

CANADIAN OCEAN SCIENCE NEWSLETTER

LE BULLETIN CANADIEN DES SCIENCES DE L'OcéAN

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OCEAN SCIENCE PROGRAMS

The Canadian Arctic GEOTRACES Program: Biogeochemical and Tracer Study of a Rapidly Changing Arctic Ocean

Submitted by Roger Francois, Dept. of Earth, Ocean and Atmospheric Sciences, UBC, Vancouver, BC (rfrancois@eos.ubc.ca);

The Arctic marine system is undergoing rapid change as a result of climate-driven alterations in sea-ice cover and surface ocean circulation, which in turn can strongly influence biological productivity, air-sea exchange of climate-active gases and the distribution of contaminants. Against this background of climate-driven changes, we expect significant expansions of commercial fishing, shipping and exploitation of fossil fuel and mineral resources. Our present ability to fully evaluate the impacts of these changes and predict their future trajectory is limited by a poor understanding of the interacting chemical, physical and biological processes that shape the functional characteristics and resiliency of Arctic marine ecosystems. To bridge this critical gap in knowledge, the Canadian Arctic GEOTRACES program, involving 27 co-principal investigators from 11 Canadian universities and 3 government laboratories (Appendix), will examine the distribution and modification of geochemical tracers on a transect

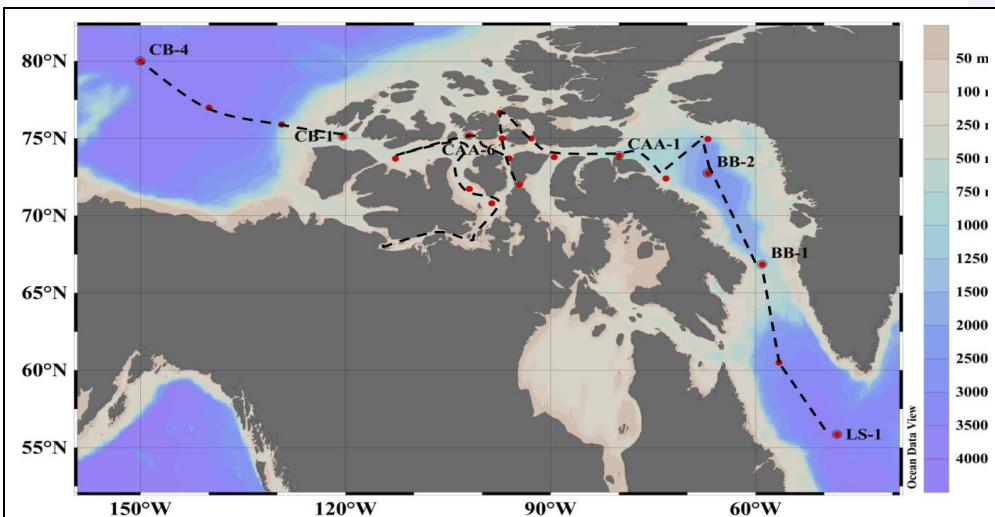


Fig. 1: Planned Canadian Arctic GEOTRACES cruise tracks on the CCGS Amundsen. The first leg covers the Labrador Sea, Baffin Bay, and the Canadian Arctic Archipelago. The second leg starts at the entrance of McClure Strait and continues across Canada Basin towards the northern tip of Northwind Ridge.

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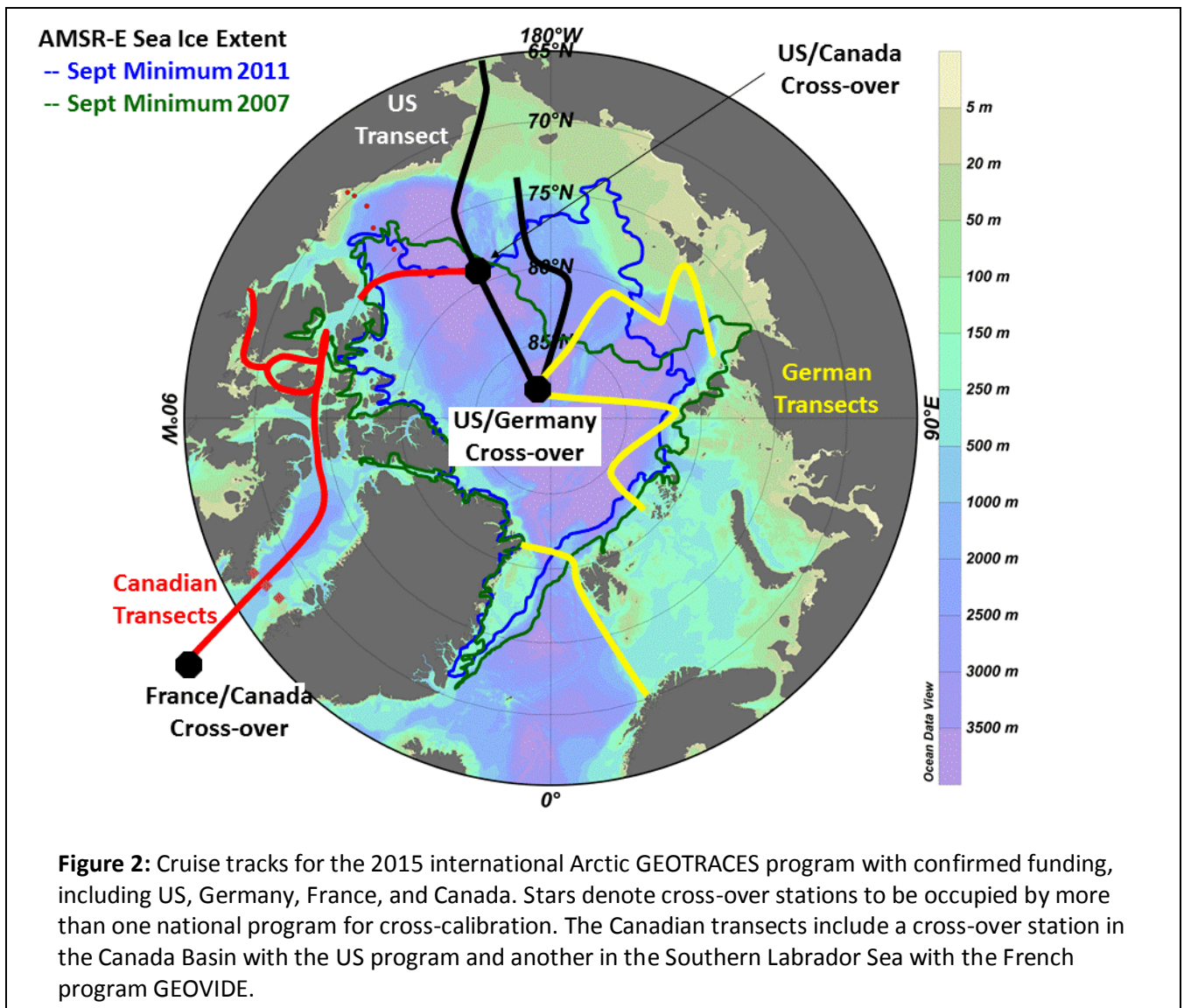
The Canadian National Committee of the Scientific Committee for Oceanic Research (CNC-SCOR) fosters and facilitates international cooperation. It is a non-governmental body that reflects the multi-disciplinary nature of ocean science and marine technology.

Le Comité national canadien du Comité scientifique de la recherche océanographique (SCOR) favorise et facilite la coopération internationale. Il reflète la nature multidisciplinaire de la science océanique et de la technologie marine.

from the Canada Basin across the Canadian Arctic Archipelago (CAA) to Baffin Bay and the Labrador Sea (Fig. 1).

The Canadian GEOTRACES project will be integrated in an unprecedented international, pan-Arctic field study (Fig. 2). Funding for the Canadian, US and German contributions has been approved and field work will be conducted by the three nations in summer 2015. The French program GEOVIDE, completed in June 2014, also provides a cross-over station with the Canadian program in the southern Labrador Sea (LS-1; Fig. 1).

The goals of the research program are to study key biological, physical and chemical processes in the Arctic Ocean, to map the distribution of key tracers across important hydrographic provinces, to couple chemical measurements with detailed surveys of water mass structure and circulation, and to complement our field observations with ship-board manipulation experiments to directly assess the potential influence of ocean acidification and changes in trace metal concentrations on productivity and species abundances. This information will then be incorporated into computer models to predict the response of the Arctic Ocean to



climate change and other human-related disturbances, and to provide foundational information critical for sustainable development in the Canadian Arctic.

The research activities are subdivided into five interrelated themes (Table 1), which address specific questions:

- Theme 1 (water mass structure and circulation)
 - How does water flow through the CAA into the Atlantic?
 - How can geochemical tracers be used to examine on-going circulation changes?
- Theme 2 (essential and toxic elements)
 - How will climate change and economic development alter trace element cycling?
 - How will this impact planktonic community structure, productivity and contaminant fates?
- Theme 3 (nutrients distribution, biological production, carbon sequestration and climate-active gas fluxes)
 - How will climate change impact carbon cycling?
 - What drives the spatial distribution of climate-active trace gases?
- Theme 4 (biological and chemical consequences of ocean acidification)
 - How could the buffering capacity of Arctic waters be influenced by changes in surface water hydrography, sediment geochemistry and continental run off?
 - What are the consequences of ocean acidification for productivity, ecosystem structure, trace gas emissions and carbon sequestration?
- Theme 5 (synthesis and modeling)

The results and observations obtained under these four themes will be integrated into a coupled circulation-ice-biogeochemical model [NEMO+PISCES] to:

 - investigate the response of circulation and hydrography in the CAA to climate change
 - develop a new generation marine ecosystem models with multiple trophic levels, explicit carbon, silica, oxygen and micro-nutrient/toxic metal cycles
 - add pertinent geochemical tracers into the coupled biogeochemical/circulation model to improve our understanding of the oceanography of the Arctic Ocean and refine physical and biogeochemical parameterizations in the models

Integration of state of the art geochemical data in coupled circulation/sea ice biogeochemical models will improve our ability to predict the future evolution of circulation, hydrography, marine productivity, air-sea exchange of climate active gases, ocean acidification, and contaminant dispersion. It will also provide important insights into the impact of these changes on North Atlantic productivity and deep water formation. Finally, close ties with the international GEOTRACES program will put the results generated by this project in a broad pan-Arctic and global context.

Table 1: Research themes and associated measurements to be conducted as part of the Canadian Arctic GEOTRACES project.

	Water mass structure / circulation Theme 1	Essential / toxic elements Theme 2	Nutrients, carbon, productivity & gases Theme 3	Ocean Acidification Theme 4
<i>In situ</i> Observations (Section 6.1)	hydrography, glider deployment nutrients, ^{129}I , ^{137}Cs ^{231}Pa , ^{230}Th , Al, Mn, Ba, $\delta^{18}\text{O}_{\text{sw}}$, $\delta^{13}\text{C-DIC}$, Alk, CDOM, isotopes of Cr, Nd, Si, Ra and Pb	concentration / speciation of Fe, Cu, Zn, Cd, Pb, Hg, Al, Mn, particulate metals, aerosols, isotopes of Fe, Cr, Nd, Ra; organic ligands	POC, pigments ^{234}Th , Triple O isotopes, O_2/Ar , $\delta^{13}\text{C-DIC}$, $\delta^{30}\text{Si}$, N_2/Ar , $\delta^{18}\text{O-NO}_3^-$, $\delta^{15}\text{N-NO}_3^-$, pCO_2 , DMS, N_2O , CH_4	DIC, A_T , pH, metal speciation
Process Studies (Section 6.2, 6.3)	physical dynamics in narrow straits	metal-clean Incubations	1° & 2° production, nutrient / metal uptake and recycling	CO_2 / pH manipulation experiments, pigments, 1° & 2° production
Theme 5 Modeling (Section 6.4)	Circulation & water masses NEMO v 3.4	TEIs incorporated into coupled PISCES - NEMO	New Arctic Ecosystem in Coupled NEMO - PISCES	CanESM2/ CanRCM-forcing in coupled NEMO-PISCES

Appendix: Principal Investigators.

Allen, S. (UBC), Azetsu-Scott, K. (BIO), Bergquist, B. (U. Toronto), Cornett, J. (U. Ottawa), Cullen J. (U. Victoria), Francois, R. (UBC), Gueguen, C. (Trent), Hamme, R. (U. Victoria), Holmden, C. (U. Saskatchewan), Kienast, M. (Dalhousie), Klymak, J. (U. Victoria), Maldonado M. (UBC), Miller, L. (IOS), Mucci, A. (McGill), Myers, P. (U. Alberta), Orians, K. (UBC), Rivkin, R. (Memorial), Ross, A. (U. Victoria/IOS), Smith, J. (BIO), Steiner, N. (EC), Thomas, H. (Dalhousie), Tortell P. (UBC), Vagles, S. (IOS), Varela D. (U. Victoria), Wang, F. (U. Manitoba), Waterman S. (UBC), Williams, W. (IOS)

News from SCOR Working Groups

WG 139 on Organic Ligands — A Key Control on Trace Metal Biogeochemistry in the Ocean

The third meeting of WG 139 was held at the University of Hawaii, Manoa on February 23. Fourteen members and four guests attended, and new Associate Member Parthasarathi Chakraborty (India) was welcomed to the group. Action items from previous meetings and progress toward the group's terms of reference were reviewed. The results of the intercalibration effort for interpretation techniques of speciation data were presented. A field intercalibration effort is currently being planned, and a database for speciation data is being assembled for Fe, Cu, Co and Zn; interested individuals should contact any of the WG 139 co-chairs. A series of invited presentations covered recent advances in ligand research, and the meeting finished with discussions of upcoming WG events.

WG 140 on Biogeochemical Exchange Processes at the Sea-Ice Interfaces (BEPSII)

The group met in conjunction with the International Symposium on Sea Ice in a Changing Environment in Hobart, Australia in March. The group met together on March 16 and subgroups met at various points during the symposium. The group's review on sea-ice methodologies has been submitted to the journal *Elementa*. A list of 9 reviews on specific sea-ice parameters and processes (of which 7 have confirmed authors) was drafted for a special issue of an open-access journal. The collection of chlorophyll a data from the Arctic is taking shape. The 1-D model intercomparison exercise also is well underway, with 8 groups contributing. The goal is to evaluate outcomes on biomass and primary production over a seasonal cycle, both in the Arctic and the Antarctic. Several other model intercomparisons are being discussed (e.g., upper-ocean circulation in the Arctic and impact of sea ice, in collaboration with the Forum for Arctic Modeling and Observational Synthesis). The group continued its discussion of a joint field campaign for method intercomparison and will seek financial support to organise this activity. Two different campaigns are envisioned: one in Japan (Saroma-Ko lagoon) concerning intercomparison of ice-melt procedures and potentially gas-exchange measurements; and one in Finland (Baltic, Tvarminne) on various primary production methods. Finally, there was discussion about an interactive Web site for the group.

WG 143 Dissolved N₂O and CH₄ Measurements: Working Towards a Global Network of Ocean Time Series Measurements of N₂O and CH₄

On 21 February, the inaugural meeting of SCOR WG 143 was held. The venue was the Center for Microbial Ecology (C-MORE) on the University of Hawaii campus. As it was the first time many members of the group had met, time was included in the agenda for introductions and networking. The key discussion points and highlights of the day were (1) how to achieve the group's objectives over the 3-4 year lifetime of the group, (2) information about spectroscopic gas analyzers, and (3) an update of the intercalibration exercise that is currently underway. The intercalibration exercise is one of WG143's key objectives and at the time of the meeting, five of the fourteen participating laboratories had analyzed the samples as part of the intercalibration exercise. After the other laboratories contribute their values, the data will be compiled and exchanged among group members.

WG 144 on Microbial Community Responses to Ocean Deoxygenation

Most of the Full Members of WG 144 met in Hawaii to begin planning the group's work. Planning is well underway for a workshop in Saanich Inlet, a seasonally anoxic fjord off the coast of Vancouver Island, British Columbia, Canada, to ground truth common standards for process rate and molecular measurements and to identify model ecosystems for future cross-scale comparative analyses.

MEETINGS

XXXII SCOR General Meeting, 15-17 September 2014, Bremen, Germany

The XXXII SCOR General Meeting will take place in Bremen, Germany from Monday, 15 September through Wednesday, 17 September 2014. The SCOR meeting will be followed by a one-day symposium and student poster session on German ocean science on 18 September. And, on 12-13 September, a workshop is planned to discuss coordination of national research plans for Indian Ocean research in the period 2016-2020 and national input to a research plan for the International Indian Ocean Expedition-2 (IIOE-2). All of these meetings are open. Visit the [SCOR website \(click\)](#) for more information.

ARCTIC NET: International Arctic Change 2014 conference, 8-12 December 2014, Ottawa, Ontario

Building on the success of its annual scientific meeting, the ArcticNet Network of Centres of Excellence and its national and international partners are welcoming the international Arctic research community to Ottawa for the International Arctic Change 2014 Conference to be held at the Ottawa Convention Centre from 8-12 December 2014.

Coinciding with the pinnacle of Canada's Chairmanship of the Arctic Council, Arctic Change 2014 welcomes the participation of international researchers, students, policy and decision makers, representatives of government and non-government organizations, the private sector, northern stakeholders and media to address the global challenges and opportunities arising from climate change and modernization in the circum-Arctic. With over 1000 participants expected to attend, Arctic Change 2014 will be one of the largest trans-sectoral international Arctic research conference ever held in Canada.

Visit the [Arctic Change 2014 website \(click here\)](#) for more information.

PERSONNEL

Dr. William Li Receives John Martin Award, from the American Society of Limnology and Oceanography

Dr. William Li, of the Bedford Institute of Oceanography, has been recognized for his contribution to the advancement of aquatic ecosystem science with the prestigious John Martin Award. Established in 2005 by the American Society of Limnology and Oceanography, the award annually recognizes one aquatic sciences paper which has been deemed to have strongly affected subsequent research in its field. The paper chosen must be a minimum of ten years old, and can be from any area of aquatic sciences, so long as it has had a profound and fundamental impact on research (either focus or interpretation).

Dr. Li is being recognized for his 1983 paper on primary production in the ocean, entitled, *Autotrophic picoplankton in the tropical ocean*. (Li, W. K. W., D. V. Subba Rao, W. G. Harrison, J. C. Smith, J. J. Cullen, B. Irwin, and T. Platt. *Science*. 1983. 219:292-95.) The paper, published in *Science*, has evolved the understanding of primary production and has also become a model with respect to testing experimental hypotheses in oceanography. Over twenty years later, the paper is still considered a "game changer" - one of the foundations of modern conceptions of marine food webs and has been cited close to 500 times. The paper was also responsible for an increase in interest in picophytoplankton research, creating a new area of study in biological oceanography. Additionally, this research continues to have an impact on areas such as the impact of climate change on the productivity of the Arctic Ocean as declining ice opens potential new fisheries.

Sincere congratulations to Dr. Bill Li.

The award citation follows:

JOHN MARTIN AWARD

"AUTOTROPHIC PICOPLANKTON IN THE TROPICAL OCEAN"

Autotrophic picoplankton in the tropical ocean. Li, W. K. W., D. V. Subba Rao, W. G. Harrison, J. C. Smith, J. J. Cullen, B. Irwin, and T. Platt. *Science*. 1983.219:292-95

Today, it is hard to imagine a biological oceanography text or statement about primary production in the ocean that does not make reference to the importance of picophytoplankton, such as Synechococcus and Prochlorococcus. Essential to this now-established paradigm is three decades of research inspired by the landmark paper "Autotrophic Picoplankton in the Sea" by Li and coworkers that conclusively demonstrated that photoautotrophs in the <2 micron size fraction were responsible for a majority of primary production at model sites representing much of the tropical ocean.

Described by one nominator as "a game changer," the paper firmly established an alternative to food web models based on primary



Li et al's 1983 Science paper established that photoautotrophs in the <2 micron size fraction were responsible for a majority of primary production at model sites representing much of the tropical ocean

production by net phytoplankton to one in which small photoautotrophs were important. Published only a few years after the first reports that phycoerythrin-containing Synechococcus were abundant in the ocean, five years before the discovery of Prochlorococcus, and at a time when some authors suggested most material flux in the small size fraction was due to bacterial heterotrophy, it laid to rest suggestions that chlorophyll-containing particles in the picoplankton size range were dead cell fragments and/or plastids from larger cells, or otherwise unimportant.

One reason "Autotrophic Picophytoplankton in the Sea" was so scientifically convincing was the careful use of multiple lines of inquiry in the paper. It remains a model of the application of 'Strong Inference' (sensu Platt, 1984; Science, 146:347-53) and experimental hypothesis testing in oceanography. Central to the work were experiments showing that a significant fraction of ¹⁴C bicarbonate wound up in the <2 micron size fraction after bottle incubation. Additionally, more than 70% of ribulose bis-phosphate carboxylase activity was associated with the picoplankton size-fraction at both sites, a result that was consistent with biomass distribution was seen in size-fractionated chlorophyll data and epifluorescence-based counts of picophytoplankton. Paired light-dark experiments ruled out dark-fixation by bacteria by showing the light-dependence of radiolabel accumulation in the <2 micron fraction. However, as explained eloquently in the paper, this result alone did not prove the picoplankton were photoautotrophs. If larger phytoplankton released labeled organic matter during photosynthesis, heterotrophic uptake of the labeled organic matter by the picoplankton size fraction would occur primarily under lighted conditions, but not be light-dependent itself. This possibility was eliminated by an elegant experiment in which larger cells were removed by filtration before the isotope was added. When the same light-dependent rates of ¹⁴C accumulation by small cells were observed in absence of large phytoplankton, the authors were able to ascribe the result to photoautotrophy by cells in the <2 micron fraction.

Li et al's 1983 Science paper established, for the first time, that picophytoplankton definitely fix carbon at significant rates. Confidence in the importance of picophytoplankton engendered by this work led to a pivotal NATO Advanced Study Institute in 1985 (organized by Platt and Li) and triggered widespread interest in both prokaryotic and eukaryotic picophytoplankton, a field that has subsequently emerged as a new and vibrant sub-discipline of biological oceanography. Cited nearly 500 times, Li et al (1983) remains one of the 'go to' papers for rates of productivity by picophytoplankton and a seminal paper in biological oceanography.

Dr. Paul J. Harrison awarded the 2014 Parsons Medal for Excellence in Multidisciplinary Ocean Sciences

On June 3, 2014 at the annual congress of the Canadian Meteorological and Oceanographic Society in Rimouski, Quebec, Director General Denis Hains of the Canadian Hydrographic Service announced that the 2014 Parsons Medal, awarded by DFO for excellence in multidisciplinary ocean sciences, has been awarded to Dr. Paul J. Harrison of the University of British Columbia.

The Timothy R. Parsons Medal was established by Fisheries and Oceans Canada to recognize achievement in ocean sciences. It honours the outstanding contributions of Dr. Timothy R. Parsons to the field of ocean sciences, who was the first recipient of the medal. It is awarded for:

- distinguished accomplishments in multidisciplinary facets of ocean sciences while working for Canadian Institutions or for the benefit of Canadian science.
- excellence during the lifetime of the recipient or for a recent outstanding achievement, both being equally eligible.

Dr. Harrison received his Bachelor's degree in General Science from the University of Toronto, A Master's degree in Botany and Ecology from Guelph, and a Ph.D. in Biological Oceanography from the University of Washington in Seattle. From 1975 to 2002, Paul was a Professor at the University of British Columbia in Vancouver, and from 2002 to 2010 he was the Director of the Atmospheric & Marine Science Program at the Hong Kong University of Science & Technology. Since 2010, Paul has been Professor Emeritus at UBC.

A specialist of phytoplankton ecology and physiology, Dr. Harrison has authored and co-authored over 300 refereed publications on subjects ranging from the physiological ecology of marine algae to nutrient uptake and assimilation by phytoplankton and seaweeds. His work has been cited over 16,000 times in scientific publications, with almost 6,000 citations since 2009. He has also written 3 textbooks.

Paul is a Fellow of the Royal Society of Canada, has won awards for his teaching and international awards for his research. He has also been a PI on 3 large multi-disciplinary Canadian programs: JGOFS, GLOBEC, and SOLAS. He has assumed leadership roles as the President of the Western Canadian University Marine Biology Society, and the Board of Directors for the National Research Council and Venus and Neptune Networks.

Numerous letters of support were received from both across Canada and abroad, which highlight a variety of reasons why Dr. Harrison is highly deserving of this award. They spoke of his work on numerous committees across the world, the number of students that he has supervised throughout his career, and the editorial responsibilities which he has assumed over the years. Three separate letters noted that one of Dr. Harrison's key contributions are his laboratory cultures that form the groundwork of our understanding of the photosynthesis, nutrient uptake, growth, sinking and competition of phytoplankton in nature, and how difficult these are to perform - his lab, for example, is one of the few capable of growing key oceanic species that exhibit Fe limitation. They also noted that Paul went beyond the lab, designing observations and experiments in the field to complement his findings. Another letter discussed how Paul just "knows bugs"; which should be considered the highest level of praise to understand how it all fits together, from oceanographic forcing to physiological and biochemical mechanisms.

Congratulations again to Dr. Paul J. Harrison!

CMOS / SCMO Awards presented at the 48th CMOS Congress

J.P. Tully Medal in Oceanography Médaille J.P. Tully en océanographie

The J.P. Tully Medal is awarded each year to a person whose scientific contribution have had a significant impact on Canadian Oceanography. The medal was awarded to Peter Smith, Bedford Institute of Oceanography, for his project leadership and management, and his outstanding research of fundamental processes on the Scotian Shelf and in the Georges Bank, Gulf of Maine region.



François J. Saucier Prize in Applied Oceanography Prix François J. Saucier en océanographie appliquée

Le prix François J. Saucier en océanographie appliquée, est décerné pour un travail exceptionnel dans le domaine de l'océanographie appliquée au Canada. Le prix a été décerné à François Roy, Environnement Canada, (RPN-Dorval), pour sa contribution remarquable au développement et à l'implantation d'un système opérationnel de prévision numérique de l'océan.



Dr. Fred Page Receives Aquaculture Association of Canada Research Award of Excellence

Dr. Fred Page is the recipient of the 2014 Aquaculture Association of Canada (AAC) Research Award of Excellence. This award recognizes high quality, innovative and current research that has had a significant impact on the aquaculture industry in Canada. At the Conference celebrating the 30th anniversary of the AAC, Dr. Page received the award in the presence of friends and colleagues in recognition of his continued research excellence in leading a program focused on the physical and chemical oceanographic conditions of the marine environment and their application to finfish aquaculture production and regulation.

In Atlantic Canada, his oceanographic research has led to the better understanding of cage culture interactions and dispersals of waste and pesticides in the marine environment. This research on cage site to cage site interactions has significantly contributed to better health and disease management for the aquaculture industry and the development of Aquaculture Bay Management Areas in southwest New Brunswick. His research concerning the transport and dispersal of organics released from salmon cage sites and sediment sulphides has also contributed to the design of aquaculture environmental impact monitoring programs.

Dr. Page is also involved on the international stage where he has been a member of Canadian science delegations to Spain and Chile, a member of a United Nations team working on the status of the world's oceans and an invited scientific reviewer of the New Zealand National Institute of Water and Atmospheric research aquaculture environmental interactions program.

Dr. Page is currently the Head of the Coastal Oceanography and Ecosystem Research Section at the St. Andrews Biological Station located in the heart of the southwest New Brunswick salmon industry. Congratulations to Dr. Page on receiving this prestigious award.

CANADIAN JOBS and TRAINING

Post-doctoral Position at the University of British Columbia as part of the NCE: MEOPAR

The Department of Earth, Ocean & Atmospheric Sciences at the University of British Columbia invites applications for a Postdoctoral Fellow in the field of coupled biological/chemical/physical ocean modelling.

The successful applicant will conduct research as part of a group developing a coupled numerical model, based on the NEMO model, of the Strait of Georgia with data assimilation from the Ocean Networks Canada observatory to be run operationally.

The position is for one-year, renewable for a second year and preferred start dates are Nov 2014-Feb 2015. The application deadline is Sep 16, 2014 but will be extended if a suitable candidate has not been found.

Full details are available here: http://eos.ubc.ca/~sallen/postdoc2_ad.pdf

Looking for work? Try the CMOS site ([click](#))

Vous recherchez un emploi? Visitez le site SCMO ([click](#))

GENERAL

GEOTRACES: Changing the way we explore ocean chemistry

Read about the experiences and lessons learned in the planning and implementation of GEOTRACES international programme in a recent paper published in [Oceanography](#). Anderson and co-authors present an extraordinary synthesis of the GEOTRACES programme showing the benefits of an international collaborative research effort such as GEOTRACES. It is hoped that this paper provides useful guidance to scientists wishing to enter into the adventure of organizing coordinated research programmes. Click [here](#) to view the paper.

For more GEOTRACES Science Highlights read the [GEOTRACES eNEWSLETTER \(click here\)](#).

New from SOLAS

The SCOR/IGBP/WCRP/iCACGP Surface Ocean – Lower Atmosphere Study (SOLAS) is preparing a proposal for a 10-year project extension for consideration by SOLAS co-sponsors. At the same time, SOLAS continues implementation of the elements of its mid-term strategy. (Several SCOR working groups are contributing to elements of the mid-term strategy.) SOLAS also is preparing for its next OSC, in September 2015 in Kiel, Germany.

Special Issue of Biogeosciences: The Ocean in a High-CO2 World

The special issue of Biogeosciences from the Third Symposium on The Ocean in a High-CO2 World has recently been completed. The special issue, which includes 21 papers based on presentations from the symposium in Monterey, California, USA in September 2012, can be found at www.biogeosciences.net/special_issue129.html.

Special Issue of Deep-Sea Research: Harmful Algal Blooms

The Core Research Project on Harmful Algal Blooms in Stratified Systems of the Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) project published a special issue of Deep-Sea Research II: *Raine, R., E. Berdalet, M. McManus, and H. Yamazaki (eds.). 2014. Harmful algal blooms in stratified systems. Deep-Sea Research Part II: Topical Studies in Oceanography 101:1-254.*

Special issue call for Papers: 'Biogeochemistry of trace elements and their isotopes' in Marine Chemistry

Trace elements and their isotopes (TEIs) are critically important in regulating ocean biology, as tracers of oceanic processes, and as paleoceanographic tools. The past decade has seen major advances in our understanding of the distribution, cycling, and biogeochemical function of TEIs in the ocean, afforded by the first basin-scale surveys completed as part of the CLIVAR and GEOTRACES programs, and by concurrent advances in chemical and isotopic analysis, numerical modelling and molecular biology.

The main objective of this special issue in the journal Marine Chemistry is to address the biogeochemical cycling of TEIs in the ocean, with three main themes: (1) the distribution and physico-chemical speciation of TEIs in the ocean, including results from recent GEOTRACES field activities and intercalibration efforts; (2) the exchange of TEIs between the lower atmosphere and the upper ocean; and (3) parallel studies of TEIs that inform our understanding of key regulatory processes, including their input, speciation, biological cycling and removal.

The submission deadline is 31 October 2014. More information is available on the GEOTRACES webpage ([click here](#)).

Call for Nominations - The NSERC Awards for Science Promotion

The NSERC Awards for Science Promotion honour individuals and groups who make an outstanding contribution to the promotion of science in Canada through activities encouraging popular interest in science or developing science abilities. Two recipients (one individual and one group) may be selected for the awards each year. The individual recipient will receive an award of \$10,000. The winning group will be awarded \$25,000 to further science promotion activities.

NSERC invites all Canadians with an interest in science, including teachers and university researchers, to contribute to the success of this annual effort by nominating the people who are making others aware of what science means to all of us.

Details as well as the nomination form are available [here \(click\)](#). The deadline for nominations is 1 September 2104.

Arctic Inspiration Prize

The Arctic Inspiration Prize recognizes and promotes the extraordinary contribution made by teams in the gathering of Arctic knowledge and their plans to implement this knowledge to real world applications for the benefit of the Canadian Arctic, Arctic Peoples and therefore Canada as a whole. This \$1 million prize is awarded annually. Nominations must be submitted to Arctic Inspiration Prize office by 1 October 2014. Further information as well as the nomination package are available [here \(click\)](#).

CANADIAN OCEAN SCIENCE NEWSLETTER

LE BULLETIN CANADIEN DES SCIENCES DE L'OcéAN

Previous newsletters may be found on the CNC/SCOR web site.
Les bulletins antérieurs se retrouvent sur le site web du CNC/SCOR.

Newsletter #78 will be distributed on 17 September, 2014. Please send contributions to Michel Mitchell, michel.mitchell@dfo-mpo.gc.ca
Le Bulletin #78 sera distribué le 17 septembre 2014. Veuillez faire parvenir vos contributions à michel.mitchell@dfo-mpo.gc.ca

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