



NEWS

North-East Pacific Time-series Undersea Network Experiments (Canada)



University of Victoria

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Newsletter

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Message from Project Director

by Chris Barnes, Project Director



Today, we are pleased to make two major funding announcements: for the wet plant infrastructure and for the scientific instruments supporting the community science experiments.

The University of Victoria (UVic) has signed a contract valued at nearly \$39M with Alcatel Submarine Networks (ASN) to design, manufacture and install the wet plant infrastructure for NEPTUNE Canada. Some Canadian subcontractors such as Satlantic and Alcatel Canada will be involved in portions of the work. This installation will involve an 800km cable loop from the UVic shore station at Port Alberni out to the Endeavour spreading ridge. Two full observatory nodes will be located at Barkley Canyon and Endeavour Ridge and two Branching Units (BU) at ODP 889 and 1027 sites. Full nodes can be readily added to the BUs if additional funding is received (presently being sought). ASN will install the facility in mid-2007 with some instruments; most instruments will be deployed after full testing and commissioning in mid-2008. Peter Phibbs has led a team that has worked tirelessly through an 18-month process of the RFQ/RFP/Contract negotiations and presents more details elsewhere in this issue.

For reasons discussed in the last Newsletter, we have insufficient funds at present to install the full scope option that was requested in the initial requests to funding agencies. We are, however, able to obtain one that is well beyond the minimum scope approved by those agencies. Once the scope was defined through contract negotiations, we were able to review which community science experiments would be provided at the Endeavour and Barkley sites following the external review committee's recommendations; a stand-by list of instruments is on hand should additional funding be secured. Brian Bornhold and Kim Juniper have led the exhaustive analyses of the proposals and the required compromises; they present below the details on the \$3.5M awarded for instruments and a similar amount for the accompanying for extension cables, interface modules, and installation. Many of the instruments will require development work and then will need bench and wet testing, coordinated by Paul Hansen and others using the Saanich Inlet VENUS node, prior to deployment. Science workshops have been arranged by Brian and Kim for mid-November to further define the next steps in the acquisition, development and specifications for the instrumentation requested.

NEPTUNE Canada (NC) will provide ASN with the necessary detailed route surveys for the cable/nodes. Cheryl Katnick has been compiling all available data along the 800km route. Additional survey work has been necessary and much of this was accomplished this September. The University of Washington's R/V Thompson was used for a month-long cruise to Endeavour, led by John Delaney and Deborah Kelley. NEPTUNE Canada and NSF provided some funding to ensure that the Autonomous Benthic Explorer (ABE, from WHOI) was available to undertake systematic seabed mapping to facilitate the task of laying the cable along the narrow Endeavour rift valley. Adien Aggenbach was on board for part of the period as the NC route engineer and has contributed an article for this issue. Both she and Brian Bornhold participated on other vessels to complete two surveys across the shelf, including cone penetrometer tests, totaling over 1000km; Brian worked diligently to secure the vessels, specialists and equipment for these cruises.



ABE is brought on board the Thompson

NEPTUNE Canada continues to add new staff, especially to develop the Data Management and Archive System (DMAS) (new staffing opportunities are listed on our website:

www.neptunecanada.ca) and good progress has been made by the team led by Benoit Pirenne on the interim DMAS for the VENUS project that will serve as a prototype for the needs of NC.

In August, UVic Vice Presidents and NC staff met with Alex Isern (NSF), and Bob Detrick and Rick Jahnke (ORION) to discuss ways to improve the collaboration in planning and installing the Stages I and II of NEPTUNE, ahead of the approval of the major US funding of the Ocean Observatories Initiative (OOI). A report from ORION is included in his issue. Also that month, we held a meeting with the US Ocean Observatories Security Systems Working Group that has been established to review how issues of national security can be balanced with the scientific priorities in OOI, and with NEPTUNE in particular.

In summary, NEPTUNE Canada has moved from a variety of planning and design efforts to allocating most of its budget to defined acquisitions and developments. We are now on a more specified track with precise coordination over the next two years to ensure the installation of the wet plant infrastructure and then a further year to establish the full working systems.

RFP 262: Underwater Infrastructure (Wet Plant) Awarded to Alcatel

by Peter Phibbs, Associate Director, Engineering & Operations



Since the May Newsletter, the responses to the Request for Best and Final Offers under (RFP) 262 for the underwater infrastructure for NEPTUNE Stage I have been received and evaluated, with the result that the RFP Review Team unanimously recommended to the RFP Oversight Committee (Chris Barnes, Chair) that UVic commence negotiating a Contract for the engineering, procurement, installation and commissioning of the underwater infrastructure (an EPIC contract) with Alcatel Submarine Systems (ASN). The RFP Oversight Committee accepted this recommendation, and passed it on to University of Victoria's Vice President of Research, and Vice President of Finance and Administration, who authorised the project team to start the negotiations. Following a three day technical meeting in Reston VA, and a three day legal meeting in Vancouver BC, a contract was complete and ready for signing by September 30 2005.

The System scope has been adjusted to match the funds in hand, but includes the ability to easily increase the scope without disrupting the work. The backbone will be a ring, with two cables landing at the shore station in Port Alberni. Each science node will have two fully independent paths to shore, carried on separate wavelengths in a single fibre pair. Each path will accommodate two gigabit Ethernet signals. The science nodes will be connected to spur cables off the backbone ring by means of wet-mateable connectors, allowing easy recovery for maintenance. Four sets of seabed frames and node connectors will be installed, but only two will be equipped with nodes due to budget constraints. Each node can accommodate eight 10/100 Ethernet and 400V power wet-mateable connectors, and two extension connectors supplying gigabit Ethernet and 10kV power. The initial scope of work will only populate four 10/100 connectors and one extension connector on each node due to budget constraints.

The Contract includes firm pricing for equipping the other two nodes, and fully populating the nodes with connectors. It also includes pricing for extending the system to the north to accommodate Nootka an extension into the Explorer Plate. The project team is actively pursuing avenues for additional funding which, if received in the next year or so, would allow the system to be fully populated or expanded without additional mobilization costs.

The project team is ramping up efforts on the issue of connections between instruments and nodes, including multiport dry-mate and wet-mate science interface modules. Expect to see progress on these connections, building on the experience gained on MARS and VENUS, now that the backbone technology has been selected.



Left to right: Martin Taylor, Peter Phibbs, Rick Nilsson, Chris Barnes, Jack Falk.

Marine Route Surveys—Vancouver Island Continental Shelf

by Brian Bornhold, Co-Chief Scientist



A geophysical route survey across the southern Vancouver Island continental shelf was undertaken (September 10-24) from the 30-m fishing vessel "Royal City" owned by the Canadian Fishing Company of Vancouver. The two crossings of the shelf will require that the cable be buried to about one metre because of very active trawl fishing in the region.

Survey activities included: (1) extensive multibeam echosounding along the two routes, to define precisely the seabed morphology; (2) sidescan sonar coverage to characterize seabed substrates and especially to identify targets that may impede plow burial of the cable (e.g., large boulders, bedrock outcrops or ship wrecks); (3) sub-bottom profiling to determine if sufficient sediment thickness is available to bury the cable to a depth of at least one metre below the seabed; and (3) magnetometer surveys in areas of existing cables along or near the route to ascertain their correct position so that they can be effectively cleared or crossed during cable installation.

In all, about 1000 km of geophysical lines were obtained including development work to optimize the routing. As well, multibeam data were obtained near Port Alberni at the shore landing and in Barkley Sound. The mapping accomplished its objectives in optimizing the route and providing guidance for cable installation, cable types and future data requirements.



The Royal City

Oceans in Transition - Mapping of Seafloor for the NEPTUNE Cable System

by Adien Aggenbach, project representative



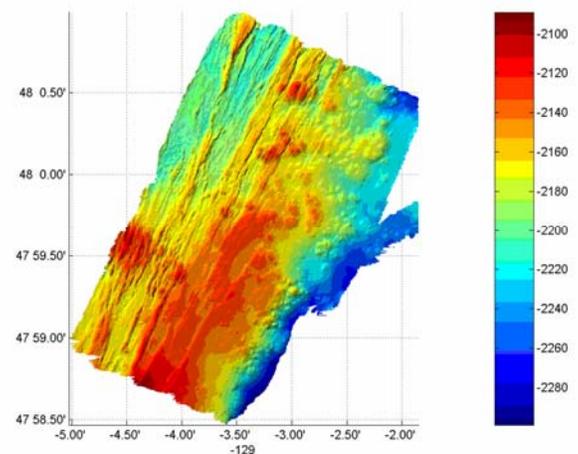
There are powerful societal and intellectual reasons to develop new strategies for studying the ocean basins. NEPTUNE will provide us with the opportunity to revolutionize the way in which these studies are done.

The NEPTUNE cable system will be routed over hostile, sharp, young volcanic rock. Structures that would be avoided in conventional cable engineering like hydrothermal vents spewing hot (320°C) fluids are the focus of scientific studies

I recently spent 2 weeks as the NEPTUNE Canada project representative on the R.V. Thompson as she was conducting biochemistry, seismology and marine geology experiments, on the Endeavour Ridge as part of the University of Washington's Visions 05 Cruise, which NEPTUNE Canada provided some of the funding for. Of particular interest to NEPTUNE was the acquisition of seabed data using Woods Hole Oceanographic Institution's (WHOI) Autonomous Underwater Vehicle ABE (Autonomous Benthic Explorer) and Jason II (Remote Operated Vehicle)

Traditionally, seafloor mapping for submarine telecommunications cable systems have always consisted of a few key components. Shallow water surveys (normally up to the 1000m contour) include Side Scan Sonar (100 – 300 kHz), Sub Bottom Profile (3.5 kHz), multibeam bathymetric surveys & seabed sampling; deep water surveys are limited to multibeam bathymetry using equipment mounted on the survey ship's hull or on a shallow towed towfish. For NEPTUNE, more detail is needed, particularly in the deep water and aggressive seabeds around Endeavour. Regular seabed surveys pale in comparison to ABE, which provides data with 50 – 100 times the resolution of regular hull mounted multibeam bathymetry. Objects and features that were previously undetectable with conventional mapping methods are clearly visible, enabling secure routing for the cable.

Apart from the regular geophysical and bathymetric survey, on the Visions 05 Cruise we have also undertaken an extensive visual survey of the seabed in areas of concern. The high definition cameras and ROV capabilities have given us the opportunity to experience the subsea environment as if we were there in person.



Dataset of exact location collected with ABE multibeam

The system security of NEPTUNE is of the highest priority. Cable repairs are costly and involved. Through the technical capabilities of The Visions 05 Cruise we can now engineer a safer, more secure cable route ensuring system security and connectivity for this project.

First Awards for Community Science Experiments

by Brian Bornhold and S. Kim Juniper, Co-Chief Scientists



Approved Experiments

Following external and internal review of proposals submitted to the Community Science Experiment competition, NEPTUNE Canada has awarded funds for the first science programs to be deployed on NEPTUNE Stage 1 in 2007 and 2008. Only two nodes will initially be available for science experiments, but we have tried to maximize flexibility/expandability for future programs by having the cable loop through most of the original high priority sites, so that more nodes can be added prior to and after the 2007 installation, should additional support be forthcoming. Barkley Canyon on the Vancouver Island margin and Endeavour Segment on the Juan de Fuca Ridge will be the locations of the first two nodes and funded experiments. It is important to note that these nodes have capacity to support more experiments than those currently funded; researchers who are able to secure additional funding for instruments and deployment are encouraged to contact NEPTUNE Canada. At least two Branching Units (at ODP sites 889 and 1027) will be provided to allow ready installation of additional nodes. We are already pursuing several avenues of supplementary funding for additional nodes, extension cables and instrumentation.

The requests for funding totaled over \$39M – three times the original anticipated budget for experiments and six times that presently available. These recommendations were then reviewed by the Executive Committee which considered other aspects relevant to the final decisions; e.g., breadth of scientific disciplines, geographic location of experiments, probability of success within the timeframe available. A total of \$3,565,000 has been awarded for science instruments, plus \$3,332,000 for extension cables, SIIMs (Scientific Instrument Interface Modules), other science infrastructure and installation. In addition to the offshore nodes, a NEPTUNE Canada engineering test bed will be established at the VENUS node in Saanich Inlet, B.C., to qualify all NEPTUNE instruments prior to deployment at the experimental sites. In the table below, where funded experiments share a common location, the award for shared extension cables, SIIMs, etc is attached to the proposal with the greatest requirement. Although only the lead proponents are listed, it is important to state that all proposals were team efforts and that the larger awards went to broad, interdisciplinary proposals involving investigators from many institutions.

Funded Community Experiments – NEPTUNE Canada

Lead applicant(s)	Experiment	Location	Instrument Award	Extension cables, SIIMs, etc
Kathy Gillis (Univ. Victoria)	Monitoring Endeavour hydrothermal systems	Endeavour Segment	\$765,000	\$873,544
Garry Rogers (Univ. Victoria)	NEPTUNE Canada seismography network	Endeavour Segment	\$400,000	\$75,000
Paul Snelgrove (Memorial Univ.) Anna Metaxas (Dalhousie Univ.)	Role of disturbance in deep-sea benthic ecosystems	Barkley Canyon	\$1,000,000	\$52,612
John Dower (Univ. Victoria)	Biophysical linkages off Vancouver Island	Barkley Canyon	\$1,000,000	\$334,237
Ross Chapman (Univ. Victoria)	Seafloor hydrate observatory	Barkley Canyon	\$205,000	\$255,487
Colin Bradley (Univ. Victoria)	Science support test bed	Saanich Inlet	\$150,000 (salary - test bed engineer)	\$100,000

In addition, we have created a priority standby list, for highly ranked proposals at locations where we presently cannot fund node installation. These locations are: ODP sites 889 and 1027, and Bamfield. Nodes and experiments at these other sites will be funded if and when additional financial support becomes available.

Next Steps

Funded groups were requested to submit revised budgets and project plans for an early October deadline. During the month of November, NEPTUNE Canada will be scheduling discussions between the different project groups and NEPTUNE engineers, to develop site configuration plans and review power and data transmission requirements for each instrument and instrument package. At the same time, the funded groups will work with the NEPTUNE Canada office to develop a procurement plan for their instruments. Where possible, purchasing will be centralized to simplify project oversight and allow pooling purchases of common instruments to reduce cost. All instruments for deployment on NEPTUNE Stage 1 will need to go through a series of qualifications prior to deployment. We are presently planning on a 3-step process that will begin with the instrument being sent to the data management group for writing of software drivers for communication and instrument control. This will be followed by testing on a simulated network in a dry test bed, and then by a wet deployment in Saanich Inlet on the science support test bed.

While the procurement and testing are underway, NEPTUNE Canada will be taking steps to encourage communication and exchanges between project groups in order to make these first experiments as interdisciplinary as possible. As well, we will also shortly be circulating a draft Data Access Policy for input from all interested individuals and groups.

Environmental Assessment

by Cheryl Katnick, Manager, Permits & Rights of Way



In July, Hemmera Envirochem Ltd. of Vancouver was selected to assist NEPTUNE with the permitting Environmental Assessment process. Since that time, Hemmera has been compiling required data for the environmental assessment as well as assisting NEPTUNE with the planning for other agency submittals.

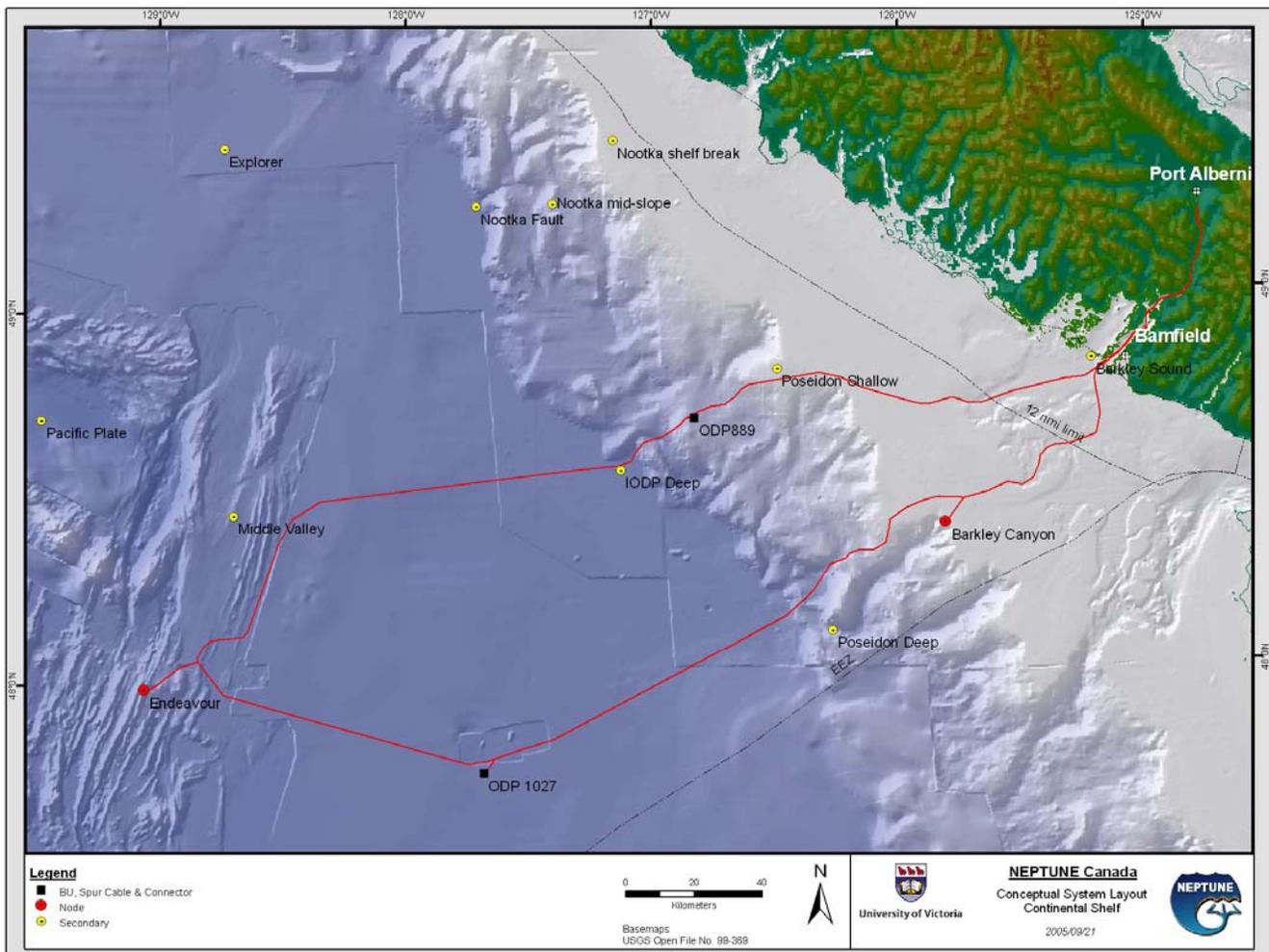
During the summer, the project team met informally with many of the First Nations' councils in the area, to introduce them to the project and to request the benefit of their experience and local knowledge.

In August, a dive survey was completed of the proposed landing area in Port Alberni. The goal of the survey was to assess the existing near shore habitat and environment as well as to assist in the determination of a route for landing the network cables. The survey was successful, and with some surprise (adjacent site was a historical plywood mill site), there were numerous marine species present, including sea cucumbers, plumose anemones, and sea urchins. The dive crew was also able to locate the existing TPC4 cable, so we can plan our installation accordingly.

With the nearshore assessment complete, NEPTUNE and Hemmera can commence discussions with Fisheries and Oceans Canada to determine the requirements for approval under the Fisheries Act.

Information with regards to the project installation and operations plans are also being distributed to other regulatory agencies in order to assess other requirements for approvals, and as such, the requirements for a project screening under the Canadian Environmental Assessment Act.

The permitting team at NEPTUNE Canada is looking forward to an exciting Fall when the environmental assessment is issued in draft form, applications submitted for the required approvals, and formal consultations with the public, First Nations and fishers will commence.



DMAS Corner

by Benoit Pirene, Assistant Director, Information Technology



VENUS interim data management and archiving system (iDMAS)

Work is progressing as planned for the interim DMAS to serve the early needs of the VENUS Observatory, which is on time for a November deployment:

- The overall structure design was firmed up. It calls for the control and instrument data acquisition at the shore station as well as a store-and-forward mechanism to relay data to the archive centre and the users.
- The observatory access security was designed and implemented. Tests and proof of concepts were successfully carried out and were discussed with the military.
- Software interfaces to support all the instruments on the first platform were implemented and work is proceeding on the others.
- Initial steps to acquire an upgradeable data backhaul line were completed.
- Initial web-based user data access tools are being put together.

More technical details on the concepts mentioned here will be presented on our web site.

NEPTUNE Canada DMAS preparation

The NEPTUNE Canada science programs have now been selected and feedback from the various proposal PIs has been received. We can therefore estimate the efforts required for the integration of the instruments into the infrastructure, both from the point of view of their physical layout as well as from a software point of view. This exercise requires first a consolidation of the experiments' instrument packages, the negotiation of individual requirements and the elaboration of efficient solutions to manage the data produced by the instruments. This is not done in isolation, but through an open dialogue with each team. Beyond the first contacts we are planning to invite the technical and science representatives of each selected science program for an exchange of views on how the Observatory is going to work, how their program is going to be implemented, and how the data and data services are going to be accessible to all.

Staff Updates

Most recently, Don Moffatt has joined the VENUS/NEPTUNE Canada team. Don's contribution will initially be in the projects' web presence. Expect new, modern looking and efficient web sites for both Observatories soon; these are being developed as dynamic sites capable of handling the real-time data flow once the observatories are installed.

Don taught web technology at UVic's Continuing Studies department for five years, where he currently teaches a distance education course, spent eight years in public outreach at the NRC's Herzberg Institute of Astrophysics, and has written freelance features for *The Globe and Mail*. Don is working in concert with NEPTUNE staff to produce content. He will also help to determine and implement the appropriate server-side technology and interfaces to bring data and data products to NEPTUNE users over the web.



ORION Program Moving Forward

by Richard A. Jahnke, Executive Director



The Ocean Research Interactive Observatory Networks (ORION) Program is a comprehensive effort to invest in ocean research infrastructure, greatly expanding the temporal and spatial scales at which observations are made and thereby the diversity of ocean processes that can be investigated. The centerpiece of ORION is the Ocean Observatories Initiative (OOI), an ambitious plan to develop and deploy \$269M in observing infrastructure for research purposes. Development of this program has been accelerating rapidly. Within the last six months, many milestones have been reached and all indications are that the next six months will be even more productive. Below I briefly summarize a few recent accomplishments and outline near-term future activities.

In late spring of this year, the Science Plan was officially published. This plan provides examples of science themes that can be addressed with the anticipated observing infrastructure. These themes mesh well with the focus of many high priority research areas identified by other groups, with the proposed observatories providing unique new capabilities to approach the research goals identified in these programs. Possible collaborations include linkages to the IMBER, SOLAS, GEOTRACES, RIDGE2000, MARGINS and OCCO programs. It is important to recognize that ORION/OOI does not compete with these other programs but rather is designed to enhance them by providing observing technologies which in many cases are called for within their respective science plans.

The development of ORION is assisted by the formation of an advisory committee structure. In addition to the Executive Steering Committee (ESC) and Sensor Committee formed in 2004, we have constituted a Science and Technology Advisory Committee (STAC), Cyberinfrastructure (CI) Committee, Engineering Committee and Education and Public Awareness Committee (EPAC). The specific duties of these committees are described on the ORION website (www.orionprogram.org). The committees will play a major role in the development of the draft Project Execution Plan and provide an important conduit for exchanging information between the ORION Project Office and the research community.

The ORION Project Office engaged the research community to identify the most compelling scientific questions that the anticipated observatories can address, and the technological capabilities required to accomplish those research goals. The Project Office released a Request for Assistance (RFA) call for proposals in February 2005. At the closing of the call on 23 May 2005, the community response included 48 proposals with 549 individuals representing 137 research and educational institutions, agencies and private companies in 35 states and 4 Canadian provinces.

This enthusiastic response endorses NSF's efforts to promote ORION by demonstrating community support and by providing tangible examples of the cutting-edge scientific research that can be pursued when this infrastructure is deployed. It further supports the program planning efforts by providing technical requirements for the observatory infrastructure needed to achieve the research goals. The abstracts of all proposals are posted on the ORION website (www.orionprogram.org).

The RFA proposals will be reviewed and ranked by an expanded NSF-appointed review panel of unconflicted individuals in late September 2005. Each panelist will be requested to read a representative cross-section of the proposals so that the panel as a whole can provide an internally consistent assessment and ranking of all proposed research.

The output of the RFA process will be integrated with existing workshop and planning documents to define the science user requirements for the OOI observatory network. An engineering team will utilize these science user requirements to establish the high-level technological requirements for the system. The resulting science and technical requirements will form the basis for a draft ORION Project Execution Plan to be developed by the ORION Project Office and reviewed by the ORION advisory committees.

We expect to present this preliminary plan to the community at the ORION - Design & Implementation (ORION-D&I) workshop, scheduled for 27 - 30 March 2006, in Salt Lake City, Utah. Workshop participants will review the plan, provide extensive comment and feedback, and identify omissions. The results of the workshop will enable the engineering team to revise and refine the observatory design. We also hope that the ORION-D&I workshop will provide the opportunity for the formation of collaborative groups to begin the development of integrated research projects and we strongly encourage participation.



ORION visit: www.orionprogram.org or www.orionocean.org/RFA/
Newsletters are available at www.orionocean.org/news/newsletter.html



VENUS Project: Partnership, Exploration and Ocean Insights

The University of Victoria (UVic) is the lead institution for VENUS (Victoria Experimental Network Under the Sea) an interactive cabled ocean observatory project that will provide data from the ocean via the Internet. From land, the scientific community, classrooms and the general public will be able to observe oceanographic processes at two locations in B.C.'s coastal waters—Saanich Inlet and the Strait of Georgia. The Saanich Inlet node is under construction with cable and array deployment taking place from Global Marine's Wave Venture vessel at the end of November, 2005. We look forward to receiving VENUS's first live data before the end this year. Please see www.venus.uvic.ca



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University
of Victoria

Opportunities

Currently open:

Senior Web Services Specialist

Experience in Web Services, SOA areas (including: service-oriented architectures and their modeling - SOMA; web services development (XML, WSDL, SOAP; familiarity with IBM's WebSphere environment would be an asset); BPEL and ESB concepts; J2EE, JMS, MOM; content delivery through RSS; and workflow orchestration tools. Strong experience with Java, C and/or C++ software development in a Unix environment, and relational Database Management Systems and/or data warehouses. Team leadership and project management experience.

NEPTUNE Canada Software Librarian

Strong experience in the testing, integration and configuration of medium to large software system, very good familiarity with complex systems based on IP networks, Relational Database Management systems, client-server configurations in a Unix environment; very good technical writing skills, mind set on the design-development-testing-integration-operation workflow. Familiarity with the concepts of multi-tier software architectures.

Future job openings: Junior Web Services developers

Check <http://www.neptunecanada.ca/> regularly for updates.

Business Opportunities:

Upcoming RFP for the evaluation and recommendation of a data warehousing system for NEPTUNE Canada. (Nov./Dec. 2005).

RFPs for the provision of the necessary DMAS storage and computer hardware (Late Summer 2006).

