THE ALBERTA SCIENCE TEACHER

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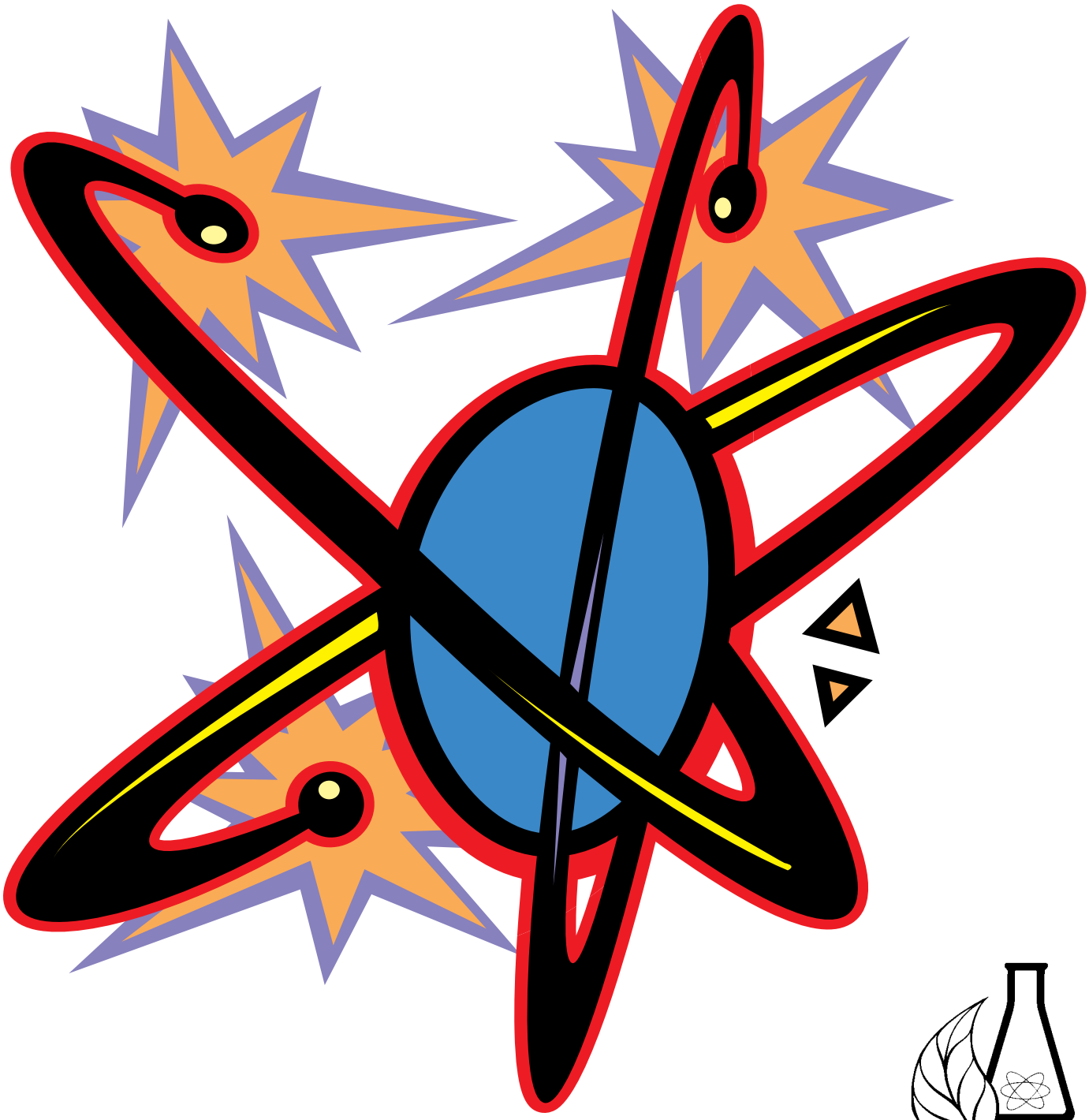

From the Editor

I want to begin by thanking everyone for the comments you sent in about the last issue on teaching science in rural areas. I am happy to have such good submissions to make the issue successful. Thank you as well for the critical comments about some of the articles. I hope that teachers in urban centres would be willing to send in an article or two to let everyone else know about the difficulties and rewards that they face.

The main goal of this newsletter is communication. Despite the inventions of instant messaging, e-mail and the Internet, teaching is still a lonely profession. There must be a reason why teachers cannot avoid talking shop when they gather at conventions, staff parties and even family reunions. Even though everyone experiences education, no one really understands what teachers do. Do your relatives simply ask, "How's work?" only to wait for the typical answer "It's okay"?

This issue contains several articles that deal with some of the concerns of education and the teaching profession. Frank Jenkins provides data to show that times have changed. Patricia M. Rowell and Margaretha Ebbers present the result of their investigation into teaching science in Alberta elementary classrooms. Rick Mrazek's guidelines for improving the process of curriculum development is featured. The other feature is a discussion paper on accountability in education, to which we need your feedback. There are also resource reviews, professional development opportunities and other fun stuff.

Derek Collins

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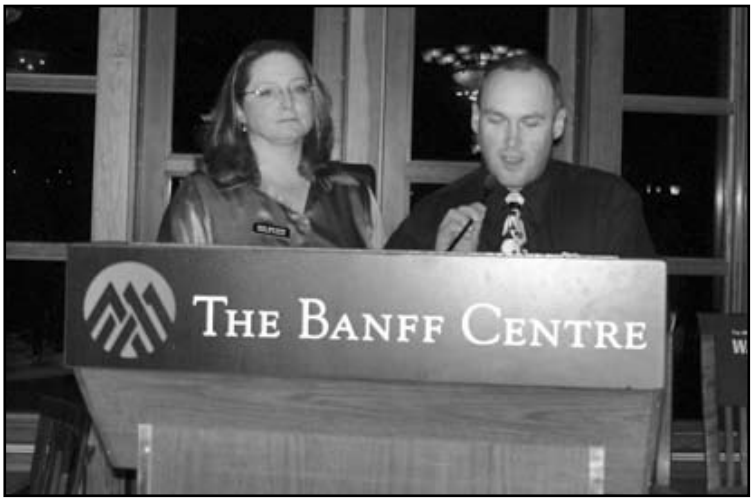
The Alberta Science Teacher is one of the official publications of the Science Council (SC) of the Alberta Teachers' Association. SC Bylaw 9.4 states: *The Alberta Science Teacher* shall reflect on the contributions and activities of Alberta science teachers in the classroom.

Please address all correspondence to the editor: Derek Collins, Box 3665, Vermilion T9X 2B7; phone (780) 853-5251 (school); fax (780) 853-4343. Material for publication may be submitted on disk or paper. Unformatted text formats are preferred. Articles may be given to any executive member for relaying to the editor. This publication is typeset using InDesign and operating under Windows.

Individual copies of this newsletter are available at a cost of $2 per copy plus 5 per cent shipping and handling and 7 per cent GST. Please contact Distribution at Barnett House to place your order. In Edmonton, dial (780) 447-9400, ext. 321; toll free in Alberta, dial 1-800-232-7208, ext. 321.

Science Conference 2005

This year's conference is shaping up very well. Some of the details are below. Remember to register early to save.



Keynotes

- Marilyn Steinberg (Canadian Space Agency)—TBA
- Marc Fricker (Canadian Space Agency)—Science Fiction Versus Science Fact: A Videoconferencing Workshop
- Philip Currie—The History of Dinosaur Hunting in Western Canada: A Perspective on the Eve of the Centenaries of Alberta
- Bob Church—Dare to Dream: It Doesn't Matter Where You Come From
- Frank Sulloway—In Darwin's Footsteps: How the Galapagos Islands Revolutionized Darwin's Thinking
- Mark Moffett—Ants: Solitary and Social

- David Naylor—The Herschel Space Telescope: Canada's Role
- Doug Hube—1905: Annus Mirabilus: Albert and Alberta
- Rick Mrazek—From Merlin to the Matrix: Changing Views of Science

There will be three keynote presentations on Friday, four on Saturday and two on Sunday.

Science Olympics

The Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA) has agreed to organize a Centennial Science Olympics for delegates.

Off-Site Venues

The Odyssium has agreed to hold four workshops at their facility. Two will be on Saturday morning from 11:00 a.m. to 12:30 p.m. and two will be in the afternoon from 3:00 to 4:30 p.m. Sixty delegates can be accommodated in the morning and another 60 in the afternoon.

Social Functions

On Friday evening will be the Centennial Awards banquet with entertainment by Johnny "Bagpipes" Johnston. Tickets are $10 each (Limit of 400 preregistered). Gifts for the sponsors will be framed prints by a local artist (D. C. Lund of Taber) with the Alberta emblem included. The prints have been ordered and will be available once the final number of sponsors is known. Draw prizes will be given away during the banquet.

On Saturday evening will be the wine and cheese, and entertainment by Phoebe Legere. Tickets are $5 each (limit of 350 preregistered). Draw prizes will be given away during the evening.

On Sunday morning will be a keynote speaker and a free brunch. Three hundred tickets will be available at the registration desk. Draw prizes will be given away during the brunch.

Come and enjoy what the field of science has to offer and celebrate Alberta's centennial year.

Accidental Inventions

Vat19 Productions, a group that makes films for students, such as *Rules of the Road*, has released a new DVD that will interest science teachers. *Accidental Inventions* features the story of 10 inventions and how a fortunate discovery, a mistake in the lab or pure luck led to the invention of something that we would find it difficult to do without.

The DVD allows the viewer to either view all 10 or to pick one from the menu. This is great because the stories about matches and Teflon can be incorporated into a chemistry class and the piece on microwave ovens is good for a physics class. The segments include interviews, artwork and animations to illustrate the concepts. Little facts pop up on the screen and are also a very nice touch. Some of the invention sections have extra segments. For example, the invention on anaesthetic offers a short demonstration on how doctors are trained.

I have shown the film to a couple of classes. The students were interested in watching the background to all of the inventions, and it encouraged lots of questions, which led to good teaching opportunities. The narration of the film uses clear language and does not talk down to the students. Scientific jargon is used appropriately.

It is difficult to find strong films for science classes. Many are simply lab demonstrations or lectures on tapes, and many of them bore students. This DVD is a nice change. To add this DVD to your collection, contact Vat19 Productions at sales@vat19.com or by phone at (314) 569-1771. Their website is vat19.com.

Reviewed by Derek Collins

Edmonton Biology and Chemistry Regional Annual Workshop: A Focus on Nanotechnology

Friday, May 6, 2005
University of Alberta

List of Presenters:

- Nils Petersen, director general of the National Institute for Nanotechnology—Canada's investment in nanotechnology, and the investigation of membranes biochemistry from a nanotechnologist's perspective.
- Hicham Fenniri, a scientist from the National Institute for Nanotechnology—The process of supramolecular design, and does your approach to science change when you become a nanotechnologist?
- Michael Lam, facilities manager at the National Institute for Nanotechnology—Tools of nanotechnology
- Keith Bagnall, professor from the University of Alberta's Department of Anatomy—Medical applications of nanotechnology
- Jon Veinot, assistant professor from the University of Alberta's Department of Chemistry—Organic Light Emitting Diodes (LEDs) and other nanotechnology projects
- Linda Pilarski, professor from the University of Alberta's Department of Oncology—Use of nanotechnology in cancer diagnosis
- Lori Sheremeta from the Health Law Institute—Legal implications of nanotechnology
- Michael Mehta, director of the Social Research Unit at the University of Saskatchewan—Social issues associated with nanotechnology

There will be a tour of the Nanotechnology Centre and Nanofabrication Unit for a cost of $45, which includes lunch at the faculty club.

For further information, please contact Morrie Smith (biology representative for the Edmonton regional) at morrie.smith@epsb.ca or Dan Leskiw (chemistry representative for the Edmonton regional) at dan.leskiw@gov.ab.ca.

Please refer to the registration form included in this newsletter. Online registration is available at www.shep.net/chemreg.

Edmonton Biology and the University of Alberta Present the 13th Annual One-Day Lecture Series

May 6, 2005
Room P 126, Physics Building

Edmonton Biology has invited speakers to present lectures on the theme of nanotechnology from the Biology 20/30 Program of Studies. It is hoped that these lectures will provide current and background information on this selected theme.

Registration will begin at 7:30 a.m. and sessions will start at 8:15 a.m. There will be five or six sessions for the day and lunch at the Faculty Club. The wine and cheese is included in the $45 registration fee. The following speakers have been confirmed:

Please share this registration form with other staff members at your school.

Name: _____

Address: _____

City: _____ Postal Code: _____

Telephone (home): _____ (school): _____

E-mail: _____

School Name: _____

Address: _____

Make your $45 cheque payable to Edmonton Biology (your receipt will be issued on site).

The deadline for registration is April 22, 2005

Mail this page with payment to:

Morrie Smith
11416 Malmo Road
Edmonton AB, T6H 4M2

Phone: (780) 434-0707
Fax: (780) 473-4295
Work e-mail: morrie.smith@epsb.ca
Home e-mail: morriesmith@shaw.ca

Teaching Science in Alberta Elementary Classrooms

In the early 1980s, the Science Council of Canada (SCC) funded a national study of science education in Canada (Orpwood and Alam 1984). One component of this study was a survey of science teachers across the country. It was designed to determine teacher beliefs about the aims of science education, teacher perceptions of the effectiveness of their teaching and the obstacles for teachers in achieving their aims. Twenty years later, a new study is hoping to determine the beliefs about and perceptions of science teaching held by elementary teachers in Alberta. To provide continuity and establish a basis for comparison, the focus of the earlier study was maintained.

In the first three months of 2003, 1,116 teachers from 417 schools responded to a questionnaire about teaching science in Alberta elementary classrooms. Many of the questions were identical to those used in the national study of science teaching conducted 20 years ago. Additional questions probed the language practices in Alberta elementary science teaching. Survey respondents taught science in rural, town and city schools in all geographical zones of the province.

In this article, questions are raised from the findings of this study. Further details are available in the report entitled *Elementary Science Education in Alberta Schools* (Rowell and Ebbers 2004).

Objectives for Teaching Science

The survey showed that teachers consider inquiry skills to be very important in elementary school. "Developing skills and processes of investigation" is ranked first among 14 objectives for science teaching (94.3 per cent). "Understanding scientific facts, concepts and laws" was ranked fourth. However, "Understanding the way scientific knowledge is developed," which is a companion objective to both of the aforementioned objectives, is ranked only tenth. This is reason for concern. Less than half of the respondents considered themselves effective in attaining this objective, suggesting that teachers are more oriented toward *what* concepts are known rather than *how* concepts are known. Without an understanding of how scientific knowledge has come into existence, students may not recognize that the purpose of investigation is to gather data for evidence to support a tentative explanation, and instead may think that science is nothing more than a collection of information-gathering activities.

Curriculum Resources

Since 1984, the *Program of Studies for Elementary Science* has become much more prescriptive about the content to be taught. A high proportion of teachers who responded to the survey indicated that the *Program of Studies* is an important document in guiding their instructional planning. This is likely a reflection of the tighter focus of the program and the implementation of a mandatory provincial test in Grade 6. Although textbooks are not commonly used in elementary school science in Alberta, many teachers draw heavily on commercially published materials. What criteria are used by teachers in their selection of such materials? To what extent do such materials develop key ideas in science? And to what extent do such materials support an inquiry approach to science?

The widespread use of the teacher guides produced by Edmonton Public Schools (EPS) in 1996 is a cause for concern. When the *Program of Studies for Elementary Science* was revised in 1996, few resources were available for the 30 units that comprised the instructional program. Although the EPS guides have not been authorized for teaching by Alberta Education, they do provide activities to support each of the specific learner expectations listed in the *Program of Studies* and student worksheets for nearly every lesson. In the absence of student textbooks, the latter resources are considered essential by many teachers. However, the situation has changed since 1996, and there are now multiple resources available that model a more authentic approach to inquiry science. These are listed in the Alberta Education database and in the Learning Resources Distributing Centre catalogue, yet very few were cited by teachers. It seems that teachers need to be told about these alternative materials.

More than two out of three elementary teachers are accessing the Internet in preparation for their science instruction. What resources on the Internet are accessed most frequently and how are these resources used by teachers? What criteria do teachers use to make their selection of Internet resources?

Inservice Education

Elementary teachers' perceptions of the effectiveness of inservice programs for school science in their schools or school districts have changed very little

over the past 20 years. There is no consensus among teachers as to which agencies are most appropriate for assuming responsibility for professional development in science education. Teachers rate informal meetings with other teachers and workshops offered by teachers as the most valued modes of professional development. Although such encounters nearly always offer some helpful pedagogical strategies that arise out of classroom experience, how do new ways of thinking about science inquiry, science practices, language in science or people in science become disseminated into the classroom?

Physical Facilities and Equipment

Although the current instructional program advocates an inquiry approach to teaching and learning science, the majority of elementary teachers do this in a classroom that has no special facilities for science. Only one in four teachers say that they have ample equipment for student use. This is an improvement on the national 1984 conditions, but it is still unsatisfactory. This lack of appropriate space and equipment for teaching science could be a consequence of a lack of leadership in science education in elementary schools. What can be done at the school and school district level to improve the situation?

Leadership in Science Education

It is remarkable that over the past 20 years, teachers' perceptions of science education leadership in elementary schools has barely changed; two thirds of respondents indicate that there is no particular form of science education leadership in their school. As well, the perception that there is no particular form of science education leadership in the school district was higher in 2004 than in the national 1984 study. What kinds of science education leadership are required to address the needs of elementary teachers?

Language Practices in Elementary Science Lessons

Contemporary perspectives on teaching science highlight the important role of language and discourse in the classroom. In school science communities, it is important to acquire and practice the language and discourse for an inquiry in which students examine their own and others' ideas, gather evidence to support or refute these ideas and build explanations on the basis of such evidence.

The forms of text that teachers consider valuable in teaching science are limited to books that present explanation, how-to books and reference books. This selection of textual forms suggests that many elementary teachers have not considered the value of a wider range of genres in their science teaching. Regardless of the type of reading, very little is done in science lessons. Field guides are an exemplary tool for teaching how and why classification is important, yet nearly 25 per cent of respondents never use them and 34 per cent use them only once or twice in the year. What has to be done to convince teachers that specific types of reading would support both teaching and learning in science? What textual (and financial) support must be given to ensure that school libraries contain a wide variety of nonfiction genres?

The forms of student writing in science that are valued by teachers are those that display observations, explanations, procedures and experimental reports. This survey does not explain how students are introduced to these forms of writing, how they are taught to use these forms of writing or why teachers select these forms of writing. What is the influence of readily available student worksheets on the range of student writing in elementary science lessons?

The lack of credence given to writing in diaries or journals is surprising. Only half of the respondents value journal writing in science lessons and more than half (59.3 per cent) provide no or just one or two opportunities during the year for this kind of writing. Many scientists, particularly those involved in long-term observational studies, rely heavily on their field notes (think of Jane Goodall and her 20-plus years studying chimpanzees). Journal writing in any investigation at the elementary level helps develop the ability to note changes that occur over an extended period of time. It also helps counter the message given by a typical elementary school investigation—that is, that everything important can be uncovered in a 60-minute time period.

What Comes Next?

There will be a review and revision of the *Program of Studies for Elementary Science* in the not-too-distant future. Hopefully, the findings of this study and the questions it raises will be a focus for deliberation on providing support for the teaching of authentic science inquiry.

References

Orpwood, G. W. F., and I. Alam. 1984. *Statistical Database for Canadian Science Education*. Vol. 2 of *Science Education in Canadian Schools*. Ottawa: Science Council of Canada.

Rowell, P. M., and M. Ebbers. 2004. *Elementary Science Education in Alberta Schools*. Edmonton, Alta.: Centre for Mathematics, Science and Technology Education, University of Alberta.

Patricia M. Rowell and Margaretha Ebbers

Times Have Changed

A few years back, I wrote an article for *The Alberta Science Teacher* about the critical shortage of chemistry, physics and mathematics teachers in the province. The University of Alberta was supplying about 75 biology majors and 12 physical science (chemistry and physics) majors—a 6 to 1 ratio—whereas the demand for high school teachers was for a ratio of 2 to 3. About four years ago, we only graduated two chemistry teachers from the University of Alberta. We had a surplus of biology majors to take some of the physical science positions, but many of these students did not even have a physical science minor.

To compound the issue, the same critical shortage that we had in Alberta was happening worldwide. For our physical science and mathematics students, their major and/or minor was a ticket to travel and see the world, and many did. This is a recruitment tool that sometimes backfires. We hope that some of these students will be back some day.

I am happy to report that we have had some success in turning this situation around. The number of majors and minors in the physical sciences now exceeds the number of majors and minors in biology. The word has gotten out to students about the opportunities for a career as a physical science or mathematics teacher. The University has also created chemistry and physics majors and minors to remove some of the barriers to specialization and honours science students who are entering the faculty. The following are the numbers of students in the University of Alberta education system and their majors and minors:

Subject	Majors	Minors	Total
Biology	131	117	248
Chemistry	51	48	99
General	81	39	120
Physical	46	33	79
Physics	31	28	59
Math	200		

One problem that remains is communicating this information to department heads, principals, human resource officers and superintendents—that is, people who are hiring chemistry, physics and mathematics teachers. Non-science majors are being hired to fill science positions because some of the people doing the hiring still think that there is a critical shortage of graduating science-education students. On the contrary, we now have specialists to fill these vacant positions.

Please help get the word out to the people who do the hiring in your district. Send them a copy of this article or talk to them directly.

It's nice to have some good news to spread.

Frank Jenkins
Secondary Education,
University of Alberta

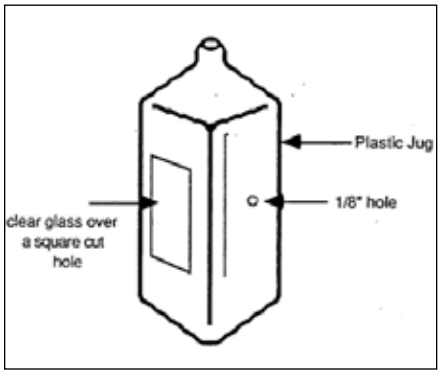
Fibre Optics Demonstration

Fibre optics can be demonstrated easily, even if you have no optical fibre. All you need is a plastic jug with flat sides, a piece of glass, silicon sealant, a drill and a small powered laser (which costs $18 in Boreal's catalogue).

Cut a square hole about 3-inches (8-centimetres) square into the side of the plastic jug. Seal a clear piece of glass over the hole. Drill a small 1/8-inch hole into the other side of the jug.

Direct a laser beam through the glass plate through, while at the same time allowing water to stream out the hole in the jug. Make sure the room is very dark. The laser beam will follow the stream of water.

After the demonstration, initiate a discussion on the properties of laser beams and their use in fibre-optic technologies.



Transforming Science Education in Alberta: Supporting the Will to Change

The following letter and article was sent to the Minister of Education, the Honourable Gene Zwozdesky:

In the early 1990s, science curriculum in Alberta underwent a significant change. The implications of the science-technology-society focused curriculum, which had inquiry and constructivism as its underlying foundations, was a significant departure from the previous curriculum of the 1970s and 1980s. In most cases, the new curriculum was embraced by teachers and students alike. As with any curriculum change, the last decade has revealed successes as well as significant weaknesses that still exist in the science education program. Although there was a significant effort made to improve the support materials for teachers, including textbooks and teacher resource manuals, the concrete efforts of custom-published materials in junior high school quickly dwindled through senior high school. In elementary school, even though there was more articulated direction provided by the Science Alberta-produced teacher resource materials, the wide selection of textual materials and other resources still left many elementary schools and teachers wondering what the core elements of the program really are. With the emphasis on integration across the curriculum, one of the key elements for success and implementation of the curricula, as is often the case, was in the implementation and subsequent inservice and professional development for science teachers.

With the reduction of support for the implementation of curricula, which among other things saw the disintegration of regional offices and specific subject specialists, the task of implementation was left to school districts and individual schools.

Even though the curricula focus in science education has changed to be much more hands-on and inquiry based, the content or knowledge base was not reduced to provide for these opportunities but instead was increased. With disproportionate emphasis on diploma examination results and misapplication of achievement examination results in the media by boards and superintendents, the content emphasis was not only reinforced but in most cases increased. This minimized attention to those central elements that were deemed important in the science curriculum, such as the science-technology-society emphasis and hands-on experiential base. Other significant influences of the last decade have included a dramatic expansion of the science-based knowledge in our world, the integration of the information and communication technology area, and outcomes that have resulted from the exploding advances in the technology and computer information. This is further compounded by an increasing paranoia from industry and post-secondary sectors that there are not enough high school graduates educated and trained in the sciences to meet the expanding needs for those skills. Further, complicate this with the increased demands on teachers with expanding classroom sizes, inclusive needs of students and deteriorating relationships between teachers, boards and government officials, and one quickly comes up with a recipe for failure for further curriculum implementation. The major emphasis identified by Alberta Education for the changes to the secondary science curricula (besides updating resources) is alignment with the Pan Canadian protocol for science education.

To provide recommendations for the curriculum changes and subsequent implementation of a new secondary science curricula, one must seriously consider the impact of the Pan Canadian Common Framework of Science Learning Outcomes. Besides the recent attention to this issue in Alberta, British Columbia and Ontario, science teacher organizations and educators provide an analogous comparison to consider. The recommendations provided for the Science Council executive of the Alberta Teachers' Association draws on the feedback of participants in ATA conferences (2000, 2001 and 2002), extensive research, which includes an analysis of the Pan Canadian implementation in Ontario and British Columbia, and recent efforts in the United States through the National Standards and Project 2061. These recommendations are meant to serve as a starting point for an ongoing feedback process related to curriculum implementation and change. This will be conducted by the ATA Science Council executive representatives through its website, conferences and sponsored professional development activities, and relationships with science education-oriented organizations at the provincial, national and international levels.

As one reads through these recommendations, there are two major points to consider. First, there are obviously many different assertions that can be

made about upcoming changes to the secondary science curriculum. It is better to be selective and, in this case, pick out less than a dozen major areas to focus on. We establish these as a priority where we cannot only support the need for these changes but provide ongoing lobby to see the recommendations implemented by Alberta Education and subsequently included in the curriculum, curriculum resources and implementation of new curriculum in Alberta.

The second major point is that secondary education curricula serves as an entry level for these changes. When modifications are made to the elementary and junior high school in the future, the continuance of these recommendations will also help make the science curriculum at those levels more workable. Hopefully we will see the true emphasis of the science-technology-society-environment (STSE) curriculum come through not only in the development phase but also in the curriculum as implemented and learned.

ATA Science Council Curricular Issues and Recommendations for High School Science Curriculum Changes

Issue 1

Excess content

Recommendation 1

Teaching practices need to be consistent with the goals and curriculum frameworks, therefore the amount of content must be within what the realities of the school timetable permit. We must pick the most important concepts and skills to emphasize so that students can concentrate on the quality of understanding rather than on the quantity of information presented.

Issue 2

Inappropriate time

Recommendation

The knowledge, skills and attributes stated in the science curriculum take time for children to master. If learning, rather than memorization, is the primary focus in science education, then we need to ensure that children are provided with adequate time to fully understand the information and concepts presented within our classrooms. In order to achieve this educational goal, students must be allowed to engage in scientific, inquiry-based learning in which they can explore, experiment and problem solve.

Issue 3

Inadequate focus on inquiry

Recommendation 3

The program of study must continue to emphasize student understanding through inquiry and the time allocated to this emphasis must allow the needs of an inquiry-based program to be met. Inquiry is a critical component of a science program at all grade levels and in every domain of science, and designers of curricula and programs must be sure that the approach to content, as well as the teaching and assessment strategies, reflect the acquisition of scientific understanding through inquiry.

Issue 4

Challenges of using new technologies appropriately

Recommendation 4

Conducting scientific inquiry requires that students have easy, equitable and frequent opportunities to use a wide range of equipment, materials, supplies and other resources for experimentation and direct investigation of phenomenon. Good science requires access to the world beyond the classroom for all students. As new technology becomes available, it must be provided to the schools. It is important that students learn information retrieval from computer databases, such as the Internet, CD-ROMs and computer software in general. Because teachers must be able to help their students use technology, they themselves must be supported with appropriate training.

Issue 5

Need for flexibility of approaches to learning

Recommendation 5

Concepts are learned best when they are encountered in a variety of contexts and expressed in a variety of ways, because that ensures that there are more opportunities for them to become imbedded in a student's knowledge system. Specific ways of encouraging students to explore, develop and apply ideas must be selected by the teacher.

Issue 6

Marginalizing the Science-Technology-Society-Environment (STSE) focus

Recommendation 6

Future science courses must have a true STSE focus with a heavy emphasis on skills, as well as content and real-life applications. They should be more relevant to students. To achieve the vision of scientific literacy, students must increasingly become engaged in the planning, development and evaluation of their own learning activities. In the process, they should have the opportunity to work collaboratively with other students to initiate investigations, communicate their findings and complete projects that demonstrate their learning.

Issue 7

Lack of comprehensive authentic assessment

Recommendation 7

Assessment policies and practices must be aligned with the goals, student expectations and curriculum frameworks of the science curriculum. There should be multiple and varied methods of assessment starting early in the year in each course with clear, consistent expectations for students. Practical, hands-on assessments should be included and these assessments should also have an STSE focus.

Issue 8

Lack of leadership for successful curricular implementation

Recommendation 8

Support systems with formal and informal expectations of teachers must be aligned with the goals, student expectations and curriculum frameworks. An effective science program requires an adequate support system, including resources of people, time, materials and finance, opportunities for staff development and leadership that works toward the goals of the program.

Issue 9

Need for effective professional development structures

Recommendation 9

Responsibility needs to be clearly defined for determining, supporting and maintaining all elements of the science program. Schools must explicitly support curriculum change in an atmosphere of openness and trust that encourages collegiality. Teachers must be supported in creating and being members of professional development networks. Schools and school districts should establish professional development standards to provide teachers with opportunities to develop and enhance the needed capabilities for effective science teaching with funding and professional time allocated for such.

Issue 10

Inadvertent nurturing of stereotypical messages

Recommendation 10

Popular conceptions of the nature of science assume a less than accurate linear model of the acquisition of scientific knowledge. In promoting that stereotype, schools continue to inadvertently close the science door to our most divergent and creative thinkers. As it stands, science remains unappealing to people (in larger proportions, female) for whom power and competition are less important than co-operation and for whom an integrated approach to reasoning is deemed illogical. Concerted efforts toward equalizing staff proportions of male and female science teachers are imperative to opening up the science field. The addition of mentorship programs that match students with adult female scientists would further expand perceptions and shatter stereotypical roles for both male and female students.

Rick Mrazek

Igniting Creative Energy Challenge

National Energy Foundation is pleased to announce the fourth annual Igniting Creative Energy Challenge. The Challenge is an educational competition designed to encourage students to learn more about energy and the environment and demonstrate that understanding.

One teacher and three students will be named grand prize winners and will each receive a hosted educational trip of a lifetime for two to Hawaii from April 26 to May 1, 2005. This journey of will include visits to a volcano, tropical forests and, of course, Hawaii's famed beaches. The estimated retail value of the grand prize trip is $3,500 to $4,000 or more, depending on airline fares.

Winners will also participate in the National Energy Efficiency Forum in Washington, D.C., on June 14 to 15, 2005, where they will share their Challenge entries and ideas with government officials and energy leaders from across the nation.

For guidelines and entry forms, and to see previous winning projects, visit www.ignitingcreativeenergy.org or call 1-801-908-5800 and ask for Shannon.

The deadline for postmarked entry is February 19, 2005.

Take the Igniting Creative Energy Challenge today and see the spark it ignites in your classroom.

IGNITING CREATIVE ENERGY
A NATIONAL STUDENT CHALLENGE

Science Connection in the Rockies: An Earth Science Professional Development Workshop

Presented by the Burgess Shale Geoscience Foundation

Date: August 25–28, 2005
Location: Yoho National Park, British Columbia

Cost: $350 per person, including three nights accommodation, meals and lots of resource materials

Optional: Guided hike to the world-famous Burgess Shale

Contact: Lisa Holmstrom at (250) 344-7347 or e-mail at lisa.holmstrom@burgess-shale.bc.ca

More information: www.burgess-shale.bc.ca

What past participants have said:

- The best mini-science conference I have attended in six years!
- Everything was very well organized.
- Exceeded my expectations! I received fantastic resource materials to make my lessons more interesting and fun!
- I have a much more holistic picture of earth science and this will allow me to connect all of the topics in my curriculum.
- The location and setting were astounding!

Don't be disappointed—register by May 15. The workshop has support from the following sponsors: EdGEO, Suncor Energy Foundation and the CSPG Educational Trust Fund.

Accountability in Education

The following is a summary of the discussion paper on accountability in education entitled "Accountability in Education: Background Paper." The discussion paper looks at the history of how education is managed in Alberta and the development of standardized testing. It also makes recommendations for the future of education.

The authors are looking for feedback from teachers on the paper. What things did you find interesting? What things did you find positive? What do you see as the real challenge in accountability? Comments can be directed to Frank Horvath at fhorvath@teachers.ab.ca or (780) 447-9400. Please refer to the feedback form included in this newsletter.

This summary was prepared for discussion at the 2005 Annual Representatives' Assembly (ARA). It was prepared for discussion purposes only. The full paper can be found in the 2005 Resolutions Bulletin, which was included in the March 15 issue of *The ATA News*.

Accountability in Education: Background Paper—Executive Summary

Education accountability defines and directs the learning system in Alberta today, but not necessarily in ways that will address students' needs in the 21st century. The Accountability Framework was introduced by government about 10 years ago during a time of restructuring, downsizing, and funding cutbacks, and has yet to be reviewed for its present or continuing effectiveness and future viability. This background paper is intended to stimulate discussion for such a review.

Accountability is best defined as the process through which individuals or organizations in the education system take responsibility for their actions and report on these actions to those who are entitled to the information. Accountability also implies an obligation to find ways to improve the capacity and performance of those responsible, not just measure the achievement of outcomes.

Historical Contexts of Accountability in Education

The current model of accountability in education has its roots in the Provincial Student Evaluation Program which government announced in 1980. Initially, achievement tests and diploma examinations served purposes other than those of accountability. By the mid-1980s, however, Alberta Education began looking to these assessment programs to provide the backbone of accountability reporting.

Opportunities for Improving the Accountability System

Alberta's Accountability Framework, under the Government Accountability Act, is designed to help the government manage the various sectors within its mandate. Government requires that the ministry and school boards answer for how well they carried out their responsibilities. The Education Ministry has chosen to use student assessment results in core subjects extensively for its reporting. The pressures and controls exerted by the ministry over the long-term have unintended adverse effects which ultimately limit students' opportunity to learn and the overall system's capacity to achieve the goals of education. Following are some of the areas where improvements could be made which

would result in a more effective accountability system.

- Assessment that addresses the full range of education goals
- Quality standards implemented not standardization
- Use of accountability data as a means of improving the system
- Increased public confidence in accountability data
- Allocation of resources to support better accountability measures
- Roles and responsibilities of education partners enhanced
- Support for teacher professionalism and judgment
- Transparency in the provincial assessment process
- Use of a review mechanism

Emerging Directions in Accountability

Current research and events in education suggest the following positive emerging directions:

- Increasing interest in pursuing the broader goals of education
- Greater recognition of the value of capacity building at all stages and levels of the accountability system
- Enhanced technology to support system integrity and credibility
- Two-way shared accountability
- Measuring what we value
- Building commitment

Context for an Effective Accountability System

Discussions about accountability in education are often dominated by specific concerns about testing, which should be only a small part of the system. In order to develop a more dynamic and responsive vision of accountability, it is helpful to take a systemic view first and then tackle the bits and pieces that make up the whole. An accountability paradigm, consisting of four perspectives on accountability that emerge from the dynamics of system coherence and program integrity in education, is provided for discussion purposes.

Key Principles of an Effective Accountability System

The following seven principles are presented as a foundation for reflecting upon and improving the current accountability system.

- Education partners have a shared understanding of and commitment to fairness, openness, respect for diversity, and stewardship, key values underlying accountability in education.
- The primary purpose of accountability in education is to support the broad goals of education and the diverse learning needs of children and youth.
- Information for accountability purposes is gathered in a variety of ways from all relevant sources, and reported and used in ways that respect the limitations of the data.
- Sound educational research and practice guide the design and implementation of an accountability system in education.
- Accountability in education enhances the capacity of education partners to fulfill their respective roles and responsibilities and leads to sustained improvement of the system.
- Each education partner is accountable for those areas of the system that are within its authority and expertise.
- The system of accountability in education is evaluated on an ongoing basis.

Future Directions

To facilitate discussions about improving the current accountability framework, this paper provides a definition of accountability, a history of events, concerns with the current system, promising trends in accountability and fundamental principles that could serve as a discussion starter for education partners and the Education Ministry. Given emerging notions of shared accountability and capacity building, the teaching profession invites education partners and the Ministry to engage in a review of the accountability system and make improvements that will enable the education system to meet current and future learning needs of our children and youth.

Notice of Upcoming AGM Items

Two notices of motion have been made for two changes to our constitution. They will be proposed at our next annual general meeting (AGM), to be held at the 2005 science conference. The motions are

- to change the length of terms for the president-elect and the past president from two years to one year and
- to combine the division one and division two positions into one division called elementary science.

For a complete description of these along with a rationale, please visit http://atasc.ab.ca/upcomingagm.html. We urge all members to attend the AGM at the November conference.

Dennis Oppelt
President

Preliminary Feedback

Accountability in Education Background Paper

Name: _____ Specialist Council: _____

Position on Specialist Council: _____ Date: _____

After reviewing the Accountability in Education background paper briefly, please provide your initial thoughts on the following:

1. What stood out as something really positive in the paper or about what you have heard about the paper?

_____

_____

_____

2. What did you find interesting in the paper, perhaps something you hadn't been aware of or considered before?

_____

_____

_____

3. What do you think will be a real challenge for us as we continue our work on the issue of accountability in education?

_____

_____

_____

4. Other thoughts?

_____

_____

_____

Thank you for your help. Subcommittee on Accountability in Education, The Alberta Teachers' Association.

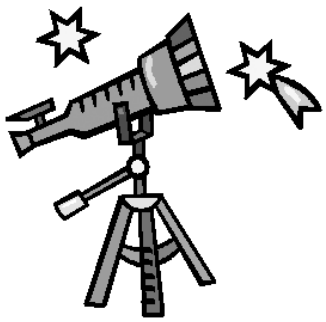
Please call Frank Horvath at (780) 447-9440 or e-mail him at fhorvath@teachers.ab.ca if you have additional comments or questions.

Astronomy Notes

In the volume 25 number 1 issue of *The Alberta Science Teacher*, I began a series about resources around Alberta where people can go to view the night sky. This article features the Odyssium in Edmonton.

The Odyssium is well known for its interactive displays, IMAX theatre and the Margaret Ziedler Star Theatre. The Margaret Zielder Star Theatre is a modern planetarium that can present views of the night sky at any time and any place. It features laser shows set to various musical pieces along with tours of the night sky. With its computer-controlled projectors, it can also show features ranging in topics from dinosaurs to climate change. Check out www.odyssium.com/mzt.htm for show times and prices.

For astronomy buffs, the real attraction at the Odyssium is the outdoor observatory. It is open from 7:00 to 10:00 p.m., as long as the outside temperature is above -15°C. It is run by volunteers from the Royal Astronomical Society of Canada, and it's free! They have a great variety of telescopes. The newest one is a 16-inch reflector that has GPS, which allows it to point to over a hundred thousand objects. It is linked to a computer to track night sky objects for great viewing.



I have visited the observatory a few times myself. The staff are very helpful and willing to assist you in finding your favourite sights or to point out other interesting ones. My favourite part is getting to use telescopes that are beyond my current purchasing power, along with the computer imaging and tracking. This allows me to see the nebulas and deep sky objects that are out of the reach of my binoculars.

For more information, check out the Odyssium's website, www.odyssium.com, or call them at (780) 452-9100.

Derek Collins

PSAC Grant Program for Elementary and Junior High Schools in Small Communities

Five Petroleum Services Association of Canada (PSAC) school grants of $1,000 each are being awarded in 2005. For the third year in a row, PSAC is awarding $5,000 in grants to enhance educational opportunities in rural schools. The goal of the PSAC Grant Program for Schools in Small Communities is to introduce elementary and junior high school students living in rural communities in western Canada to the petroleum services sector and its many exciting career opportunities.

The following are the eligibility criteria. Schools must be located in British Columbia, Alberta, Saskatchewan, Manitoba or First Nations communities with a population of 15,000 or less. Applications must clearly address a specific educational requirement relating to math, sciences or the oil and gas industry (such as computer hardware, software, field trips, science equipment, calculators and so on). Applicants must provide a description of the project's cost, why the project is needed, who will benefit from the project and how they will benefit. Projects valued at more than $5,000 in total will not be accepted. Funds awarded must be used in the 2005/06 school year. Schools that submitted applications in previous years are eligible to re-apply, even if they received a PSAC grant in the past.

The following were the 2004 PSAC grant recipients:

- Gladmar Regional School, Gladmar, Saskatchewan—Science kits to study energy and machines
- Gordon F. Kells High School, Carlyle, Saskatchewan—Microscopes, magnifying glasses and soil-testing kits
- Kateri School, Trout Lake, Alberta—Microscope with flexible camera
- New Myrnam School, Myrnam, Alberta—Microscope with flexible camera
- St. Michael's School, Bow Island, Alberta—Hands-on kits that integrate math and science

All 2005 PSAC Grant Program applications must be in the PSAC office by 5:00 p.m. on Friday, April 29. Detailed rules, application forms and promotional posters can be downloaded from the PSAC website at www.psac.ca/initiatives/scholarship_grants.html or by calling PSAC at (403) 264-4195 or toll free at 1-800-818-7722.

Science Council Awards

Call for Nominations

The Science Council requests nominations for the following award categories:

- Certificate of Achievement
- Outstanding Science Teacher
- Distinguished Service Citation

Letters of nomination should indicate the appropriate award, give supporting evidence for the nomination and include the names and addresses of two other persons who are acquainted with the nominee's achievements. For the Outstanding Science Teacher award and the Distinguished Service Citation, nominations must be postmarked on or before September 15 and received by the president-elect (see the Council listings at the end of this newsletter).

The Awards

Certificate of Achievement

This award recognizes special science projects undertaken by individuals or groups of teachers in Alberta. An article that describes each project will appear in *The Alberta Science Teacher*. The president presents the certificate at a regional meeting. Please note that this award is in a continuous category and nominations can therefore be sent in at any time.

Outstanding Science Teacher

This award recognizes excellence in classroom teaching in Alberta, specifically contributions to science teaching through articles, workshops, curriculum development or other forms of professional development. Eligible candidates must be teaching at least two-thirds of the time.

Distinguished Service Citation

This award recognizes a broad, extended contribution to science education in Alberta over 10 years or more. Contributions may have been in curriculum development, inservice classroom teaching or leadership in a broad context.

Nominations for awards and positions can be made by going to www.atasc.ab.ca/nominations.html.

ATA Educational Trust

The ATA Educational Trust is an organization that distributes grants and bursaries for proposals that improve the teaching profession in Alberta. The Trust is now accepting submissions in several areas. Teachers can apply for grants for personal professional development. There are various amounts available for taking courses, working on graduate studies, attending specialist council conferences and making presentations at council conferences. The deadline for application is May 1. There is a call for submissions for grants for developing resources in early childhood education, global and environment education, francophone and French immersion programs, and other areas of educational concern.

More information is available online at www.teachers.ab.ca (click on Professional Development, then Grants, Awards and Scholarships) or you can contact Violette Bigeat at (780) 447-9494 or 1-800-232-7208, ext. 494, or by e-mail at vbigeat@teachers.ab.ca.

Important Notice to All Members

Membership Survey

The Science Council is conducting a general internal assessment, part of which is a survey of all members, to help the Council set goals and its direction for the future. Please fill out our short online survey at www.atasc.ab.ca/survey2005.html. Thank you.

E-Mail Addresses

Many Science Council members have joined through mail but have not supplied us with a valid e-mail address. It is very important that we have an e-mail address for each member so that we can have a record of members for our website database. You will not be able to register for the conference or receive e-mail notices if we do not have your e-mail address. The addresses we store are secure and you will not receive more than a few messages a year. Also, if we have your address, you will be able to use our online resource sharing database.

E-mail your name and e-mail address to wstrass@atasc.ab.ca. Thank you.

Resource Sharing Database

We hope that our members start using the resource sharing database in the protected area of our website. You can upload or download tests, lesson plans and so on at the touch of a button. If people do not start using it, then there will be nothing there to use. You can start using our OWL-based system by going to the website at www.atasc.ab.ca then clicking on the Protected Areas link on the left.

News Snippets

I often find myself mentioning a new discovery, press release or news item in my classroom. Every morning, I scan about 30 websites that range in topic from technology to science to research to odd news. Most of the time there is no connection to the lesson at hand but it does get the students talking and thinking.

I want to tell you about a news story I came across on February 14 that had me, a skeptic's skeptic, puzzled and wanting to dig deeper. The kids were truly awed but they readily accepted it. I think they do this because they see the Internet as a type of authority; if it's on the Internet, it must be true. I did some digging but I am still not satisfied in learning enough about this story.

Red Nova News (www.rednova.com) featured a story called "Can this Black Box See Into the Future?" I nearly passed it by but I gave it a closer look. Basically, there is a project running in which 65 random event generators (or Eggs, as they are called) are connected to the Internet and are constantly sending in their events. Each event consists of an Egg generating either a zero or a one. Most of the time, the combined results from the Eggs follow standard statistical rules for deviation from the mean, resulting in each number appearing 50 per cent of the time.

There are times, however, when the results shoot away from the predicted average, as if they were being influenced by something.

The project has a history in searching for the paranormal. In the 1970s, a researcher named Robert Jahn did experiments in which volunteers tried to influence the outcome of similar random generators with their minds. He reported statistically important variations in the results. People seem to be able to influence these black boxes.

In the same decade, John Hartwell found that when he presented emotional images to his subjects, their brainwaves changed dramatically. He then discovered that their brainwaves actually changed seconds before the image appeared. It seemed that people could predict if a benign or an emotional picture was coming up.

Now, a group working at Princeton on something they call the global consciousness project is using the Eggs to measure the combined influence of the six billion people on the planet. They claim to read variations in the Eggs' results before major events, which have included the September 11, 2001, attacks and New Year's Day celebrations.

This story gave me a great chance to challenge the students in my classes on whether or not this belongs in science, and whether or not it is real.

Some students questioned how people can influence these computer devices. The website for the project (http://noosphere.princeton.edu) gives such explanations as psychic influence and emotional power. I asked the students how the evidence, if it is true, illustrates this. This lead to an explanation of the difference between a correlation, and cause and effect. The data indicates a correlation but it does not show that tragic or emotional events are causing the randomness to change.

I steered the students toward the idea that perhaps the deviations are, in fact, normal. When flipping a coin a hundred times in a row, it is possible to have spikes in the randomness of the data, and there is always something emotional happening in the world. On the website, there is a link to an independent study of the spike that the system recorded on September 11, 2001. The study comes to the conclusion that there is no abnormal statistical variation. The students and I had a great discussion about probability.

Someone always asks, "But what if it is true?" It would definitely be amazing and revolutionary if this turns out to be real. Imagine a global scattering of hundreds of black boxes that could predict emotional events by minutes and sometimes days. How would that change our society? How would it change our news reports, politics and religions? Although it makes an interesting storyline for a science fiction writer, we still had the most fun with this line of thinking. Students can definitely be creative.

Derek Collins

Nominations for Executive

The Science Council executive is a board of volunteers that works on behalf of Alberta science teachers. Most positions on the executive are two-year terms. Any active regular member can be nominated for a Science Council executive position. If you are interested in running for a position, feel free to contact any member of the current executive for information. Nominations should be sent to the president of the Council by July 1, although an extension may be granted if the president is informed of a candidate's intention to run for an executive position by July 1 (such as through a letter of intent or an e-mail).

If any position receives multiple nominations, a mail-in ballot election will be called. If positions receive only one nomination, the nominee will be acclaimed to position at the annual general meeting (AGM). Results from any election will be announced at the AGM.

Science Council Executive 2004/05

President
Dennis Oppelt — doppelt@atasc.ab.ca

President-Elect
Colleen Yoshida — cyoshida@atasc.ab.ca

Secretary
Karen Shevy — kshevy@atasc.ab.ca

Treasurer
Kevin Joncas — kfjoncas@atasc.ab.ca

DIRECTORS

Early Childhood Science and Division II
Erick Noriega — enoriega@atasc.ab.ca

Division III
Corey Karvonen-Lee — ckarvonen-lee@atasc.ab.ca

Chemistry
Kevin Klemmer
Res. (403) 252-0684
Bus. (403) 243-8880, ext. 3171
Fax (403) 777-7059
kklemmer@atasc.ab.ca

Biology
Rachel Toews — rtoews@atasc.ab.ca

Physics, Division IV
Cliff Sosnowski
Res. (780) 929-8918
Bus. (780) 435-3964
Fax (780) 437-7228
csosnowski@atasc.ab.ca

Science
Myrna Loewen — mloewen@atasc.ab.ca

Conference Codirectors 2005
Gillian Vas — gvas@atasc.ab.ca

Kevin Joncas — kjoncas@atasc.ab.ca

Journal Editor
Wytze Brouwer — wytze_brouwer@ualberta.ca

Newsletter Editor
Derek Collins
Box 3665
Vermilion T9X 2B7
Res. (780) 853-2116
Bus. (780) 853-5251
Fax (780) 853-4343
dcollins@atasc.ab.ca

Technology Director
Wade Strass — wstrass@atasc.ab.ca

Postsecondary Representative
Keith Roscoe — kroscoe@atasc.ab.ca

Alberta Learning Liaison
Caroline Nixon — caroline.nixon@gov.ab.ca

PEC Liaison
Frank Bruseker
Barnett House
11010 142 Street NW
Edmonton T5N 2R1
Res. (780) 453-3613
Bus. (780) 447-9400
or 1-800-232-7208
Fax (780) 455-6481
fbruseker@teachers.ab.ca

ATA Staff Advisor
Mike Kischuk
Barnett House
11010 142 Street NW
Edmonton T5N 2R1
Bus. (780) 447-9413
or 1-800-232-7208
Fax (780) 455-6481
mkischuk@teachers.ab.ca

REGIONAL COUNCILS

Calgary and District Biology
Esmeralda Everett

Calgary Junior High
Mark Collard — mccollard@cbe.ab.ca

Calgary Elementary
Pratt Hetherington — hetherington@cbe.ab.ca

Edmonton Biology
Morrie Smith — msmith@epsb.ca

Edmonton Chemistry
Dan Leskiw — dan.leskiw@gov.ab.ca

Edmonton Elementary
Margaret Ebbers — margebbers@connect.ab.ca

Edmonton Physics
Wytze Brouwer — wytze_brouwer@ualberta.ca
