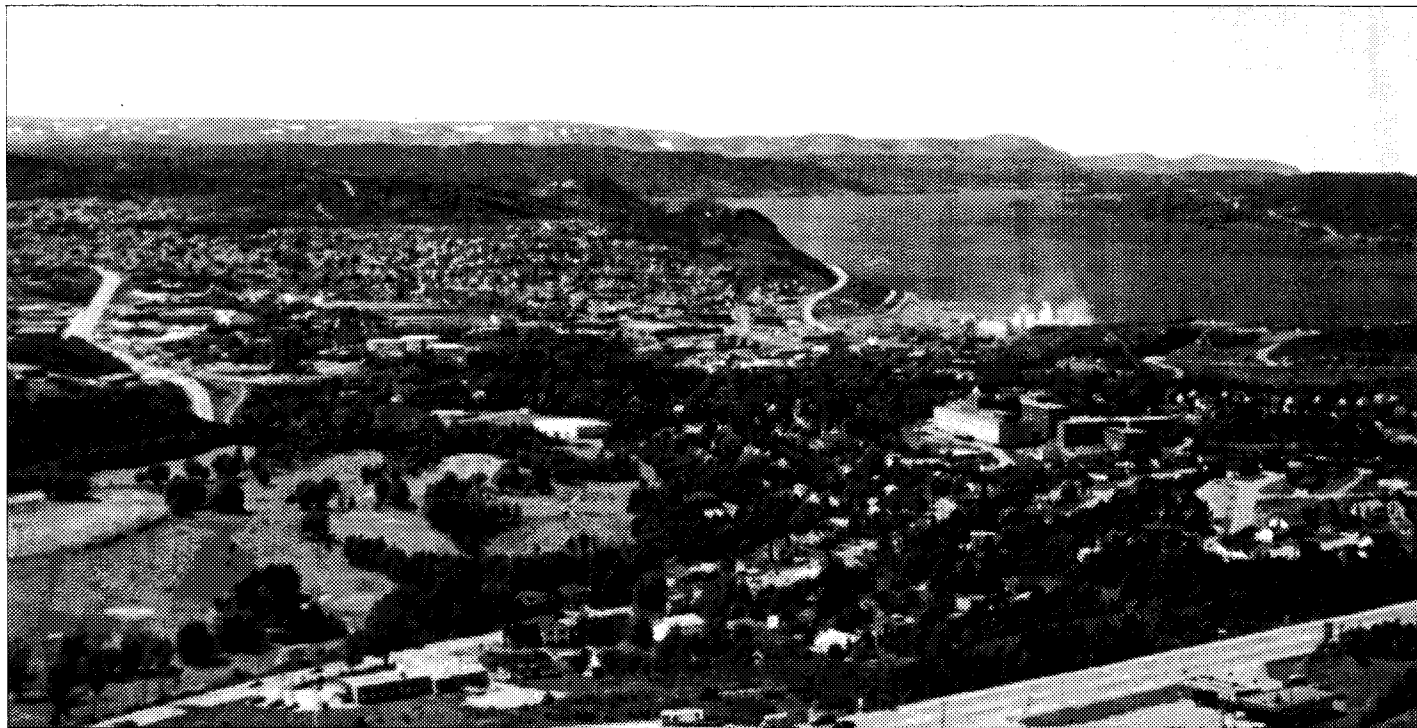


C₃ News



Newsletter of College Chemistry Canada / La Chimie Collégiale au Canada



Sir Wilfred Grenfell College, Corner Brook, Newfoundland, home of the 1997 C₃/2YC3 conference

Photo by Lee Gilbert

Visit Corner Brook

The C₃ conference moves clear across Canada from Whitehorse (1996) to Corner Brook, Newfoundland for the 500-year anniversary of John Cabot's landing in Newfoundland. This year's conference will be a joint event with College Chemistry Canada and the U.S. Two-Year College Chemistry Conference.

The C₃/2YC3 joint conference will be held at Sir Wilfred Grenfell College, Corner Brook, Newfoundland, on June 12 to 15. The conference promises to provide some excellent sessions on each aspect of the teaching of college chemistry: course content, teaching methodology, and the applications of technology. There will be a

particular emphasis on the teaching of chemistry as a service course towards degrees in everything from nursing to forestry. The keynote speaker will be the renowned Canadian scientist, Dr. Mary

Anne White of Dalhousie University, who will give a presentation, with demonstrations, on the relevance of materials science to chemical education. (See page 7 for conference details.)

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C₃ News

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Articles of any length will be gladly accepted. Please send typewritten copy to the Editor at the above address or send by fax. Copy can also be sent on a 3.5" disk, Mac or IBM format using Microsoft Word 6.0, or IBM format using WordPerfect 6.0 or lower, or any word processor producing ASCII output.

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President's message

Upcoming meetings

- **Joint Board and Executive Meeting**

June 12, 3 p.m.

Sir Wilfred Grenfell College

Check with the conference organizers when you arrive in Corner Brook for the exact location. All board and executive members should plan to attend this meeting, and bring their annual report. If you are a regional director and will not be attending the conference, please send your annual report to myself, or our secretary, Bob Perkins, prior to the conference.

- **Annual General Meeting**

June 13, 5 p.m. (following the afternoon sessions)

Conference Hall

Upcoming Elections

It's that time again, time to think about the upcoming executive elections. The elections for new executive members will occur at the annual general meeting, so be sure to be there. This year we will be holding elections for the positions of: Treasurer (two year term), Secretary (two year term), President Elect (a one year term, to be followed by a two year term as President, and a one year term as Past President), as well as the annual elections of Regional Directors. The usual course of action has been to hunt down prospective new executive members at the Thursday evening wine and cheese; this of course eliminates anyone who is not at the conference from being considered for an executive position. I would like to try things a little differently this year by identifying nominees prior to the conference. If you know anyone interested in these positions please forward their names to an executive member before the conference. If YOU are interested in one of these positions please contact an executive member - don't be shy, we need enthusiastic, dedicated executive members. The jobs are not overly difficult or time consuming, and the perks are... well, the perks are non-existent but the experience is well worth it.

The Chemmys

The Chemmy awards are awarded for various "achievements" from the previous year's conference. Do you have a particularly fond or funny member of something that happened in Whitehorse? Do you think someone should be appropriately honoured? If so, let me know. The Chemmys are to be awarded at the discretion of the President, but I am open to suggestions.

The Conference

This issue has lots of information on the conference for us. Start making your plans now. We are going to have a significant number of US 2YC3 members attending and as usual it should be a memorable event. Send in those paper proposals and registration forms now!!!

ChemMatters

ChemMatters is an ACS publication geared towards the high school junior college level. It often contains excellent teaching and demo ideas, and is a bargain at \$8 (US) per year. If you have heard of or seen this publication and are interested in subscribing you may either order over the internet at <http://www.acs.com> or phone 1-800-209-0423 product #HS29 (I found that number at the web site, I hope it is not a US-only number.)

Suzanne Gardner

Computer-Based Chemical Education

John Martin, University of Alberta

There's lots of computer-based chemistry instruction around. Watch out for stuff with pretty pictures, animations and interesting text, but little that can't be done equally well by a book or a videotape. And beware instructional material that takes over your course, forcing you to try to wrap your presentation around what's on the computer.

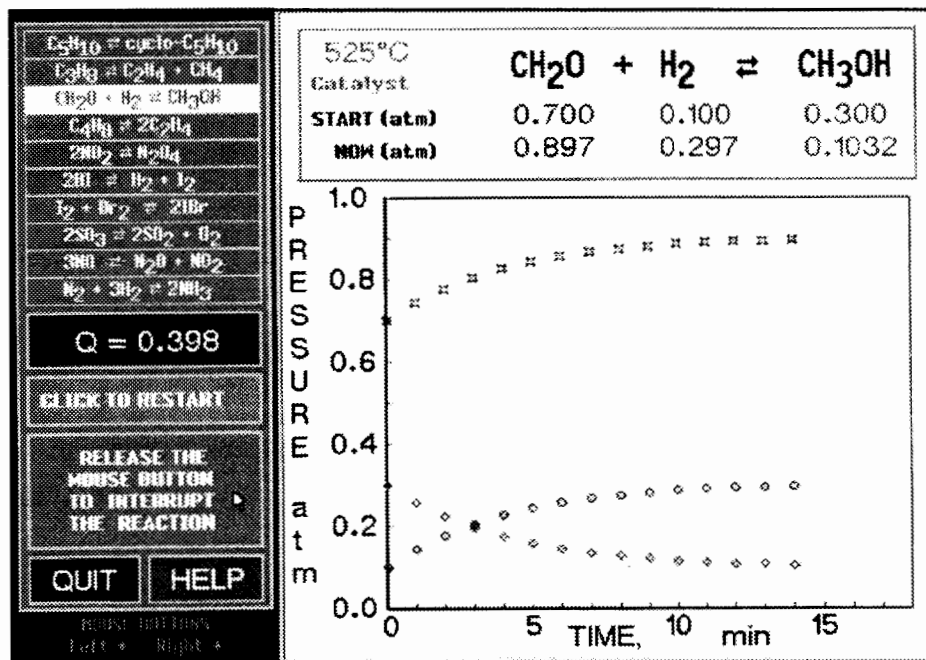
Ed Blackburn of Faculté St-Jean and I are working on instructional materials which take advantage of what computers do well: they are highly interactive, and as far as we can manage, leave the course presentation in the most capable hands - yours.

There are three components: instructor-controlled Simulations and Interactive Resources (SIRs), games for individual students or groups, and lessons on specific topics for individual students' use. They're all DOS based, and will also run as DOS applications on all the versions of Windows on which we've tried them. They do not run on the Macintosh operating system (but they do run on Power Macs).

Simulations and Interactive Resources

The SIRs are meant to be used by an instructor in class, using a projection monitor or palette. They are completely under your control, via an intuitive mouse-operated interface.

There are 24 of them, on various topics: periodic table, atomic structure, gases, phase equilibrium, thermodynamics, reactions, stoichiometry, gas equilibrium, acid-base equilibrium, kinetics, electrochemistry and mathematical functions. They have been published as Volume 9B, number 2 of the *Journal of Chemical Education: Software*, Dept. of Chemistry, University of Wisconsin-Madison, 1101 University Avenue, Madison WI USA 53706-1396. The price outside the US, which just covers costs, is \$80 US for a single copy; network prices are available (though the SIRs were not really designed for network use).



Screen print of SIR Q

There is a complete description of the SIRs on p. 722 of the August 1996 issue of the *Journal of Chemical Education*.

To give you an idea of the way the SIRs work, here's a brief description of SIR Q, on chemical equilibrium.

Notice that the instructor's menu is on the left, and the stuff the students are supposed to see is in big bold type on the right.

You may choose any of ten reactions, from a simple isomerization to quite complex reactions, by clicking on it. You may choose any of five temperatures for each reaction; the left mouse button increments and the right one decrements. Similarly you establish starting concentrations, in 0.1 atm increments from 0 to 1.5 atm, by clicking on them.

You may select from four amounts of catalyst, from none, which will not let you reach equilibrium within the graph, to an amount guaranteed to reach equilibrium. You may choose whether or not to have the reaction quotient, Q , displayed as the reaction runs.

You start the reaction by clicking on the area where you see the pointer, and keep it going by holding the mouse button down. You may interrupt and resume the reaction whenever you like. The partial pressures are shown as the reaction runs, colour-keyed to the points on the graph.

Everything I've just told you, and more, is instantly available by clicking the HELP button. Of course you should do this the night before, not in front of the class...but it's there if you need it.

You can start with the simple one-to-one isomerization, see how stoichiometrically equivalent systems always go to the same equilibrium state, figure out what mathematical relationship is common to all the equilibrium states, and then proceed to deduce the law of mass action for more complex stoichiometries.

You can show how temperature changes affect the equilibrium state and the equilibrium constant. You can demonstrate LeChatelier's principle. You

continued on next page

continued from page 3

can show how a catalyst changes the rate of approach to equilibrium but not the equilibrium state...and so on.

If you want to get fancy, the equilibrium constants are in fact thermodynamically correct, so you can deduce the heats of reaction from the temperature dependence of the equilibrium constants. (Don't take the kinetics too seriously, though. Everything is first order. There is a separate collection of SIRs for kinetics.)

SIR Q is quite representative. Behind the display which students see is a wealth of chemical information, which you may invoke as you need it.

Periodic Table Games

Two related games, based on the periodic table, are due to appear in JCE: Software some time in 1997. They're called the Nomenclature Game and the Formula Game.

The illustration shows the Formula Game. Initially all you see of the formula in the upper box is a set of question marks. "?e" represents an element and "?n" a number. You have to deduce all of them.

Screen print of the Formula Game

Elements can be picked off the abbreviated periodic table, and numbers from either the keypad on the screen or from the keyboard. You try your chosen element or number in a suitable place in the formula. If you're right it appears in the formula; if you're not, you get a hint, as shown.

When you have completed a formula, your score is twenty minus the number of wrong guesses. Five formulas make a game, maximum possible score 100. It is practically impossible to get a perfect game score in the Formula Game.

Straight guessing is very unproductive. Students show an impressive learning curve, as they figure out that they can manage the feedback by making guesses which, if incorrect, will yield the most useful response. And there are all sorts of interconnections.

In the example, the feedback would incline you to try antimony next. There are probably six fluorines. After that's established, the smart move would be to try either 2 or 3 for the number of complex anions, since that will give you the oxidation number of the first element.

The Nomenclature Game looks much like the Formula Game, except that you are given the name of the compound. In the Nomenclature Game your score is ten minus your wrong guesses, and ten formulas make a game.

Both games provide all sorts of useful facilities: a hall-of-fame of the highest scores, statistics of games played, and tutorials on the properties of the elements and how to play the game. You can also choose which convention for naming the groups (American, European or IUPAC) you want the computer to use.

Most important for you, the instructor, are the editing facilities. You may set up the databases of formulas and names that the computer uses; as many as seven for each game. They can be graded in difficulty, or specialised to certain branches of chemistry. You may determine which database will be the default, which ones are available to the students, and which group convention will be the default. You may also reset the scoreboards and the statistical summaries.

The games are designed to run on networks. Your formula and name databases and all student scores and records will be available across the network.

Computer Lessons

Over the past fifteen years Ed Blackburn and I have written about forty lessons for individual student use, covering most of the topics of an introductory chemistry course. They are organised into modular groups, with considerable integration of the lessons in each module.

We intend to relate the lessons to the SIRs, so that students may explore aspects of the simulations in the SIRs.

Since there have been spectacular advances in computer technology in the past decade the lessons have had to be updated considerably. We hope to begin publishing them starting in the next year or so.

I shall spend the coming (Spring 1997) semester at the University of Texas at Austin, working with Prof. J. J. Lagowski to see how the computer-based materials best fit into an introductory chemistry course. We hope that we'll end up with something that will give you access to the power of computers without taking away your ability to control the content and pace of your teaching.

Biennial Conference on Chemical Education

John Olson, Augustana University College

The theme of the 14th BCCE was "Chemistry: The Challenge of Change". For me, the challenge was choice! With oftentimes 20 or more events occurring simultaneously (symposia, workshops, tours), there were occasions when I would have liked to have been in as many as five places at once! This report contains only a few highlights of *my* unique conference.

There were several "special" lectures I heard, the most interesting and informative of which (for me) was "Anticancer Drugs" by Graham Jones (Clemson). I learned that raspberries, strawberries, blackberries, and especially walnuts are good sources of ellagic acid, an anticancer agent. Jones identified the top ten vegetables according to their value in human nutrition, including anticancer properties (broccoli, spinach, Brussels sprouts, lima beans, peas, asparagus, artichokes, cauliflower, sweet potatoes, carrots), and, in responding to a question from the audience addressed a long-standing concern (of mine, at least): If not to be eaten raw, broccoli should be steamed for no more than three minutes, because longer boiling destroys the beneficial components.

There were five plenary lectures in all. Darleane Hoffman (Berkeley) described some of the chemistry of the heaviest elements; I found out that the name of element 97 is pronounced "berklium"! Peter Gibson (York Glazier's Trust, England) presented a fascinating, slide-illustrated lecture dealing with restoring and preserving stained glass. Alex Johnstone (Glasgow), recipient of the 1996 Brasted Award, challenged teachers of science to focus on the needs of the *learners*; how sensible can you get?!

Ron Perkins (Greenwich High School, Connecticut) quoted Paul Arthur who said, in 1939, "Few teachers would go through all the work needed to prepare demonstrations if amusement were its purpose." Hubert Alyea (1952) was also cited: "Lecture demonstrations? Of course. But be sure to present these lecture experiments slowly, with deliberation, and with great pains that the demonstration and more particularly the principle is

understood. It is not just a scientific show."

Demonstrations were presented throughout the conference, most spectacularly by John Fortman (Wright State) and friends, including Lee Marek (Naperville North High School, Illinois - perhaps you've seen him on David Letterman) and Irwin Talesnick (S17 Science Supplies) Monday evening at an outdoor amphitheatre ... WOW! It was there I saw the energy released by a "gummi candy" dropped into a test tube containing molten potassium chlorate (14 g). [CAUTION: Try this outdoors!!] The demonstrators combined the luminol reaction with elephant toothpaste and also with the ammonia fountain. [Elephant toothpaste: Pour 50 mL of 30% hydrogen peroxide into a 500-mL graduated cylinder; add a squirt of dish detergent, a drop of food color, and a gram or two of potassium iodide (catalyst).] There were lots of fires and explosions, especially suitable for outdoors!

Robert Becker (Kirkwood High School, Missouri) has a CD ROM, as well as booklets and a videotape, showing a great many demonstrations and labs. If you like cartesian divers and/or Scott Joplin music, you've got to see his video! Becker generated carbon dioxide and then showed how it can be not only poured from one container to another, but also siphoned! Kinetic energy is converted to thermal energy when two large (7-10 cm diameter) ball bearings are smashed together; a piece of paper caught in the middle shows burn marks. Even more spectacular is the smashing together in the dark - watch your fingers!- of these two large rusty ball bearings when they are wrapped with aluminum foil! Could this be a micro thermite reaction?!

Marie Sherman's demonstrations (Ursuline Academy) were less spectacular, but very good nonetheless. I tried some of her ideas on experiments using pop cans in my introductory/orientation lab with my general chemistry class this fall. Many issues (mass determination, volume measurement, significant figures, density, technical difficulties to be overcome)

arose as we tried to figure out why regular-pop cans (unopened) sink while diet-pop cans (unopened) float in water. Evaporation of the two different kinds of pop (regular vs. diet; we used lemon-lime) resulted in two very different-looking residues. There's enough aspartylphenylalanine methyl ester in the diet pop to give a (weakly) positive test with ninhydrin! Sherman also provided information on making one's own blueprint paper; a partially reversible "blue and gold" reaction [oxidation of Rochelle salt (tartrate) in stages to carbon dioxide in the presence of hydrogen peroxide and copper(II), which is reduced and precipitated as copper(I) oxide]; and the synthesis of and dyeing with indigo.

Harvey Wiener (W. C. Mephram High School, Bellmore, NY) likes to use "discrepant demonstrations" - predictions (by the students) don't come true! One of Marie Sherman's falls into this category: Equal volumes of two colorless liquids are in two beakers; phenolphthalein is added to each and both liquids turn pink. When poured together, the two liquids give a colorless solution! [One liquid is 0.1 M NaOH containing 10 mL of glycerol for each 100 mL of solution. The other liquid is a 4% aqueous solution of sodium tetraborate decahydrate (borax). Apparently the formation of a cyclic borate ester enhances the acidity of boric acid enough to lower the pH of the solution below 8.5.]

Demonstrations can teach the teacher, as well as the students. At an earlier BCCE, a presenter made a comment about demonstrations that don't work (obstinate discrepant demonstrations!). An audience member commented that demonstrations *always* work the way they're supposed to, not necessarily the way the demonstrator intended! Along these lines, Ron Perkins stated "As few demonstrations are completely understood, many of our old standbys contain secrets yet to be discovered!"

For additional information: olsoj@corelli.augustana.ab.ca, snail mail (Augustana University College, Camrose, AB T4V 2R3), phone (403-679-1509), or fax (403-679- 1129).

Computer Animation and Organic Chemistry : Visualization and Understanding

Brian Lloyd, Medicine Hat College

This article is found on the Chemist's Den page (<http://www.tst-medhat.com/~chemden/>). It describes the role of computer animation in the organic chemistry program at Medicine Hat College.

At Medicine Hat College, instructors are continually exploring new methods of facilitating this visualization process. One approach being taken is that of computer

animation to bring alive the chemical reactions of organic chemistry.

In no other science is an ability to visualize the process so advantageous to the student. Chemical reactions represent a new and foreign language to the organic chemistry student. Traditionally, these materials are presented on overhead or a blackboard with a starting chemical formula, a product chemical formula and perhaps an intermediate species.

While the reaction is verbally described the student is pretty much left to his/her own cognitive abilities for visualizing the reaction that is occurring.

For some this will be no problem, but for others it may be a stumbling block for which there is no solution.

In order to prevent this problem from occurring, computer animation of the chemical reaction and reaction mechanism is being used to bring the reaction to "life".

Indeed, the student will actually witness the specifics of the reaction occurring before their eyes as the on screen lecturer describes those reaction features in detail. By providing the animation with the lecture, all students are allowed to visualize the process under study.

The first prototype animated sequence was exported to VHS tape as a video of eleven minutes duration. The video is ideal for a one hour lecture period and has been used to summarize the reaction mechanism for several years now.

The response from the students has been excellent. With regard to the future, CDROM represents another format that will allow such animations to be accessed directly using one's own personal computer.

Modularization of lecture notes coupled with this computer animation on CDROM will allow visualization of chemical reactions, new to the student, to reach unparalleled heights. It is said that one of the strengths of Albert Einstein was a unique ability to visualize the problem in front of him.

Indeed, his visualization of what he would see if he rode along at the speed of light opened the door to an understanding of the universe that literally forged the shape of the world we live in.

For information regarding the acquisition of the video contact the author at chemden@tst-medhat.com.

The Right Question

Bob Perkins, Kwantlen University College

One of the recent threads on the Chem-Ed Newsgroup has been concerned with the use of multiple-choice questions on chemistry exams. I wrote a piece on this matter several issues ago in C3 News (in the Critical Comment Corner). I tend to agree with many of the respondents on the internet that it can be very difficult to test higher level thinking and problem solving skills if one relies exclusively on multiple-choice exams. I try to convey to my students that I am in the business of improving their critical thinking skills by using chemistry as the vocabulary. The problem below is an example in which many areas of an introductory chemistry course are required to arrive at a complete solution. It is an example of how I try to make the subject more alive and therefore fun to my students.

You have recently joined the ranks at a small analytical lab and have been placed in charge of the analysis of an unknown hydrocarbon A. Combustion of a 1.000 g sample of compound A with excess oxygen gas produces 3.143 g of carbon dioxide and 1.286 g of water. You soon discover that it takes 15.0

minutes for a given volume of helium gas to diffuse through a porous membrane under the same conditions that required 62.7 minutes for the same volume of compound A.

The above information should be sufficient to allow the determination of the molar mass and molecular formula of compound A.

Having completed the numerical analysis of the unknown compound, you turn to qualitative analysis.

Compound B was isolated from the treatment of compound A with HBr(g). Reaction with the strong base NaNH₂ converted compound B into a mixture of compound A and compound C. Compound D could be prepared from the reaction of either compound A or compound C with hydrogen gas in the presence of finely divided platinum metal. Compound E was the only product isolated from the reaction of compound D with bromine in the presence of ultraviolet radiation or compound C with HBr(g).

Using the above information provide the structures and IUPAC names for compounds A, B, C, D and E.

Joint C₃/2YC3 (Eastern) Conference

June 12, 13 and 14, 1997 at Sir Wilfred Grenfell College, Corner Brook, Nfld.

General Information

The island of Newfoundland has its own time zone, 1 1/2 hours ahead of Eastern time. The climate in western Newfoundland tends to be cool in June (about 15°C average). Thus it would be advisable to bring some warm and waterproof clothing.

Sir Wilfred Grenfell College is a small campus (approx. 1200 students) of Memorial University of Newfoundland, the parent campus being 470 miles away in the capital, St. John's, on the other side of the island. The college was founded 22 years ago as a two-year feeder campus, but in recent years, degree programs have been initiated, the first being Fine Arts and the latest being Environmental Science (which includes an environmental chemistry stream) and Environmental Studies.

Transportation

The nearest airport is Deer Lake, 60 km away. Deer Lake is serviced by Air Canada, through their subsidiary, Air Nova; and Canadian Airlines, through their subsidiary, Air Atlantic. There are frequent non-stop flights by both airlines from Halifax, Nova Scotia to Deer Lake. **Canadian Airlines has been designated as the official airline for the conference and delegates to the conference are strongly urged to quote the number MJ808F7 when making reservations for this conference.**

There is a scheduled limousine service (run by Star Taxi) to Corner Brook that meets each flight. The cost is currently \$13 (but \$19.25 if you are the sole passenger). The airport has all of the common car rental agencies: Avis, Budget, Hertz, National, Tilden, Rent-a-Wreck, Sears and Thrifty. The rental agencies are also represented in the city of Corner Brook.

Accommodation

There is accommodation in the student residence at Sir Wilfred Grenfell College. This will cost \$29 per night (tax included). It is important to note that, except for conference events, there is no regular food service on campus. Reservations should be requested on the Conference registration form.

The official conference hotel is the Glynmill Inn. The conference rate is \$68 (plus 15% tax) per night and all major credit cards are accepted. The Glynmill Inn is the nearest hotel to the college, with a pleasant river-side walking train linking it to the college. The walk takes about 20 minutes (note: the last part is up a steep hill). The taxi fare between the hotel and college currently costs \$6. For reservations at the Glynmill Inn, phone 1-800-563-4400 (fax 709-634-5106).

There are other hotels in town: the Holiday Inn Corner Brook (tel 709-634-5381 or 1-800-399-5381); the Best Western Mamateek Inn (tel: 709-639-8901 or 1-800-563-8600); and the Comfort Inn (tel 709-639-1980 or 1-800-668-4200). The Holiday Inn is also within reasonable walking distance of the college, but the Best Western and Comfort Inn are not. There are also a few bed & breakfast locations.

Conference events

As well as an exciting program of presentations the conference will have:

- a wine and cheese reception following the registration on June 12,
- a formal banquet on June 13 at which one of the menu choices will be local lobster. The dinner will be followed by local entertainment.
- a barbecue hosted by 2YC3
- a fun run on June 14
- a one day trip to nearby Gros Morne National Park on June 15.

The spectacular National Park has been declared a World Heritage Site as a result of its unique geology. The tour will take

participants first to Trout River, where they will embark on a boat trip up the Trout River fjord. After lunch at a nationally-renowned restaurant, the more athletic members of the group will be able to ascend the short but steep train to lookout point, overlooking picturesque Bonne Bay and the peak of Gros Morne. The remainder of the group will proceed to the Park Information for a video of the geology and natural history of the park.

For those who wish to travel further afield, participants staying longer can visit L'Anse aux Meadows National Park (another World Heritage Site) at the northern tip of Newfoundland where the Viking settlement, the first known European habitation in the New World, has been reconstructed. Participants will have to make their own arrangements, though we will be delighted to offer additional information.

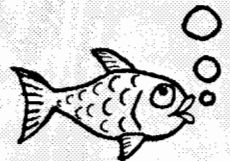
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Upcoming issue

If you have a short news item for Chembits, or would like to submit a short article, please send it to the editor before the deadlines shown below. Handwritten, typewritten, computer disks, fax or email contributions are all welcome. Deadline: April 1

Next issue

C₃/2YC3Conference,
Newfoundland - preliminary
program



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Thank you

We wish to thank Medicine Hat College, the University of Lethbridge, and the University of Calgary for their sponsorship of C₃ in the upcoming year.

Renewals

If you would like to continue receiving C₃ news, please remember to renew your annual membership. Forward a \$20 cheque to Bob Perkins payable to "College Chemistry Canada."

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