Science conference in Seattle, which began yesterday.

If the U.S. government approves funding in two years, Neptune could be under construction in 2008 and light up in 2009. The Canadian government has committed one-third of the money.

John Delaney sessions

John Delaney will speak at two sessions at the American Association for Advancement of Science meeting in Seattle: from 9 a.m. to noon tomorrow at the "Oceans in Our Solar System," session at the Washington State Convention and Trade Center, room 6B, and from 2-5 p.m. Sunday at a Town Hall meeting, "Oceans for Everyone," at the convention center, rooms 2A and 2B. Registration is required for the Town Hall meeting. For more information, call 206-770-7014.

The Monterey Bay Research Institute and the University of Victoria will install test networks in 2005, and scientists are discussing what kind of equipment the network will require for experiments. The project's partners also include heavyweights such as the Woods Hole Oceanographic Institution in Massachusetts and the Jet Propulsion Laboratory in California .

"It is one of the most innovative and ambitious components of this (ocean observatories) effort," said Michael Purdy, the former director of ocean sciences who gave the project the green light at the National Science Foundation. "There is no question in my mind that we will be doing ocean science in a fundamentally different way."

Traditionally, scientists have used ships and satellites to observe the ocean. But they usually can lease a research vessel for only a month every few years, and if they're studying unpredictable phenomena, they're rolling the dice with that month. It's like trying to predict Seattle's weather by checking the temperature once a year. Satellites, on the other hand, can only measure what's happening at the surface of the ocean.

But a gradual shift is taking place in research to create a more holistic view of the planet's bodies of water. A waterworld Web would be the next leap forward.

Not a routine scientific study

When Delaney talks about Neptune, he doesn't start with project details but with human population, environmental destruction, life on other planets, even terrorism.

He opens speeches with statements such as, "We're about to embark on one of the greatest adventures of humankind."

Oscar Schofield, an associate professor at the Institute of Marine and Coastal Sciences at Rutgers University, compares Delaney's speeches to "rock concerts." (Rock concerts for scientists, that is.)

"John's a classic romantic oceanographer," Schofield says. "You need those scientists who are dreamers, to start thinking about what the potential could be in 20 years."

While Delaney is quick to say that only a team of dedicated scientists and engineers could have taken Neptune so close to reality, he is the visionary who had the persistence to see it through.

In his office, a quote from Goethe is pinned to a bulletin board: "If there is

anything you can do or dream you can, begin it. Boldness has genius, power, magic in it. Begin it now."

At 6-foot-3, Delaney is a turtleneck-wearing, bearded explorer, prone to recite poetry, usually Robert Frost or Robert Service.

Born near Pearl Harbor, Hawaii, the day after the 1941 bombing, Delaney moved all over the country with his Navy father. After majoring in geology at Lehigh University and earning a master's degree at the University of Virginia, he studied ore deposits. He reconsidered that career when a mine tunnel he was working in partially collapsed.

As a graduate student at the University of Arizona, he fell in love with volcanoes in the Galapagos.

The University of Washington oceanography department hired him in 1977. During a research trip in the Atlantic, he dredged up rocks that had been cemented and broken over and over again by intense heat. After a long study, he concluded scientists would never be able to know what changed those rocks unless they could go to the seafloor and watch.

He began installing tape recorders on the ocean floor. Some worked, some didn't, and he had no idea what he would get until he retrieved them months later. What he needed was live communication with sensor equipment.

Meanwhile, he made seafloor dives in Alvin, a 15-ton titanium research submarine that can transport three scientists at a time to the crushing depths of the seafloor. Delaney wanted the world to see crabs that live where there is no light, neonlike jellyfish and the black smoking chimneys that rise from the seafloor like castle turrets.

Fortunately, the Internet was invented. And real-time communication suddenly was possible.

In 1992, Delaney and other scientists began talking about laying fiber-optic cable. Three years later, they expanded the plan to cover a tectonic plate. In 2000, Delaney and a team of 80 scientists published a feasibility study.

The National Science Foundation has included $100 million for Neptune in its 2006 budget as part of an ocean-observatories initiative, and it's optimistic that the observatory will be funded.

But nine figures is a phenomenal amount of money for an ambitious, untested project in ocean science, and Neptune has attracted criticism.

Some question whether it would be the best use of resources, fearing Neptune will rob funding from other research areas.

"What's important is to look all over the ocean and be able to sum up all its parts," says Charles Eriksen, an oceanography professor at the UW. "That really argues for a fundamentally different kind of observing system, instead of concentrating all your resources on one small portion of the ocean and one small part of the seafloor."

Eriksen has developed several underwater gliders for about $75,000 each that can take measurements, surface and send data home through satellites. He believes the ocean would be better understood with numerous inexpensive vehicles deployed all over the world rather than by focusing on one small area.

Other scientists wonder whether it's even possible to build a network that could survive in such an unforgiving environment. The equipment would

have to withstand the pressure three miles below sea level. It would be subject to extreme heat and cold, plus the corrosive effects of saltwater. Marine animals and plants would tend to cluster around and clog it.

Delaney welcomes the criticism. The disagreement has forced him to expand Neptune's design to accomplish more.

"There was a time when people thought sailing vessels were enough and there wasn't a need to build a steamer," Delaney says. "But if we don't do new things, we can't argue for more resources."

And, anyway, Delaney doesn't want to get into what he calls "tribal battles." He wants to talk about the fundamental issues the planet faces: world hunger, the environment, the solar system.

Delaney connects dots between people facing starvation, the oceans and terrorism. He explains: The ability to grow food on land is directly tied to the ocean's motion. The ocean's health will determine whether the planet can feed humanity. The chasm between the haves and the have-nots has historically fomented political dissent, and in the future the divide could widen between wealthy nations and developing nations that can't feed their populations. Therefore, he reasons, studying the ocean could prevent the conflicts that can lead to terrorism.

Neptune, Delaney says, could enable the discovery of enzymes like polymerase — first found in the hot springs of Yellowstone National Park — which allowed scientists to create DNA analysis methods that revolutionized genome science.

He sees the organisms that live off chemicals released by underwater volcanoes and sees the possibility of finding life on Europa, a moon of Jupiter covered with ice, ocean and possibly volcanoes.

If his cabled observatory is successful, it won't be the last — it will be the first, he says. Japan and Europe are working on plans for their own networks, although Neptune is the furthest along.

"I know I'm toward the end of my career," says Delaney, 62. "Seeing this happen, I see it as a legacy."

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