

# ARTICLE



## GEOSCIENCE OUTREACH

### Raising Awareness of Earth Science through the BC Year of Science 2010–2011

**Eileen Van der Flier-Keller**  
*School of Earth and Ocean Sciences*  
*University of Victoria*  
*Victoria BC V8W 3P6*  
*Email: [fkeller@uvic.ca](mailto:fkeller@uvic.ca)*

#### SUMMARY

The British Columbia Year of Science (YoS), held in 2010–11, was a provincial government–science community collaboration aimed at engaging youth in science. The YoS provided a timely opportunity to expand our Earth science outreach efforts in British Columbia. Key components of the three initiatives reported on below include university student engagement, collaboration with partners (both within the university and in government and community sectors), funding from a variety of sources, and a target audience of primarily youth, their teachers and parents. The first project, Earth Science and Society, involved K–12 classroom presentations (127 to 2615 students), teacher and educator workshops (8 to

~138 participants) and community events (15, audience of ~ 1238). Of the K–12 students surveyed, 89.8% indicated that because of the presentations they wanted to learn more about science. In the second project, Earth science was an important part of one of the four YoS signature Expos, ‘Science and the World Around Us’ held in Prince George with over 3000 youth and community participants. The third project, ‘Science in our Lives’, involved development of nine societally relevant hands-on activities (4 involving aspects of Earth science) that were posted on [<http://uvic.ca/sciweb/>], together with 21 scientist-career profiles. The latter, featured as ‘5 Minutes with a Scientist’, highlighted exciting relevant careers in science, and portrayed scientists as real, approachable people doing interesting things that they are passionate about. Key successes of these outreach efforts include: i) funding from multiple sources enabling us to recruit and support four undergraduate students to participate in a broad-ranging outreach program; ii) partnerships and collaborations developed with government, the community and within the university; and iii) legacy resources, including activities, career profiles, teacher workshop manuals, and a new school program in non-renewable resources developed with Capital Region District Victoria to supplement their 3R sustainability school program offerings.

#### SOMMAIRE

La British Columbian Year of Science (YoS) [Année de la science de Colombie-Britannique] tenue durant l’année scolaire 2010-2011 était un programme du gouvernement provincial en collaboration avec la communauté scientifique qui visait à intéresser les jeunes à la science. La YoS a été une occasion

opportune d’ajouter aux efforts de sensibilisation de la population de Colombie-Britannique aux sciences de la Terre. La participation d’étudiants de l’université, la collaboration de partenaires (tant de l’université, du gouvernement et de certains milieux de la communauté), le financement de multiples sources, et une population cible constituée principalement de jeunes, de leurs enseignants et de leurs parents sont les composantes clés des trois projets décrits ci-dessous. Le premier projet, « Sciences de la Terre et société », a consisté à faire des présentations à des classes d’étudiants du pré-collégial (127, pour 2 615 étudiants), à tenir des ateliers avec des enseignants et des éducateurs (8, pour 138 participants), et à faire des activités dans la communauté (15, pour 1 238 personnes). Des étudiants du pré-collégial rejoints, 89,8 % ont déclaré qu’à la suite des présentations, ils voulaient en savoir plus sur la science. Dans le deuxième projet, les sciences de la Terre ont constituées une part importante des quatre expositions de marque de la YoS, « Science and the World Around Us » tenu à Prince George lesquelles ont attiré plus de 3 000 jeunes et autres participants de la communauté. Le troisième projet « La science dans la vie de tous les jours » comportait la mise en œuvre de neuf activités pratiques à visées sociétales (dont 4 comportaient des aspects géoscientifiques) affichées sur [<http://uvic.ca/sciweb/>], ainsi que le profil de carrière de 21 scientifiques. Le dernier projet intitulé « Cinq minutes avec un scientifique », a mis l’accent sur le côté excitant de carrières scientifiques et a démontré que les scientifiques étaient des personnes facile d’abord, comme vous et moi, et qui faisaient des choses intéressantes et qui les passionnaient. Les éléments clés du

succès de ces initiatives de sensibilisation sont : i) un financement de sources multiples qui nous a permis de recruter quatre étudiants de premier cycle et de soutenir leur travail dans un programme de sensibilisation à large portée; ii) des partenariats et des collaborations avec le gouvernement, la communauté et le monde universitaire; et iii) des contenus de grande qualité, incluant des activités, des profils de carrière, des manuels pour les enseignants, ainsi qu'un nouveau programme scolaire sur les ressources non-renouvelables créé par le district de Victoria de la région de la Capitale en appui au contenu de leur programme scolaire 3R.

## INTRODUCTION

The British Columbia (BC) Year of Science (YoS) was held during the 2010–2011 school year across the province. The goal was to raise the profile and increase appreciation of science among young British Columbians, and to engage young people in science by showcasing how science works, who scientists are, the kinds of work they do, and why science matters in the everyday lives of British Columbians and the communities they live in. The YoS was initiated by the Ministry of Advanced Education and Labour Market Development to inspire young minds and foster a culture of research and innovation, by helping BC families to connect with the passion and exhilaration of science discovery, and by calling attention to some of the diverse and exciting career opportunities available through science in our communities. One impetus for the YoS was the BC Labour Market Outlook 2010–2020 BC [[www.workbc.ca/docs/BCLMOutlook.pdf](http://www.workbc.ca/docs/BCLMOutlook.pdf)], which predicts that “*by the end of the decade, three quarters of all future jobs in BC will need some post-secondary education, and many of the most interesting and well-paying jobs will need a solid understanding of math, sciences, engineering and technologies [STEM]*” ([<http://yearofsciencebc.ca/science-in-government/news-releases-2/>] see entry 2010/09/24). The report also suggests that employment demand for STEM-related occupations will increase faster than other occupations over the next 10 years, with virtually all of the top 50 occupations that are

expected to experience the most serious shortages being science and technology-related. These occupations require science and math prerequisites at high school. With the YoS tagline ‘Choose Science. Go Far’, organizers hoped to encourage our young people to pursue a good education in science today, to prepare them for the jobs of tomorrow and ensure they have the knowledge and skills to build a strong economy, and contribute to a healthy environment. The projects described below aimed to ensure that Earth science was promoted and well represented throughout the YoS.

## HOW THE BC YEAR OF SCIENCE WORKED

The YoS, although initiated and led by the provincial government, was envisaged as a partnership and collaboration with stakeholders throughout the BC science community. To engage this diverse community, a YoS Planning Template, produced by the BC Ministry of Advanced Education and Labour Market Development, was distributed (in the university sector, by the Research Universities Council of British Columbia) to facilitate transfer of information regarding potential YoS co-branding initiatives. A first call for information from the science community was made in January 2010, with a further opportunity for submissions, particularly for the YoS website, in June 2010. The YoS Planning Template specifically sought information regarding existing science activities and province-wide events with potential for co-branding; i.e. those events or activities planned for Sept 2010–June 2011 that met the YoS objectives, and addressed the target audience of children (K–12), parents, teachers and educators. Proposals for expansion of existing activities to reach larger audiences and/or include broader geographic regions were also invited. Funding decisions on these proposals were made in October/November 2010 and funds were distributed in December 2010. The tight time frame for planning and science community engagement, and the slow start to the YoS (likely related to internal government reorganizations which led to YoS leadership moving to the BC Ministry of Jobs, Tourism and Innovation part-

way through the initiative), may have somewhat limited the potential scope of the YoS. However, the initiative proved very successful, and engaged a broad spectrum of the science community (e.g. more than 80 BC colleges, universities, and community groups), which organized and participated in 1300 YoS events in all regions of the province, and attracted more than 198 000 K–12 students, 29 000 parents, and 18 500 post-secondary students to various YoS events ([<http://yearofsciencebc.ca/science-in-government/news-releases-2/>], see entry 2011/07/04).

The key communication and outreach tool for the BC YoS was their website [[www.yearofsciencebc.ca](http://www.yearofsciencebc.ca)], which hosted links to YoS participants, as well as delivering content, videos and information categorized as follows:

- Get involved in Science (e.g. science camp information, museums, informal learning opportunities, and a comprehensive YoS book list, by age category and topic, developed by the Vancouver Public Library);
- Science in BC – a regional look at science opportunities across the province;
- Stories, Scientists and Careers;
- Calendar of Events and News (BC science community planned and scheduled events, including YoS Expos);
- Multimedia; and
- Science in Government.

In addition, the website, which promoted the YoS ‘Choose Science. Go Far. Win Big’ contest, had 85 entrants. The \$25 000 scholarship, to pursue a science education, was won by a high school student from Fort St. John in northern BC, for a project on the potential of naturally occurring blue-green algae as a source for biofuel. A second project in the top six was also related to renewable energy sources.

## RAISING AWARENESS OF THE IMPORTANCE OF EARTH SCIENCE

*“Science is everywhere and affects everything we do”.*

*“In British Columbia and across Canada, scientists and researchers carry out – through chemistry, biology, physics, mathematics and other fields – a wide*

*range of work which is continually leading the way to the development of many new products and practical solutions that are vital to every aspect of our lives.”*

—Moira Stillwell, October 2010

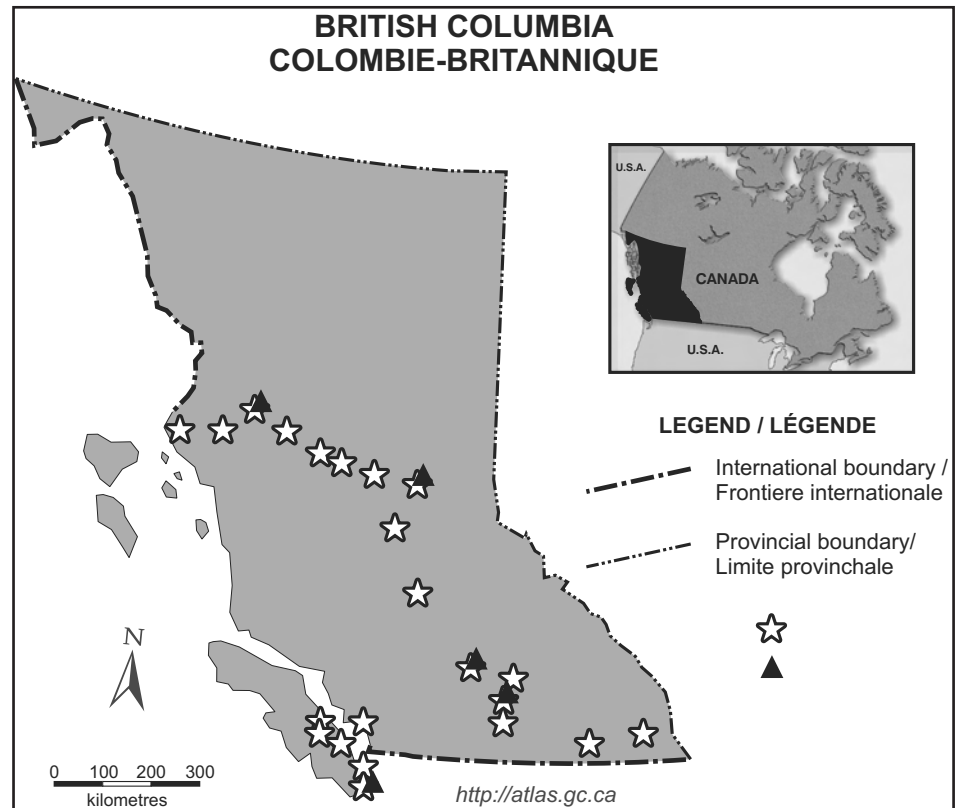
YoS Opinion—Editorial

In this and other early YoS communications, Earth science was not specifically cited with the major sciences. This emphasis on Physics, Chemistry and Biology, and exclusion of Earth science, especially for an initiative seeking to raise awareness among youth, parents and teachers, of careers in science, perpetuates the lack of awareness of the possibilities in Earth science, and encourages the perception that Earth science is less important than the other sciences. The BC YoS provided an opportunity to promote and raise the profile of Earth science, increase awareness of what Earth scientists do, and link BC youth, parents, teachers, and the community to practicing and emerging Earth scientists.

Three examples of YoS projects that promoted Earth science are described below. Each of these involved university student engagement, funding from a variety of sources, collaboration with partners in the university, government and community sectors, and were targeted primarily toward youth, their teachers and parents.

### I. Earth Science and Society

The Earth Science and Society project involved three components: free K–12 classroom presentations across the province (Fig. 1); teacher and educator professional development workshops; and community engagement (Fig. 1), all expanding upon ongoing efforts to increase awareness of Earth science, and positively influence the teaching of Earth science in classrooms around BC. Funds from the BC YoS, the BC Ministry of Energy Mines and Petroleum Resources (BC MEMPR), the Canadian Geological Foundation (CGF), and EdGEO (the Canadian Earth Science Teacher Workshop Program, [www.edgeo.org]) were used to hire four University of Victoria (UVic) undergraduate students (Rob Cook, Liana Stammers, and Rebecca Stanton in the School of Earth and Ocean Sciences (SEOS), and Erin Edwards, a



**Figure 1:** Map showing locations of UVic Earth Science K-12 Classroom presentations (stars) and Community events (triangles).

SEOS Coop student). These funds also covered travel costs, and paid for the development and purchase of classroom resources and kits for teachers, and educators at a new environmental sustainability learning centre in Victoria (Hartland Learning Centre). Resources for students and teachers were also donated by BC MEMPR, Explore for More, and the Mineral Education Program of BC (MEPBC).

### K-12 Classroom Presentations

Presentations were delivered primarily in elementary and middle schools (i.e. to grades K–8), on societally relevant Earth science topics including:

- Resources
  - The importance of Minerals and Mining in BC
  - Water
- Oceans and climate change
- Weather
- Reading the rocks - Earth history and processes
- Plate tectonics and natural hazards - earthquakes, tsunamis, volcanoes, and landslides

The interactive, hands-on presentations were curriculum-linked, col-

laboratively developed, and carried out mainly by UVic undergraduate students (Fig. 2), following training that included a combination of attending and co-delivering one or more classroom presentations, feedback (on delivery, approaches to engaging students, voice and body language etc.), on-going mentoring, and attending a tutorial on constructivist teaching pedagogy. Two of the students had previous teaching experience through participating as first year undergraduate lab mentors in the School of Earth and Ocean Sciences and one of these students also had a previous summer position with Science Venture at UVic. The students were responsible for contacting schools across the province to set up presentations and organize itineraries. Presentations were delivered in 22 locations (Fig. 1), with a focus on smaller centres that would not normally have access to visiting scientists and classroom presentations. Locations included Victoria (11 presentations), Sechelt (1), Thetis Island (1), Duncan (5), Kamloops (5), Vernon (9), Enderby (3), Nelson (3), Nanoose Bay (2), Denman Island (2), Hornby Island (1), Prince George (13),





**Figure 2.** University of Victoria undergraduates engaging with students in classroom presentations.

Quesnel (3), Smithers (4), Cranbrook (19), Williams Lake (14), Vanderhoof (4), Fraser Lake (5), Burns Lake (5), Houston (7), Terrace (5), and Prince Rupert (5). A total of 127 presentations were delivered, in 44 schools, to 2615 students.

### **Teacher, Pre-Service Teacher, and Educator Professional Development**

Teacher and educator workshops were carried out in collaboration with partners including Canadian Geoscience Education Network (CGEN) members, local teachers, and environmental education and advocacy local government (Capital Regional District (CRD) Victoria) and community groups such as Seaquaria and EcoRowing. Workshops sought to promote leadership in engagement of K–12 students in Earth science, by encouraging confidence in, and enthusiasm for, Earth science, and by providing curriculum-linked hands-on activities, engaging experiments, classroom resources and career information to help promote science teaching and learning in BC classrooms and informal education environments. Workshops focused on issues and topics that were both relevant to society and linked to the K–12 BC curriculum. Funding from YoS, CGF, and EdGEO

were used to develop and/or provide relevant resources such as rock or fossil kits, posters, and activity guidelines to participants. Workshops included the following:

- Mitchell Odyssey Foundation, Wild About Science Symposium 2010, November 6, 2010: ‘The Oceans – A Moving Target as Climate Changes’ (26 teachers).
- SD 61 District Wide ProD Day Workshop at James Bay Elementary School, November 26, 2010 (with Pacific CRYSTAL Community Programs Seaquaria and EcoRowing, and Pacific CRYSTAL teachers M. Tomasino and M. Holmes): ‘Environmental Learning Grounded in Place: Earth Science Meets Seaquaria in Our Community’ (28 participants).
- Invited workshop for the Faculty of Education, UVic, October 20, 2010: ‘Plate Tectonics, Earthquakes and Volcanoes’ (21 students).
- Education Lab in EOS 120, UVic, for students intending to become teachers, January to April 2011 (23 students).
- CRD Hartland Interpretive Centre Educators: mentoring in non-renewable resources topics and

development of activities and displays (2 educators). This collaboration is funded through a CGF grant, which has been used to purchase resources for hands-on activities, including a classroom set of non-renewable resources matching kits for the Hartland Learning Centre (see below).

- CRD Regional Parks (Victoria) Volunteer/Educator Workshop, April 7, 2011 (15 participants).
- Geological Association of Canada ‘Understanding Our Connection to the Earth’ Teachers’ Workshop: Climate Change Session (with Charly Bank and Jean Dougherty), May 27, 2011 (3 participants).
- Geological Association of Canada ‘Understanding Our Connection to the Earth’ Teachers’ Workshop: Changing Earth and Tectonics Session (with Godfrey Nowlan), May 27, 2011 (~20 participants).

In total, 8 workshops were delivered, with ~138 teachers and educators participating.

### **Public Presentations and Community Events**

In addition to community presentations on non-renewable resources and water, a public outreach display was developed by UVic Co-op student Erin Edwards for a series of community events throughout BC, with the goal of promoting understanding of the role of non-renewable resources in our lives. In total, the YoS Earth science project participated in 15 community events (Fig. 1, Table 1) reaching an audience of approximately 1238 community members.

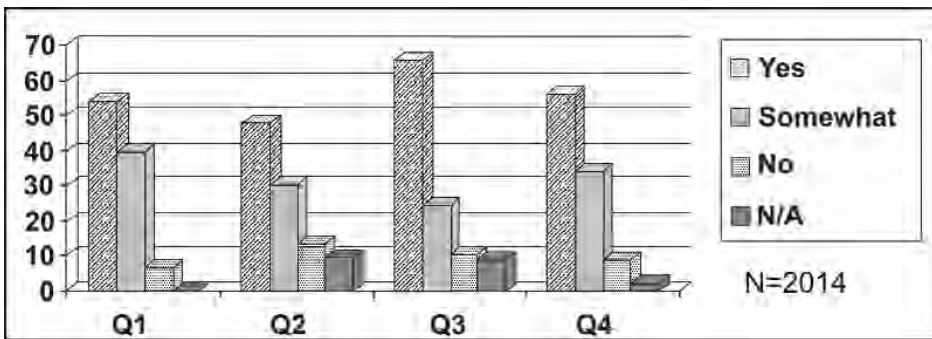
### **Feedback and Program Evaluation: K–12 Classroom Presentations**

Short YoS surveys (provided by the YoS) were completed by approximately 77% of classroom presentation participants. Very young students (K–2) were exempt as it was felt that the survey was not appropriate for this age group. The survey sought responses Yes, Somewhat, No or N/A to the following questions:

- Q1 ‘Because of this event, I feel Science is exciting, interesting and affects my life’
- Q2 ‘Because of this event, I learned of the possible career opportunities

**Table 1.** Public presentations and community events

Venue	Event type	# of Participants
Kamloops, Big Little Science Centre	2 presentations	110
Kelowna, Farmers Market	display	~150
Kamloops, Rock Hound Meeting	1 presentation	~25
Kamloops Exploration Group Conference	6 presentations	~95
Prince George YoS Expo	display	~300
Smithers, NorthWest Trade Expo	display	~500
Sidney, Beechwood Village	1 presentation	17
Victoria, Cordova Bay United Church	1 presentation	20
Victoria, CN Pensioners Association	1 presentation	21

**Figure 3:** Summary chart showing responses from participants to questions regarding the YoS classroom presentations.

by pursuing Science’

Q3 ‘Because of this event, I understand how Science can improve the environment’

Q4 ‘Because of this event, I want to learn more about Science.’

Feedback was generally positive, as shown in the summary chart (Fig. 3). For example, 93.7% of students responded that science is exciting, interesting and affects their lives (53.7% Yes, 40% Somewhat); 65.9% of students answered ‘Yes’ to Q3 about science improving the environment (75% of the subset of students who participated in the presentations on non-renewable resources answered ‘Yes’ to Q3); and 89.8% (56.2% ‘Yes’, 33.6% ‘Somewhat’) reported that they want to learn more about science. Slightly lower scores for Q2 (77.7% ‘Yes’ and ‘Somewhat’ combined) may reflect a lack of emphasis on careers in some of the presentations. ‘Explore for More’ information kits, and Earth science careers postcards [www.earthsciencescanada.com] were provided in the classrooms involved in the non-renewable resources programs.

A final part of the YoS survey was a box for student comments, with

the prompt ‘The most exciting part of this event was ...’. Student responses were varied, but matching rocks and minerals to resources was cited frequently, as were looking at, touching and writing about rocks, the seismic wave lineup, hands-on experiments, water cycle rain game, wallpaper time line, and fossils.

Teacher feedback (from the same YoS surveys as above) was also very positive. They appreciated the hands-on components, and the enthusiasm, knowledge, organization, patience, and energy of the young presenters:

*“[I enjoyed] the hands-on nature of the presentation and warm, friendly approach of the presenter”* – Grade 3 teacher, Cranbrook;

*“Students really enjoyed the hands-on activity sorting rocks”* – Grade 5 teacher, Cranbrook;

*“Mr. Cook was enthusiastic, [and] engaged the children with his knowledge. He accepted suggestions on communicating with younger children and implemented them immediately. He was very appreciative of any feedback. The kids loved the presentation”* – Grade 2 teacher, Cranbrook.

A more detailed survey of classroom teachers involved with the ‘Importance of Minerals and Mining in BC’ program, showed that teachers felt that the strengths of the program were its hands-on, interactive approach, the meaningful connections, currency, relevance, engaging activities, good examples and questions, good organization, and mix of talk and hands-on:

*“hands-on, students were ‘geologists’; really focused; small groups were very effective”* – Duncan teacher

This teacher also relayed to Erin Edwards that some students had told her it was the best science day they had had in their lives.

*“It was great for the students to realize the value of minerals. Thank you for the rocks and minerals, the class is excited”* – Vernon teacher.

This teacher is referring to the rock and mineral kit given to each class where a presentation was made. Many teachers commented that this would help them to further develop their Grade 5 Resources lesson plans and incorporate the activities demonstrated during the presentations. Teachers suggested that it would be helpful for them to have some supplementary visual aids, such as overheads, power-point slides or videos to illustrate types of mining operations discussed.

Undergraduate presenter feedback, from a 12 question survey completed by the four students involved with the program, showed that they felt that the benefits of the presentations would extend beyond the impact on the students, as many of the teachers took notes, intending to do the same activities themselves, and were overheard discussing the activities with colleagues in the lunch room.

### **Feedback and Program Evaluation: Teacher and Educator Workshops**

Based on surveys completed by the teachers after each workshop, as well as observations and informal communications, feedback was positive, with comments such as:

*“A great hands-on workshop. I’m leaving with lots of new lesson/project ideas and some new contacts”;*

*“The idea to apply observation, description, and questioning to phenomena in our natural environment outside the school setting”;*



*"If we want young teachers to become comfortable initiating outdoor ed then we have to take them out of doors. Well done"* – teachers from workshop 2.

*"The oceans workshop had very hands-on applicable demos that will be easy to bring back to the classroom";*

*"The oceans one was the best because of hands-on fast paced activities and package that went with it. Very well done"* – teachers from workshop 1.

*"The activities were phenomenal! This was so much fun, and definitely useful, loads of materials";*

*"I loved all of the experiments – learning things I will use in my classroom"* – pre-service teachers from workshop 3.

In addition, work with the CRD educators culminated in the addition of a new module, 'Digging Deeper' (Fig. 4), to the school programs [[www.crd.bc.ca/waste/schoolprogram.htm](http://www.crd.bc.ca/waste/schoolprogram.htm)] of the Waste Management Division – Environmental Sustainability of the CRD. The new module, which focuses on non-renewable resources and 'what is in our stuff', was showcased by Elaine Leckie, a CRD educator, at the recent (October 2011) opening of the new Hartland Learning Centre.

## II. BC YoS Expos

The BC YoS coordinated four major science expos around the province, including the 'Health and Science' Expo in Vancouver (November 2010), 'Science and Sport' Expo in Vancouver (February 2011), 'Science and the World Around Us' Expo in Prince George (April 2011), and the 'Science and the Arts' Expo in Victoria (May 2011). These Expos were YoS 'signature events' that were designed to be i) large-scale, interactive gatherings involving scientists; ii) broadly appealing to capture the imagination and attention of audiences including the general public, domain experts, and children; iii) newsworthy, to maximize media coverage; iv) focused on BC achievements and success stories; v) admission-free to anyone wishing to attend; vi) held at central venues; and vii) not be primarily for information transfer but rather to alert the audiences to the importance of science to their lives and wellbeing.



Figure 4. Elaine Leckie delivering the 'Digging Deeper' program.

## 'Science and the World Around Us' Prince George Expo

This Expo, the only one held outside Vancouver and Victoria, featured the science and technology that is all around us, such as innovations in forestry, clean technology, transportation, and mining that are so important for employment, development and wellbeing in many parts of the province. Participation on the steering committee for the Prince George Expo provided an opportunity to bring forward Earth science subject areas and themes, and to suggest Earth science contacts and partner organizations to participate in this event. The two-day Expo, held at the Prince George Civic Centre, involved a series of twelve scheduled main stage presentations, career roundtables, and an exhibit area with a wide range of activities and displays. The presentation topics included Energy (energy and motion; and the National Ignition Facility), Forestry (Mountain Pine beetles; sustainable wood buildings; forest growth modeling), Earth science (adventures in Earth science; water resources: and global warming), First Nations traditional wisdom, and Applications of Digital Maps. The majority of presenters were from the University of Northern BC, local industry, and gov-

ernment groups, with a small number (including this author) coming from southern BC. The exhibits and activity displays were also hosted primarily by groups from the University of Northern BC, with YoS funding recipients such as Science World and UVic also participating. As students and the public went from booth to booth participating in the activities, they filled out a series of questions on a YoS 'passport'. Erin Edwards (UVic Co-op student) brought her 'Importance of Minerals and Mining in BC' display to the Expo. The career roundtables enabled groups of high school students to meet and discuss career questions with industry professionals in engineering, geoscience, bioenergy, environmental services, and remote sensing. More than 3000 participants experienced, hands-on, the importance of science in everyday life and in providing jobs in northern BC.

## III. Science in Our Lives: Science 'Activity of the Month' and '5 Minutes with a Scientist'

This YoS project was a collaboration between the UVic Faculty of Science and Pacific CRYSTAL [<http://education2.uvic.ca/pacificcrystal/main.html>], and was intended to inform youth about science innovations and research

in British Columbia through a science ‘Activity of the Month’ throughout the Year of Science. In addition, to introduce students to a variety of researchers and possible science careers, a series of ‘5 Minutes with a Scientist’ profiles, consisting of text and image postings, were produced to link with and supplement the activities on the UVic Science website. Funds to support Ph.D. science education student Michael Todd Hammond were contributed by Pacific CRYSTAL. A YoS grant supported the UVic graphics services development of templates for the activities and career profiles, as well as the publication of a legacy compilation booklet [[www.uvic.ca/sciweb/ScienceInOurLives\\_UVic\\_web.pdf](http://www.uvic.ca/sciweb/ScienceInOurLives_UVic_web.pdf)]. The Faculty of Science provided support to the author, and John Hall (Faculty of Science Administrative Officer) coordinated the posting of materials on the web and liaison with the YoS website. UVic faculty members answered the ‘5 Minutes with a Scientist’ questions and contributed to the activities.

### Science ‘Activity of the Month’

These hands-on science activities focused on societally relevant issues in which science plays a key role, and were compiled by the author and Michael Todd Hammond, with input from faculty at the UVic. The January 2011 activity was developed by Dr. Anthony Quas of the Department of Math and Statistics. Activities (four of which involved aspects of Earth science) included:

- October* Science to Understand Our Land
- November* Science to Understand Space
- December* Science to Understand Our Forests
- January* Mathematics and Society
- February* Science to Understand the Oceans
- March* Water Science (modified from an EdGEO activity)
- April* Science of What we Eat: Food Chemistry
- May* Science for our Health
- June* Climate Science

Activities were posted each month on the UVic Faculty of Science website [<http://web.uvic.ca/sciweb/>], and linked to the YoS site. The first two activities were checked for quality

by the YoS prior to general approval for co-branding.

### ‘5 Minutes with a Scientist’

The template for these career profiles was developed (with the assistance of C. Keller) as a series of questions to highlight diverse, exciting, relevant careers in science and to showcase scientists as real, approachable people with interesting lives, doing things they are passionate about. In total, 21 profiles ranging across the science disciplines were posted together with the monthly science activities as follows.

- October* Stephen Johnston, Geologist
- November* Sara Ellison, Astronomer
- December* Peter Constabel, Biologist, and Trisalyn Nelson, Geographer
- January* Anthony Quas, Mathematician
- February* Kim Juniper, Biological Oceanographer, and Mairi Best, Marine Scientist
- March* Terry Prowse, Water Scientist
- April* Reg Mitchell, Chemist, and Fraser Hof, Chemist
- May* Michael Hayes, Geography and Public Health Policy; Brian Christie, Neuroscientist; Stephanie Willerth, Biomedical Engineer; Francis Nano, Microbiologist; Cecilia Benoit, Sociologist; Nigel Livingstone, Can Assist; Andrew Jirasek, Physicist; and Peter Keller, Geographer
- June* Francis Zwiers, Climate Scientist; Terri Lacourse, Paleocologist; and Tom Pedersen, Oceanographer

### Response and Feedback

Feedback from teachers suggests that both the career profiles and hands-on activities are useful in the classroom and for student self-directed learning, with the ‘5 Minutes with a Scientist’ being particularly suitable for students at the upper grade levels.

*“This is really great stuff!”, “I like the questions for the scientist, well rounded and not just about the science, sort of demystifies what a scientist is like, not stuck in a lab, but out there exploring, creating, innovating.”* – Cheryl Kristiansen Mitchell,

Odyssey Foundation, Managing Director

### REFLECTIONS ON THE YEAR OF SCIENCE; SUPPORTING EARTH SCIENCE OUTREACH

Time and funding are two key issues for geoscience outreach. Many practitioners carry out their outreach activities ‘off the sides of their desks’ and are time (and energy) limited by the demands of their regular jobs. Financial support from BC MEMPR to hire Erin Edwards as a coop student (full-time employment for 4 months), the YoS funding to hire three undergraduate students, as well as support for development and purchase of resources provided by the CGF (for the Victoria CRD ‘Digging Deeper’ project) and EdGEO (for several of the teacher workshops), greatly increased the scope and effectiveness of the Earth science outreach efforts possible from UVic. In addition to the importance of funding for support of Earth science outreach work, the following are some reflections on the YoS Earth science initiatives.

### Engagement and Mentoring of the Next Generation of Earth Scientists in Outreach

One of the greatest benefits of the YoS was the potential it offered to recruit and engage undergraduate Earth science students in outreach. Although several of our undergraduate students have assisted with outreach presentations in the past, the YoS provided an excellent opportunity to both financially support and engage a greater number of students in a more comprehensive outreach program, which they organized and delivered themselves, and for which they received professional development training and mentoring. The support for their province-wide travel costs, and the very positive feedback they received, highlighted to them the value, and the pleasure and gratification, of such outreach activities:

*“It is an extremely rewarding experience to have a younger generation tell you how much they learned and now enjoy science”* – Erin Edwards, UVic Co-op student.

In addition, the students expressed that they learned a lot and

were able to build on their tool kits of successful approaches to engaging youth with Earth science, as well as their presentation skills – a useful exercise in communication generally. The YoS funding facilitated hiring several students, which made it possible for them to travel in pairs and support each other with ideas, feedback, and encouragement, in both the planning stages as well as while on the road and delivering the presentations. It also meant that they could be trained and mentored together, making this process more effective.

From observations of classroom presentations co-delivered by undergraduate students, it was evident that they connected very well with the K–12 students, and were being viewed as role models. K–12 students were comfortable asking them questions about careers, university life, science courses etc.

*“Many students were already aware of things you could do with science, but not many were aware of the vast diversity of jobs available in science. Most students had not thought about the different types of science as having different career opportunities either. i.e. biologists, physicists, chemists and geologists had just been seen as ‘scientists’ to the students” and “It no longer seemed like a hard subject to learn about for some of them.”*  
– Rebecca Stanton, UVic undergraduate student.

The YoS Earth science outreach experience made a strong impression on the undergraduate students themselves, both in terms of the importance of doing outreach, and empowering them to seek opportunities to continue these activities in the future as part of whatever Earth science related career they may find themselves in.

*“This experience already prompted me to apply and work for the University Summer Science Camp, Science Venture”* – Rob Cook, UVic undergraduate student.

Given that the geoscience outreach community primarily reflects the age distribution of geoscientists generally, the training and mentoring of the next generation of outreachers represents a key component of succession planning. The challenge moving forward is how to keep the students

engaged, involved and supported.

### The Importance of Partnerships

Partnerships are often key elements in the success of outreach and awareness efforts, and the BC YoS Earth science outreach initiatives are no exception. Connections with government bodies (e.g. BC Ministry of Jobs, Tourism and Innovation) have i) enabled us to attempt to increase awareness of the importance of Earth science and its role in society within government; ii) offered us important insights into how some government initiatives work; and iii) developed contacts that may facilitate future connections in terms of building educational awareness and support for Earth science (e.g. potential Geoparks in BC). The partnership with BC YoS facilitated co-branding of Earth science outreach initiatives. Although it is impossible to measure the impact of this, our undergraduate students were likely assisted in their promotion and engagement of large numbers of schools and community groups in BC by their participation in the Earth Science and Society project, which provided additional support, legitimacy, and impetus as the YoS developed. The YoS provided additional advertising of the program, possibly increasing attendance at some events. For the YoS expos, marketing to the community (school groups, etc.) was already done and so we were able to capitalize on this audience both for presentations and the booth. The YoS Expo in Prince George was also supported by a full media program (organization of radio interviews and interviews with the local newspaper), conducted by The Pace Group, which managed the entire event on behalf of the YoS. These advantages offset the constraints such as short planning timeframes, initial funding uncertainty, lack of control of major events, and the one-off nature of the YoS.

The initial YoS engagement exercise at UVic, as well as the YoS Planning Template submission process and ongoing communications with YoS organizers, promoted awareness of Earth science outreach initiatives at the university level. As the YoS progressed, awareness was further increased through liaison with UVic’s Faculty of Science, Media Relations (in association

with receipt of a YoS grant [<http://yearofsciencebc.ca/science-in-government/news-releases-2/>], see 2010/12/02), and Government Relations in the office of the VP Research.

Community partnerships were key to the YoS Earth science outreach initiatives, not only providing resources and promotion (e.g. MEMPR and MEPBC), but also collaborations with amazing groups of dedicated informal educators and advocates. These collaborations enabled us to extend our audiences beyond Victoria and also beyond the interest contexts we typically inhabit (e.g. with Seaquaria and EcoRowing, into the biological/environmental education spheres; with the Big Little Science Centre, into the world of museums; and with CRD, into sustainability and recycling). These partnerships can create new outreach venues, piggy-backing potential on existing events, and new audiences for Earth science.

### A Legacy of Resources

Given that the BC YoS was designed as a one-off event, we were cognizant throughout of the value that could be added through the development of ‘legacy’ type resources. Where possible, teacher workshop manuals, hands-on activities, and career profiles were posted, and/or linked, on websites to increase availability to teachers, students, and career counsellors (e.g. websites for the Mitchell Odyssey Foundation, Pacific CRYSTAL, UVic Faculty of Science, MEPBC, and the British Columbia Science Teachers Association). The Science in Our Lives series of ‘Activity of the Month’ and ‘5 Minutes with a Scientist’, have also been collected and produced as a legacy booklet, available on request or at [[www.uvic.ca/sciweb/ScienceInOurLives\\_UVic\\_web.pdf](http://www.uvic.ca/sciweb/ScienceInOurLives_UVic_web.pdf)]. The Hartland Learning Centre addition of an Earth science module, ‘Digging Deeper’, to their school education recycling programs, is also an important legacy for the YoS initiative.

The challenge in the future will be to secure continuing funding sources to sustain and expand existing Earth science outreach and public awareness initiatives, as well as to capitalize on and develop new opportunities.



**ACKNOWLEDGEMENTS**

Thanks to the four undergraduate students Erin Edwards, Rob Cook, Liana Stammers, and Rebecca Stanton for their enthusiasm, dedication, energy and passion throughout their involvement with the YoS. Thanks to the UVic faculty members who generously responded to the '5 Minutes with a Scientist' project and provided feedback on activities. The collaborations with partners including teachers, CGEN members, Seaquaria, EcoRowing, and CRD were invaluable. Thanks to the BC Year of Science, CGF, EdGEO, UVic, and BC MEMPR for funding and supporting these Earth science outreach initiatives. Charly Bank's comments and feedback on the paper are gratefully acknowledged.