

## **Earth Sciences Awareness Day: National Science Teachers Association / Science Teachers Association of Ontario**

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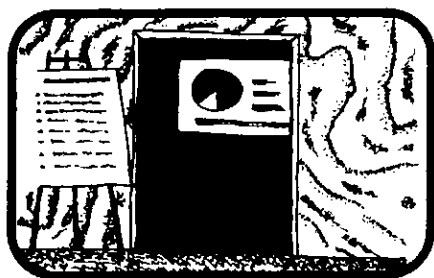
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# Conference Report



## Earth Sciences Awareness Day: National Science Teachers Association/ Science Teachers Association of Ontario

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### INTRODUCTION

The Science Teachers of Ontario (STAO) traditionally holds their annual meeting in Toronto in November. Each year I ponder the implications of this "science" gathering having a miniscule amount of earth sciences input, and resolve to do something about it. My last three attempts at this meeting, which averages several thousand teachers, have appeared futile especially when you find that you are a lonely voice in the excesses of "the other" sciences splashed around you.

Fortunately at Waterloo, I have a supportive Dean and a number of colleagues enthusiastic in their promotion of the sciences and who recognize that the earth sciences, should, indeed, be part of everyone's education. After being warned that

there was a "special" STAO emerging, I gathered my thoughts together, involved Peter Russell, and resolved to try again. This time, not a single talk, but perhaps an "Earth Sciences Awareness Day," to be presented at a joint meeting of STAO and the National Association of Science Teachers (of the United States). We also produced a special issue of *WAT ON EARTH*, a geological newsletter, aimed at high school teachers and students, and its release coincided with the meeting. Peter and I are very grateful to EdGEO for a special grant which enabled us to enlarge this issue, and to increase the print run so that it could be distributed to 1000 more educators. Chris Gilboy, Secretary of EdGEO kindly undertook the presentation of a Guest Editorial. The Fall 1996 issue can be seen at the Waterloo web site under: <http://www.science.uwaterloo.ca/earth/waton/waton.html>

We were able to call in an exceptional group of colleagues who presented a small symposium on many different aspects of the Earth Sciences and why these are important to Canadians. More specifically they were able to illustrate why the different areas of the geosciences, represented by their expertise, are an essential part of every student's education.

### THE CONFERENCE

Finally, "the big day," 22 November arrived, and the presentations began in the British Columbia Room, Royal York Hotel. We had arranged the sessions to allow speakers one-half hour each. The program attracted 30 individuals for practically the whole day, rising to a high of 48 on one count.

The session was opened by **David Rudolph, Department of Earth Sciences at the University of Waterloo** on "Understanding Water: The Mineral Commodity of the Future." He introduced problems experienced by municipalities in various parts of the world, concentrating on

the Waterloo Region as an example of a Canadian community that had depended almost entirely on groundwater supplies until recent years. David also addressed problems being experienced by larger urban megalopolises (specifically Mexico City) with graphic examples of water pollution, subsidence caused by water extraction, and difficulties encountered in dispersing waste water. He commented that university curricula must have the flexibility to allow the teaching of these "environmental" areas of the earth sciences.

I followed David with a presentation on "The Importance of The Earth Sciences to an Educated Student." As world population continues to grow and while resources remain finite, it is of increasing importance that all students become better educated about the world on which they live. These concepts were illustrated with a number of slides showing conditions in both the undeveloped and developed world, touching on problems with water, natural hazards, and the need to better understand the natural environment. Examples from glaciology were used to illustrate an understanding of how scientists realize that "global change" is taking place, while paleontological examples illustrated the need for basic science understanding in order to appreciate the "applied" aspects of the changes going on in the world today.

**Steve Evans, Terrain Sciences Division, Geological Survey of Canada, Ottawa**, talked on "Canada's Shifting Landscape" (Fig. 1). Steve's presentation was lavishly illustrated by excellent slides, some dating back as far as the government inquiry into the Frank Slide in Alberta, and others showing early views of rock slides along the coastal highway between Vancouver and Whistler. Steve pointed out that in the Cordillera, a combination of mountain relief, complex geological history, and seismicity gives rise to a wide distribution of landslides through-

out the region. Rock avalanches, involving the failure and subsequent very rapid movement of millions of cubic metres of rock, occur in the high mountains. Small scale rockfalls are also important and may cause damage to homes and transportation facilities.

Heavy rainfalls trigger debris flows, which have swept down mountains and have had drastic impacts on communities. In the St. Lawrence Lowlands, landslides are widespread in the sensitive marine sediments deposited at the end of the Ice Age. This material is sometimes called Leda Clay and it has the distinctive property of flowing like syrup when slightly disturbed.

Secondary effects of landslides include the generation of displacement waves and the formation of natural reservoirs by the damming of streams by landslide debris. Study of landslides in Canada by earth scientists provides information useful to engineers, land-use planners, and those involved in energy production. His talk really made the point that landslides are important elements of Canada's dramatic shifting landscape.

Staying with a west coast theme, the next speaker was **Catherine Hickson, Geological Survey of Canada, Vancouver**, who presented "Geological Hazards in the Pacific Northwest of Canada and the United States: Living on the Edge." Along the western margin of the North American continent, massive forces focus energy that is directed inland for hundreds of kilometres.

These forces manifest themselves as chains of mountains that stretch the length of the continent's western margin. These geologically young mountains are perpetual reminders of forces below, from which stem more episodic and violent statements of Earth's power. Cathy's vivid descriptions accompanied some mind-blowing slides. Phrases such as, "Broken into fragments like the crushed surface of a hard-boiled egg, the Earth's crust is in constant motion" and, "Rudely shaken and jarred at unexpected moments, we humans can only reflect upon the power of nature, the geologic inevitability of our world and our own mortality" provided graphic descriptions which drove home these crucial geological points.

Following Cathy's electrifying presentation, **Alan R. Hildebrand, Geological Survey of Canada, Ottawa**, spoke on the "Implications of the Chicxulub Crater Discovery." Because observers on Earth have witnessed four comets on various trajec-

tories hurtling through the Solar system in the last 10 or so years, it was appropriate that Alan should remind us that occasionally our world does receive a direct hit! He pointed out that the 180 km diameter crater at Chicxulub bears evidence that these events do seriously perturb Earth's biosphere. There have been at least five large extinction events over the last 500 million years and, although the Cretaceous-Tertiary impact event is the only one with a "smoking gun," the other extinction events are being re-examined with impacts in mind. Alan took the audience on a quick slide excursion to sites on Haiti and in Europe where "splash" materials and the iridium-rich boundary layer show up in geological sections. He commented on the sequence of hazards which probably culminated in the extinction event and other "close misses" that we have had, including two bolide "hits" earlier in this century.

A somewhat relieved audience returned to Earth (literally and metaphorically) with the next presentation by **Steve Gombos, of Waterloo Region's Recycling Operations**, in Waterloo, on "Managing Solid Waste as a Resource."

For about 6 years Waterloo's first-year class has been taken to the landfill and recycling operations before going on to the waste water treatment plant (with its water outfall to the Grand River), and then to the water intake from the Grand River, and finally to the water-treatment plant at

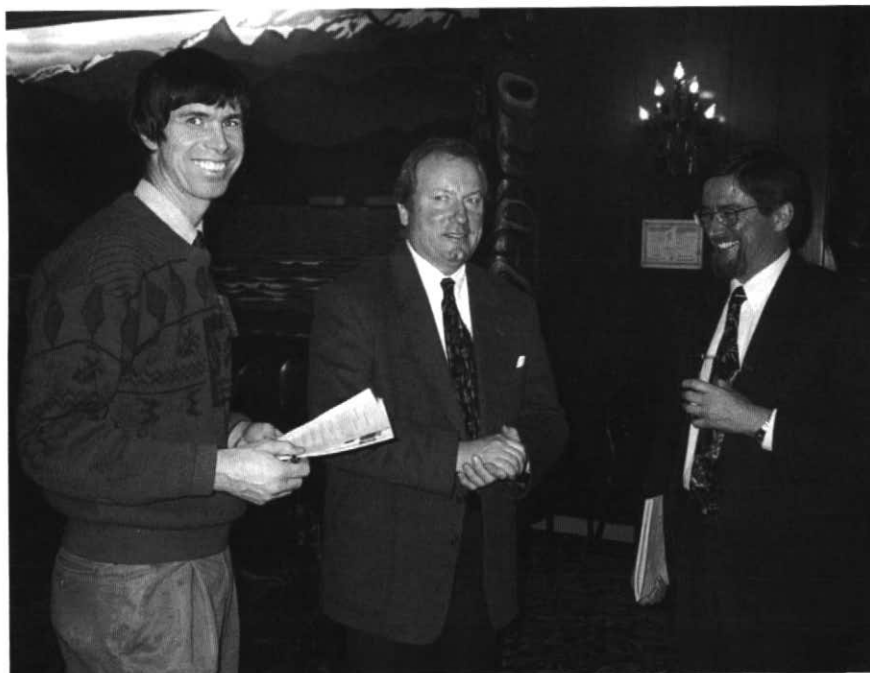
Mannheim.

The excursion provides a three-hour illustration of the "closed loop" of water and waste in the Regional Municipality. One of the fascinating aspects has been the interplay between the rate of filling at the "dump" (the landfill), the scale of operations at the recycling plant, the cost of "recyclables" *versus* "waste", whether garbage is trucked to the United States or stored locally, and the life expectancy and problems associated with the landfill. Steve's talk addressed all of these factors and illustrated the complex inter-relationships among the elements noted.

It provided an excellent return to the first talk of the day and completed the morning session.

The afternoon session had five presentations which concentrated on being able to communicate with young potential geoscientists, why it was important to promote the geosciences, and what aids are available to teachers through museums and the Canadian and United States Geological Surveys.

**Peter Russell**, co-organizer of the meeting, **Department of Earth Sciences, University of Waterloo**, presented a real "participation" number entitled "Communicating Earth Sciences at the Junior Level." Peter was accompanied by **Chris Rawlings**, a **Toronto folk singer** who has been working with Peter to produce some "earthy" songs, suitable for kindergarten (and older) children. His suggestion that



**Figure 1** Steve Evans (centre) pauses in a conversation between Godfrey Nowlan (right) and a participant at the "Earth Day" meeting, November 22, 1996.

we should all join in the chorus line of "The Rock Cycle" forced some in the audience to use a few untried vocal chords! Peter and Chris teamed up in a joint project between the Waterloo Centre for Groundwater Research and the Earth Sciences Museum at the University of Waterloo to generate innovative hands-on displays and activities as outreach for school children. These shows are used at groundwater festivals, environmental fairs at schools, malls, Fall fairs, and public libraries. One of the activities (Fig. 2) is represented by a colourful quilted cross-section of the geology of southern Ontario made to attach to an Exposystem or other display unit.

Peter and Chris were followed by **Godfrey Nowlan, Geological Survey of Canada, Calgary**, on "The Importance of Having Rocks in Your Head." He stressed that a working knowledge and skill base in science and technology is as essential for citizens of the modern world as the ability to read and write. Godfrey suggested that in order for citizens to "buy into science," they have to understand its relevance and be excited by its concepts. A scientifically literate public is highly desirable because so many public decisions require an understanding of science. Since much of the research in Canada is publicly funded, it is even more crucial to have a well informed public. Recent studies of Canadian backgrounds and abili-

ties in science show that earth science is barely in the public consciousness despite the fact that a huge proportion of Canada's income is derived from natural resources of the Earth. Furthermore, earth science is barely taught in Canadian schools despite the fact that it offers some of the best hands-on opportunities to learn scientific principles and practices. Godfrey illustrated these points with a number of interesting graphics which allowed the concepts to be brought home to the teachers.

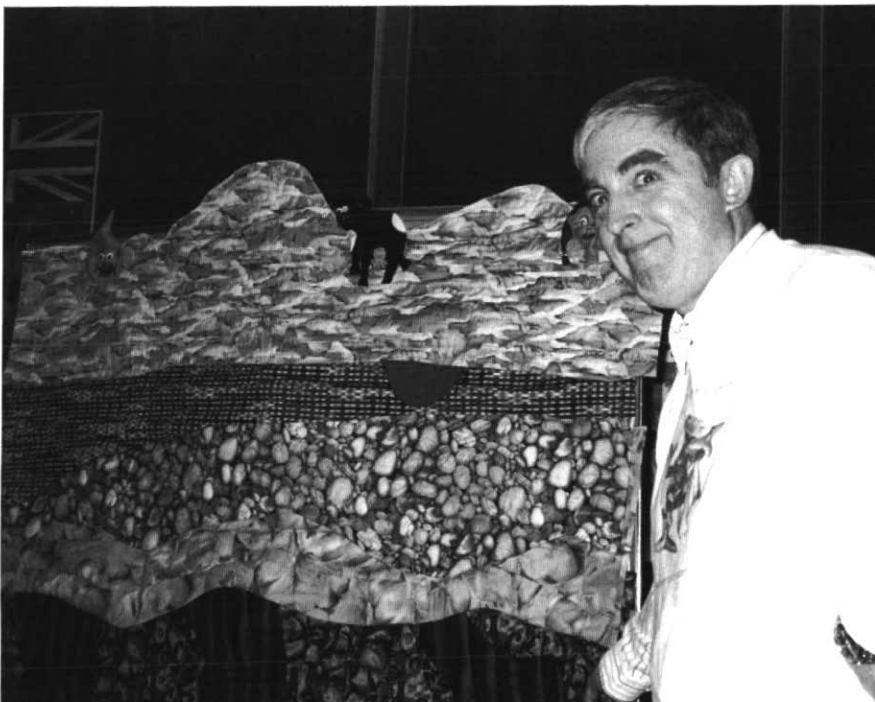
**Vic Tyrer, Programs Branch, Ontario Science Centre, North York**, was able to step into Emlyn Koster's place after Emlyn had departed for Jersey City. He gave an excellent talk on "Support Roles for Teachers: The Museums and the Earth Sciences in Canada," pointing out that museum support can occur in four important ways: the learning experience of handling and studying minerals, rocks, and fossils first hand; when students are taken into the field to see earth sciences in action in their local community; when practicing earth scientists and students are brought together for face to face exchanges of expertise and inquiry; and when museums serve as barometers of teacher/student interests and needs. Vic described the way in which local features can be used to illustrate geological concepts. I was fascinated with the concept of using the CN Tower as a geological time scale. Vic pointed out that humanity's historic efforts

would be represented by a credit card placed at the top!

Vic was followed by **Christy Vodden, Communications Officer, Geological Survey of Canada, Ottawa**, on "Federal Assistance for Teaching Earth Sciences Concepts." Christy pointed out that the Geological Survey of Canada has a long-standing commitment to educating Canadians about the earth sciences.

Since the 1920s, it has been a respected training ground for the geoscience community through its summer employment programs. Outreach activities are presented which are aimed at younger students, and designed to supplement classroom activities. Although financial resources are diminishing, external activities are growing because of the willingness of staff to take time out of their busy schedules to devote to young students. Activities are designed to fit the educational needs of the various regions and build on the strengths of staff volunteers. Educational materials are produced corporately to take advantage of economies of scale, and increasingly are being made available on the World Wide Web. Christy produced examples of the numerous excellent aids available to teachers through the GSC.

The final presentation of the session was by **Laure Wallace of the United States Geological Survey at the National Center, Reston, Virginia**, on "The Changing Role of the USGS in Earth Science Education." Laure made the point that the USGS has a long-standing record of outreach in education. Late in the 1980s, a Bureau Education Committee and a formal educational outreach program was created with emphasis in four primary areas: educational print materials, technology-based products, interactive programs for students and teachers, and educational facilities development. During the past few years, the USGS recognized the need to develop its programs and functions to meet the challenges brought on by profound changes in the world around us. Benchmark teams were formed to address many functional areas within the organization, including the Bureau's outreach programs. The "Benchmark Report on Outreach" clearly identified outreach as integral to every program in the USGS and critical to achieving the mission of the USGS. Outreach, in its broadest definition in the USGS, encompasses a variety of external and internal programs, one of which emphasizes "Life-long Learning." Linkages to the primary



**Figure 2** Peter Russell stands in front of a quilted cross-section of a typical southern Ontario moraine.

theme areas of the environment, resources, hazards, as well as data and information management provide the basis of the re-shaping of K-12 programs, and these support the basic mission of the USGS to provide scientifically credible, objective, and relevant earth science information that meets society's needs.

Was the effort worthwhile? From the comments that I received from grateful teachers, yes, but these sorts of things are very expensive to arrange, and they must have larger audiences to make the effort more rewarding. I offer sincere thanks to colleagues in the GSC, in particular, for their input to the meeting, and to EdGEO for the grant-in-aid of publication of the Fall issue of *WAT ON EARTH*. My thanks also go to Laure Wallace and the USGS for her participation in the meeting. Also, appreciation to Vic Tyrer who took time out from the planning of the Earth Systems Symposium at the Ontario Science Centre (held in early December and reported on in the December 1996 issue of *Geoscience Canada*, v. 23, n. 4). My gratitude also to Steve Gombos and to the Waterloo Regional Municipality for allowing Steve to address the teachers at the conference. Finally thanks to my compatriots at Waterloo, and to Chris Rawlings our "wandering minstrel" of STAO/NAST 1996.

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