

WIRING

the seafloor for science

By Peter Calamai

Off the west coast of Vancouver Island, Canadian scientists and engineers are about to complete a six-year saga of wiring up the rim of a swath of seafloor the size of New Brunswick.

When the final cables are laid next summer, Canada will be home to the world's first regional cabled undersea observatory — and the Earth's final physical frontier will have been crossed.

Spanning depths from 100 metres to 2.7 kilometres, the North-East Pacific Time Series Undersea Networked Experiments (NEPTUNE) will allow scientists to continuously record physical, chemical and biological data from throughout the water column, from seabed to surface. The completion of the \$100 million NEPTUNE Canada installation will also launch a new era in marine science, with the prospect of significant practical payoffs and a vast increase in basic scientific understanding.

Expected benefits:

- the earlier warning of earthquakes and tsunamis because of a much better handle on the movement of tectonic plates, the dozen floating slabs of the Earth's crust that carry the continents and oceans;
- improved climate prediction models arising from a deeper understanding of the ocean's dominant impact on climate change and its crucial role in

soaking up some carbon dioxide from the atmosphere;

- a greater knowledge of the deep oceans, the world's biggest ecosystem that contains at least 10 million species;
- pioneering investigation of gas hydrates using an underwater crawler to observe the puzzling pockets of methane gas encased in miniature ice cages which are touted as a possible future fuel.

Until now ocean research relied on measurements from the surface made during sporadic ship excursions, supplemented by occasional underwater forays with manned or remotely operated submersibles.

But once data begins flowing late next year from the hundreds of sensors circling the northern part of the Juan de Fuca tectonic plate, ocean scientists will finally be on equal footing with their terrestrial counterparts. About 800 kilometres of fibre-optic cable will deliver power to sensors concentrated at five nodes and carry their readings electronically back to shore. The public will be able to tap into this information via the web.

Reaching this deeper scientific understanding required technological innovation by engineers in private companies along with researchers from the University of Victoria who direct both

A modern treasure chest

The realm of science fiction may have the Nautilus submarine of Jules Verne, but the world of science fact will soon boast NEPTUNE Canada, a pioneering undersea observatory now nearing completion off the coast of B.C.

Hundreds of instruments along a 800-kilometre backbone of fibre-optic cable will continuously relay information about the changing physical, chemical and biological state of a vast stretch of ocean to scientists and the public anywhere in the world.

Cables

Fibre-optic cables will carry data between NEPTUNE's control centre in Port Alberni, BC and the various nodes and remote sensors. Shown below is a cross-section of the double armour cable, the thickest of five cable sizes used in the project.



Trawl-resistant base ▶ A large steel housing, designed to resist bottom-trawling fishing gear, houses each node.

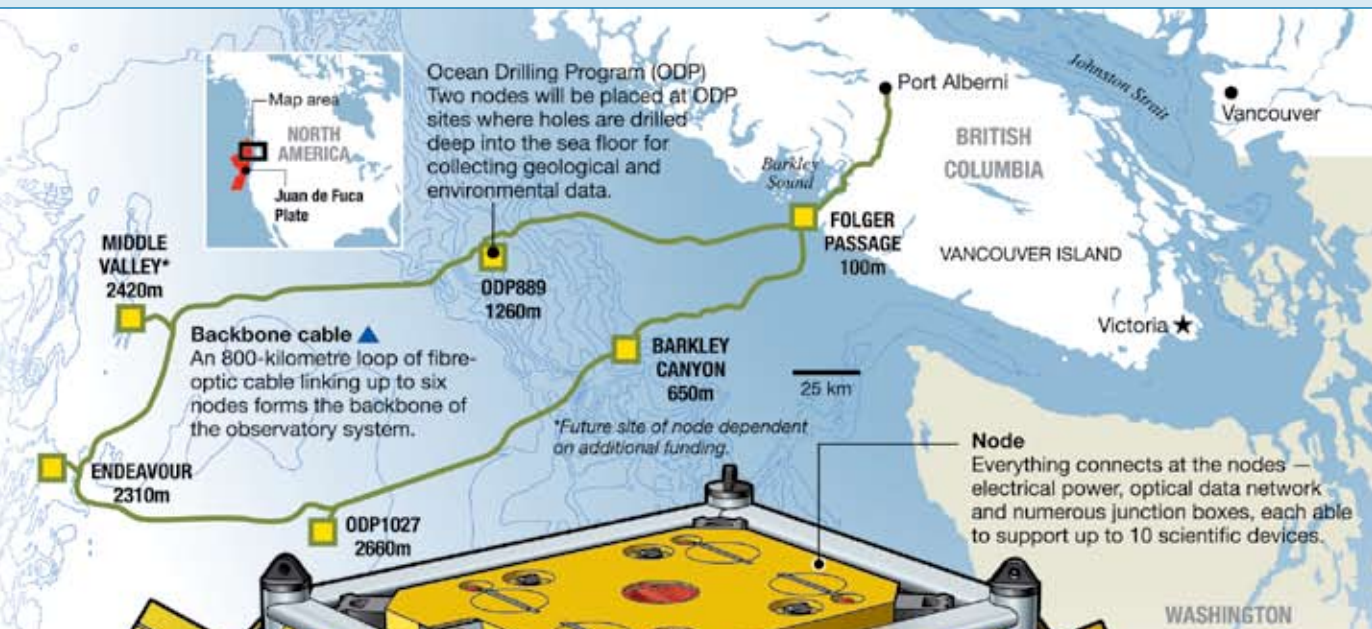
Low voltage power/ Communications assembly (below node)

Deep-sea crawler

An Internet operated deep-sea crawler created in Germany will study hydrates in Barkley Canyon.

NEPTUNE Canada and its trail-blazing sibling, VENUS. The \$10-million Victoria Experimental Network Under the Sea, which involves a similar array with 44 kilometres of cable between Vancouver Island and the B.C. mainland, was completed in September.

The southern half of the Juan de Fuca plate was also supposed to be wired up by an American counterpart group and interconnected with the Canadian portion. But the U.S. government hasn't come through with funds and the American

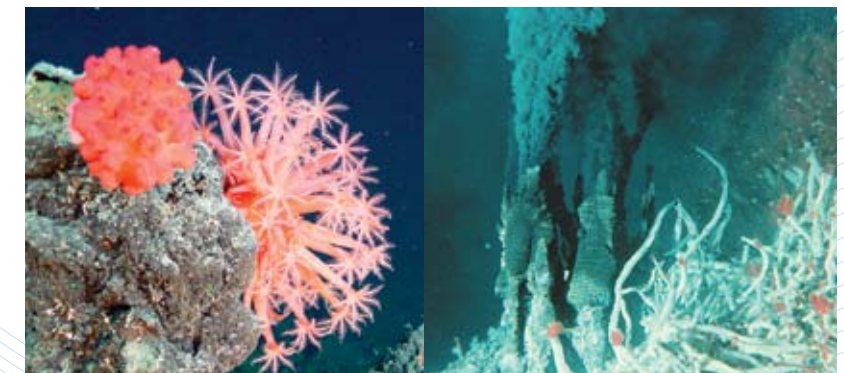


Ocean Drilling Program (ODP) Two nodes will be placed at ODP sites where holes are drilled deep into the sea floor for collecting geological and environmental data.

Backbone cable ▶ An 800-kilometre loop of fibre-optic cable linking up to six nodes forms the backbone of the observatory system.

*Future site of node dependent on additional funding.

Node Everything connects at the nodes — electrical power, optical data network and numerous junction boxes, each able to support up to 10 scientific devices.



Photos: Verena Tunnicliffe