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C3 News

Newsletter of College Chemistry Canada / La Chimie Collégiale au Canada

Vanier Conference A Huge Success

Those fortunate enough to attend the 19th annual C3 conference in St. Laurent, Quebec will agree that it was one of the best ever. Joe Schwarcz, Ariel Fenster and all their colleagues and staff must be congratulated on the chemical and social programs they arranged, and thanked for the time and effort they spent as congenial hosts. (For the doubters among you, check the independent source on page 2 of this edition.) Highlights are always risky to pick, for fear of excluding others, but here goes:

Almost all other presenters couldn't help make reference to the most intriguing session in the program: "Natural Gas: To Pass or Not To Pass, That Is the Question" given by Dr. Seymour Mishkin of Montreal's Royal Victoria Hospital. And the presentation lived up to its title. After the initial involuntary snickering, the audience settled in for an informative and humorous discussion of what is for some a significant problem, even more so with the trend to high fibre (thus higher gas) diets.

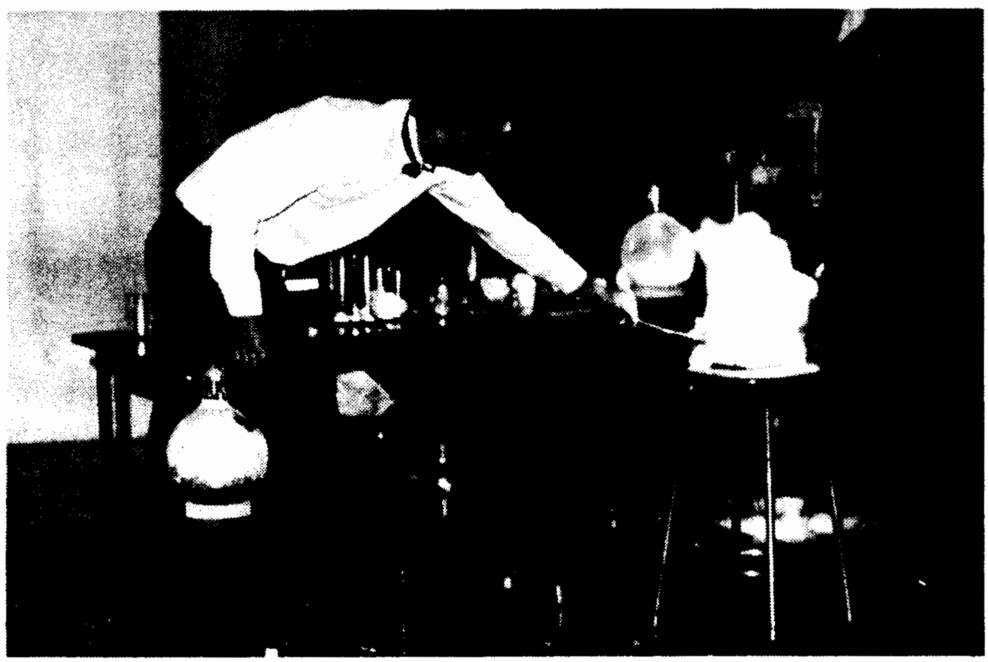
From the same hospital, Dr. David Rosenblatt told the tragic story of a mother wrongly accused (based on the misinterpretation of glc results) of murdering her own son. The subsequent careful investigations of the case by a chemistry professor at the University of Kansas helped clear the woman's name.

Professor Youla Tsantrizos (Concordia University) is well known to C3 conference veterans for her splendid presentations, and "Chemical Education in the Golden Age of Biotechnology" was no exception.

In this and future issues of *C3 News*, more detailed reports on the conference program will be appearing.

As for the social program, we were wined, dined and entertained in the sartorial splendor of the faculty club at McGill University, we were given expert advice on how to shop in Montreal, and the free Wine and Cheese Mixer was a great kick off to the conference.

Tom Whitmore, of Rhode Island Community College was on hand to witness how to put a successful conference together, and this year's editions of this newsletter will report on plans for the 20th conference (to be held jointly with 2YC3) in Providence in 1993.



Paul Morris (Exeter College, England) ignites the 19th C3 Conference (See page 3)

In this issue:

The View from "Down South": Developing a North American Perspective for the Chemistry of Our Environment

by R. Max Ferguson, Eastern Connecticut State University, Willimantic, Connecticut 06226–2295, USA

There have always been many good reasons to travel to Montreal and the 1992 College Chemistry Canada (C3) conference provided the final incentive to join with a convivial and dedicated group of chemistry professors from the far reaches of the North American continent. As a second year member of C3, it came as no surprise that the annual meeting would prove to be much more than a scientific convention with the beautiful city of Montreal providing a comfortable and stimulating backdrop for the 19th Annual Conference.

But how did a professor from a small university in rural eastern Connecticut find himself in the midst of an almost exclusively Canadian organization and why do I keep coming back? Perhaps the answer to these two questions might be of interest to Canadian and non-Canadian chemistry teachers alike. While answering these questions, I will try to refrain from superlatives lest a sudden growth spurt dilutes or disturbs the special composition of C3! More likely, U.S. citizens who make the special effort needed to cross the world's longest unfortified border are more likely to return home revitalized and even changed by their Canadian experience.

I have been known to tell my students that the common trite question "What's up Doc"? really is an exploratory question attempting to ascertain what lies to the north of Boston. In reality, students from southern New England generally need to know more about the total environment of the great continent we share. For the past two years Eastern Connecticut State University has addressed our prevailing insular attitude by developing a concentration in "Canadian Studies". My initial participation in the 1991 C3 meeting was largely brought about by my interest in developing an environmental chemistry course that included examples from across the continent. The warm welcome Pierre Zubryski demonstrated in Quebec City convinced me that the trek to Canada was well worth the effort and I resolved to return as time and money permit. Again in 1992, C3's conference chair, Ariel Fenster, drew upon the superb resources of Montreal to present another educational and entertaining program. For of us who didn't have time to say it, we all say thanks to Ariel and his associates for a great stay in Montreal and thanks for providing all the great opportunities to renew old acquaintances and to make new friends. See you in Rhode Island next year!

C3 Award Nominations

Nominations for the 1992 C3 award are now open. The C3 Award recognises the outstanding contribution by an individual to the promotion and teaching of chemistry at the 2-year college level. Nominations must be accompanied by two letters of recommendation, outlining the achievements of the nominee and must be received by the President of C3 by January 31st, 1993.

Annual Member Dues

For those of you unable to attend the annual conference, forgetting to pay your annual membership fee is easy. To help you remember, the expiration date of your membership is printed on the mailing label of each edition of *C3 News*. Please check the label to see if your membership is current. If it is not, please mail a cheque to Bob Perkins, Secretary at his address given on the back of this edition.

C3 News

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C3 Conference Reports

1. The Plastic Waste Problem

Reported by Bob Perkins

Professor Leonard Fine (Columbia University) gave an excellent overview of the post-consumer plastics waste recovery and recycling process. At present, plastics make up 18% of the volume of materials going to the landfills, but only 7% by mass. Of the 7 x 1010 lb produced in 1991, 96% was used in ordinary consumer products; however the remaining 4% used in engineering applications accounted for 10% of the total dollar value. The main difficulty with recycling is that most consumer products contain more than one type of plastic. A plastic bottle. A current CD package can contain anywhere from nine to thirteen different types of plastics. Recycling is only practical with homogeneous samples; a single PVC bottle will contaminate 20,000 PET bottles. With homogeneous samples de polymerization to the monomer with re-polymerization to new containers makes a perfect example of Le Chatelier's principle in action.

As to the future, Professor Fine suggests that industry may charge the consumer upfront for the recycling/disposal costs. For example, the price of a new car would include the cost for GM to pick up the vehicle, remove those materials which could be recycled, and dispose of any waste. Wherever possible, plastic consumer products will contain a single polymer to facilitate recycling.

2. Thomas Edison and the Chemistry of Sound Recording

Professor Paul Morris, Exeter College, England
Reported by Peter Slade

Thomas Edison is well recognized as a genius associated with numerous inventions, notably the light bulb and the phonograph. However, it is less well known that he dabbled extensively in chemistry.

Born in 1847 in Mila, Ohio, he was once sent home from school as being "brainless". His curiosity was not stifled, however: he once tried to hatch eggs by sitting carefully on them, and he gave zinc powder and citric acid to someone in order to produce hydrogen gas so that they would become lighter than air! Fortunately the person did not die. Other activities included printing a newspaper out of a railway car, and then, in an experiment with phosphorus, he set most of the train alight! Edison worked as a telegrapher, still doing chemistry experiments, and eventually opened up his own laboratory in Menlo Park, NJ.

Paul Morris discussed how experiments with reading embossed letters with a stylus led Edison to invent the phonograph. This could have been thought to be an early "fax machine" but Edison did not pursue this. Instead he found that speech patterns could be transcribed on to tin foil coated drums using a mouthpiece and a stylus. Reversing the process produced a playback which Edison first applied as stenography and later, the phonograph. Improvements were made as the early tin foil discs were replaced by wax discs, which needed a knowledge of chemistry to prepare, as Morris showed: he heated mixture of stearic acid/oleic acid mixture + NaOH + Al to give a brown coloured liquid which could be poured into a mold. On cooling, a wax drum was produced on which a recording could be made. Morris played a sample of an original wax cylinder, and the sound was remarkable. This was eventually changed to the flat disc we are currently familiar with but since it was rather soft, a celluloid disc was produced:

cellulose + nitric and sulphuric acid = nitrocellulose
nitrocellulose + camphor/ethanol/70 C = celluloid

Despite the fact that celluloid was harder, it ignited rather easily (as Morris was pleased to demonstrate using gun-cotton), and was replaced first by bakelite, and then by shellac, which is the material that those of us old enough would be familiar with (old 78's). The production of bakelite was demonstrated as a simple polymerization of phenol + formaldehyde.

Edison did not forget chemistry and spent (and lost) a lot of money tying to separate iron from crushed iron ore. He later recooped some of his losses by turning the factory into a cement works. And, of course, there were many other inventions, one of which we all know: the electric light bulb, which is another major story.

Ironically, Edison was completely deaf in his later years, but continued to work very hard in his laboratory, satisfying his inventive curiosity.

To finish his lively and entertaining presentation, Paul Morris asked members of the audience to record a greeting onto a recording cylinder, a Vanier College trombonist played a few notes, and Larry Husband's rendition of "When I'm 64" is now captured forever in wax.

3. Poisoning or Inherited Metabolic Disease?

Dr. David Rosenblatt, Royal Victoria Hospital, Montreal
Reported by Peter Slade

Dr. Rosenblatt showed a videotape from the "Unsolved Mysteries" TV programme which showed how the mother of Ryan Stallings had been found guilty of murdering her son by poisoning in 1989. She was subsequently released from prison in 1992 when it was shown that Ryan had in fact died from a rare genetic disease: methylmalonic acideria. A person with the disease cannot make the co-factor carbolamine B.

Initially Ryan was diagnosed as having acetone and ethylene glycol in his system

continued on next page

Poisoning or Inherited Metabolic Disease?

(continued from page 3)

based on glc analysis of his blood. Acetone is found in some nail polish removers and ethylene glycol in anti-freeze. Since both items were present in the Stallings' home, Mrs. Stallings was accused of murder.

The State's evidence that it was ethylene glycol was clearly wrong: if the gas chromatograms were carefully compared it was clear that the peak from Ryan Stallings' blood sample did not concur with the ethylene glycol standard. This analysis was done by a major, private chemical laboratory. This mismatch of identities of the crucial "poison" was not allowed as evidence for the defence in the trial in Missouri! Unfortunately for Mrs. Stalling, her lawyer had some science background, and felt no need to call further expert witnesses in order to pursue this line of defense.

In prison, Mrs. Stallings gave birth to a second son in February 1990 who then showed the same symptoms. A chemist at St. Louis University, Dr. Jim Schumacher, pursued the evidence and actually showed that the ethylene glycol diagnosis was incorrect, the substance was in fact propionic acid, caused by the rare genetic disease of MMA. Both parents must be carriers of this rare genetic disease and then there is only a 1 in 4 chance that it will be passed on to the children. The fact that the second child showed the same symptoms together with Dr. Schumacher's work (published in the Journal of Pediatrics in March 1992) led to Mrs. Stallings being released. Dr. Rosenblatt raised several issues in this case. The original testing of Ryan's blood seemed to look for what the police had suspected: the identification of the ethylglycol was the result that the police wanted. The obstructiveness of the laboratory in releasing data and samples of the original serum was also of concern. This story may act as a chilling lesson to chemistry students who like to get the "right answer" in the lab.

4. Chemical Education in The Golden Age of Biotechnology

Reported by Anne-Marie Weidler-Kubanek

As the first speaker on the second day of the conference, Prof. Youla Tsantrizos of Concordia University gave an overview of the current state of biotechnology, a field in which she recently obtained her Ph.D. at McGill University with Kelvin Ogilvie, and later did a post doctoral session at Brown University, Rhode Island. The early risers among the conference delegates were treated to an informative and clear presentation, beautifully illustrated with Youla's trade mark—lap-dissolve slides.

Biotechnology is in the popular press defined as the scientific field that deals with genetically altered organisms. However, biotechnology is in fact as old as wine and bread making, and represents processes which utilize some form of biological system for the production of different goods, such as foods and pharmaceutical products.

The presentation focused on enzymatic catalysis and the chemistry of natural products, which are biologically active and thus valuable in pharmacology or in agriculture. Not only biologists and biochemists but also organic chemists have been fascinated by the healing powers of natural products, especially after the discovery in 1928 of penicillin by Sir Alexander Flemming. Numerous other families of bioactive natural products have been discovered more recently, such as the antibiotic erythromycin, mevinolin, used in the treatment of high cholesterol levels, and the antitumor agent calicheamycin. The synthesis of all these natural products in biological systems are controlled by highly specific enzymatic reactions, which, in spite of their complexity on the molecular level, obey basic organic chemistry principals. They can therefore be mimicked by biotechnologists and used for the production of novel products.

Different biological systems can be used by biotechnologists, such as intact plant and animal cells or microbial cells as well as synthetic analogues or enzymes. Such catalytic antibodies or abzymes, have been extensively investigated by organic chemists Peter Schults and Richard Lerner, and their development was based on specific properties called "molecular recognition abilities" of protein molecules such as immunoglobuline IgG. These proteins, produced by the immune system in response to the invasion of a foreign particle, can bind to a large number of organic molecules in a very selective, sterically and electronically specific manner.

A biotechnologist can elicit the production of such antibodies by attaching the organic molecule of interest to a small peptide and inject it into a laboratory animal. As a response, antibodies will be produced in the liver of the test animal. The liver cells are then fused with spontaneously reproducing cancel cells and grown individually in tissue culture. The resulting "monoclonal antibodies" are tested for specific binding with the compound in question. Such abzymes, with precise steric and electronic properties, have been employed in the catalysis of classical, organic reactions such as the B-elimination of halides, ester and amide bond hydrolysis, Diels-Alder reaction, Claisen rearrangement etc.

The synthesis of these enzymes does not necessarily require the use of laboratory animals. Very recently, R. Lerner has successfully produced fully synthetic abzymes. He and his co-workers propose that if the terminal portion of the protein chain of an immunoglobuline could be synthesized, a large number of protein chains, having variations in their amino acid sequence, could be prepared. Such a total synthesis of an abzyme would involve as its key step the automated synthesis of oligonucleotides, which was originally developed at McGill University by Kelvin Ogilvie. (Ogilvie and co-workers were the first to prepare a totally synthetic transfer-RNA molecule, having a biological activity similar to the natural t-RNA.)

Youla's own research interests deal with enzymatic catalysis and the formation of biologically active natural products, using a whole biochemical pathway in a living cell. The exploration of the reaction mechanism at the enzymatic level can provide a rational approach to the synthesis of enzyme inhibitors, which may be used to block undesirable biochemical processes, or to substrate analogues, which can be converted to novel bioactive natural products. The characterization of important enzymes can also permit changes to be made at the active site, so that these enzymes can catalyze the synthesis of new pharmaceutical agents with predetermined structural features. Jack Balwin has for example worked with the key enzyme in the biozynthesis of all B-lactams antibiotics, and showed that a large number of biopeptides, structurally related to the natural substrate of the enzyme, can be easily converted to novel antibiotics with interesting biological properties. Another example is the biosynthesis of erythromycin which was pioneered by David Cane of Brown University.

Youla's research team at Concordia University in Montreal, is investigating the biosynthesis of oudenone, an inhibitor of norepinephrine which lowers the blood pressure in spontaneously hyperactive laboratory animals. The team is working on an idea that the compound is synthesized from an open polyketide of mixed origin, and is using ^{13}C labeled succinate and acetate in the investigation. Her research team is also looking at biological pest control in agriculture, an interest that goes back to her research as a graduate student, when she studied the host specific pathogen of bindweed. This weed is a problem everywhere in the world except in the tropics, and is classified as one of the most difficult weeds to control. A farmer in Ontario is said to have paid his workers one dollar for each bindweed pulled up with its roots. We can assume this farmer is looking to biotechnology for a better solution to his weed problems.

5. Natural Gas: To Pass or Not to Pass, That is the Question

Dr. Seymour Mishkin (Division of Gastroenterology, Royal Victoria Hospital, Montreal)
Reported by Alan Davis

The occurence of gas in the human digestive tract is natural, but some people suffer from it more then others.

The simple view of the digestive system is that starches and sugars are neatly converted to mono and di-saccharide which are absorbed by the blood and processed in the liver. In reality, however, foods are much more complicated. Certain foods in particular (beans, vegetables, bread) produce more gas than others.

What exactly is this "gas"? It is a mixture of nitrogen (which we swallow during breathing), diffusion of gases from the blood, reaction of bicarbonate with stomach acid to give CO_2, and the fermentation of food products in the lower intestine to give hydrogen, carbon dioxide, methane and other (sometimes smelly) gases. The result can lead to belching, flatus, rumbling, and sometimes a lot of pain.

The main reason for excessive gas production is lactose intolerance. Approximately 70% of the world's population have this hereditary trait, and avoiding dairy products will alleviate symptoms. Lactose is a disaccharide which is normally hydrolyzed to glucose and galactose in the small intestine. If it is not efficiently absorbed however, it can end up in the colon, where bacteria feed on it and germination occurs. The simplest measure of this intolerance is by measuring H2 in the patient's breathing which will reach higher concentration 4 hours after the lactose load.

The lack of carbohydrate enzymes in the small intestine accounts for the incomplete absorption of lactose, and lactose enzyme replacements can be used to treat symptoms. Unfortunately, avoiding dairy products also rids patients of important sources of calcium, riboflavin, vitamin B12 and protein.

Aged cheeses and unpasturised yogurt are low in lactose as a result of bacterial fermentation. Other foods which are high in calcium, but low in lactose include cooked broccoli and turnip greens, raw oysters, canned salmon (with bones), sardines, molasses and tofu which has been processed with calcium salts. "Hidden lactose" is also a problem. Chefs use lactose to help dissolve MSG; cut potatoes are blanched in lactose-containing solutions, and many drugs contain lactose because of its tablet-forming properties.

About half of those who are lactose intolerant are also intolerant to fructose and sorbitol (which occur in many fruits). As Dr. Mishkin pointed out "the occurrence of bloating and abdominal cramps in children may be caused by fruit juice (rather than milk), or simply fear of school." On a related note, the use of sugar alcohols such as sorbitols in "low calorie" sweeteners may be counter-productive: little calorie saving is achieved if these species are bacterially digested and absorbed in the colon.

Legumes which most commonly cause bloating:

Barley	Oats
Beans	Oat Bran
Beets	Onions
Broccoli	Peanuts
Brussellsprouts	Peas
Cabbage	Rice Bran
Carrots	Rye
Cauliflower	Soybeans
Corn	Spinach
Cucumbers	Squash
Lentils	Wheat

The use of H_2 excretion as an indicator of bacterial digestion indicates that significant fractions of complex carbohydrants can escape absorption by the small intestine. Ingestion of 100g of carbohydrates in oats, whole wheat, potatoes, corn and baked beans result in breath H_2 levels well above those in fasting subjects. The famous "gas-producers" (beans and other legumes) have high concentrations of indigestible oligosaccharids such as raffinose (see table). Humans do not produce the special carbohydrate ∂-galactosidase required to break these substances down, but a commercially available product ("Beano"), which contains ∂-galatosidase is now available to relieve the suffering of those who prefer high-fibre diets. This product is not without its own draw backs: since the enzyme is derived from a mold, persons who are allergic to molds and penicillin may have a new problem. The conference organizers were kind enough to include a sample of Beano in each attendee's package.

The overall conclusion drawn from Dr.Mishkin's talk is that the subject of flatulence is one that can be treated in at least a semi-scientific manner. Instead of dismissing patients' complaints, doctors can now systematically look for lactose or other intolerances (using an H_2 breath meter), and suggest balanced diets that can significantly reduce the problem.

6. pH Measurements by using Antimony

Professor Kwok Man Chan (St. Laurent, Quebec)
Reported by Peter Slade

Instead of using an expensive and breakable glass electrode to make pH measurements in solution, an antimony electrode can be used in conjunction with a standard copper electrode as a reference. This set-up is more robust and although it is not quite as precise, students can see better how such a system works. The actual cell is as follows:

+ Cu(s) | Cu^2 + (1.0 mol/L) | H+(aq) | Sb_2O_3(s), Sb(s) –

The copper electrode can be easily assembled in a small plastic bottle which is suspended in a larger beaker, being supported by a lid with a pre-drilled hole. A filter paper soaked with saturated KNO3 forms the contact with a solution of H+ ions that can be placed in the beaker. The antimony electrode is soldered to a piece of copper wire, sealed in another tube, suspended into the beaker in a similar way.

The electrode is calibrated by recording the millivolts (using a digital multimeter produced when standard buffer solutions are used in the beaker (e.g. of pH 2, 4, 6, 8, 10). Hence a calibration graph can be drawn and students can see how pH measurements are really potential difference measurements.

Prove information how to easily construct the electrode, Dr. Chan can be reached in St. Laurent, Quebec at (819) 336-2279 or consult "The School Science Review", 66 (236), 1985, page 455.

7. Crime in the Classroom

Professor David Harpp (Dept. of Chemistry, McGill University)
Reported by Peter Slade

We have become more and more accustomed to fraud in all walks of life: evangelism (Jim Bakker), Sports (1/3 of NFL players use performance enhancing drugs), entertainment (Milli Vanilli), and of course, academia. There are conferences on fraud, newspaper ads offer to sell essays and reports by mail: captions say: "Be wise, don't plagiarize. At least don't get caught." A book has been published, "Cheating 101" by Michael Moore. At one university, a professor who had back-to-back lectures would leave an exam early, post the results at his office and go to his next class. It was found that students were using walky-talky radios whereby one person would radio answers to those still in the classroom.

David Harpp was motivated to do something when having given an exam of 98 questions, he found 2 students with 97 answers the same; 25% of which were incorrect! This prompted David to write an elegant computer program that would show whether cheating had occurred. The idea was to generate a plot of the number of correct answers vs. the number of different answers. Normally students would have a fair number of different answers and a class plot would show a region in which everyone would fall if there was no collusion. If two students had very few different answers then this is easily recognized on the plot. Furthermore a ratio of "exact errors in common" to "errors in common" shows the probability of, for example, e.g. the students with 97 similar answers out of 98 with 25% being wrong being greater than 28 standard deviations or >1076: to 1!! This compares with odds of the ballistics matching of 13 scratchings on a bullet being 109 to 1 and DNA fingerprinting of 106 to 1. A common standard student defence of having studied together fades against such odds.

A relationship is clearly noted between suspected collusion and the seating arrangement. Prevention has been achieved by having random seating which is arranged beforehand (seats are coded) and multiple versions of exams: same questions but in a numbered differently. In the last two years this has reduced cheating to about 5% which is about the budget Eaton's sets aside for shoplifting per year! Mostly the students who cheat are those who are on the "Fail" to "C" region of the grading system.

8. Water, Water, Everywhere — Is it safe to use?

Professor Ronald Gehr (Dept. of Civil Engineering, McGill University, Montreal)
Reported by Peter Slade

Dr. Gehr gave an enlightening presentation on a commodity that we tend to take for granted. Among the startling statistics he discussed, here are but a few:

- Only 0.01% of the world's water is used for drinking. Canada has 20% of the world's water; 7.6% of Canada is covered by fresh water, most of which is in glaciers.Yukon/NWT has 30% of Canada's water.
- In 1986, 1.56 billion people were forced to drink contaminated water and this is rising by about 20 million per year (practically the whole population of Canada). About 25,000 people per day die due to water-related diseases and 16,500 of these are children (equivalent to 40 Jumbo Jets full of children crashing every day). Eighty per cent of all disease in the World is due to inadequate water or sanitation.
- Contamined water can be treated using a variety of bacteriods. A "Chick's Law" plot (fecal coliform count vs. dose of bactericide) is used to determine the dose. Chlorine is the cheapest bactericide and is the easiest one to use in Third World countries. It was found to be undesirable in the treatment of Montreal waste water and ultra-violet light is used instead. One advantage is that there are no costs in transportation as there are with chlorine. Ozone is another popular bactericide, and is used in Paris. Microfiltration or ultrafiltration can also be used to remove bacteria.
- Regarding general pollutants in water supplies, removal can be achieved by various methods such as reverse osmosis (e.g. desalination in California). Acceptable levels of Pollutants (current include nitrate – 45 ppm, 1,4 dichlorobenzene – 5 ppb, and mercury – 1 ppb. This level for mercury represents 2 grams (a cube of about 0.5 cm) dispersed in an Olympic sized swimming pool (50m x 20m x 2m deep).

In 1978 the detection limit for pollutants was 1 M (great letter) g/L (10–6g/L or 1 ppb). Eventually we can expect to reach 1 pg/L (10–12g/L). One litre of water contains about 3.3 x 1025 molecules, hence 1 pg/L is about 1 x 109 molecules. This would mean a ratio of 1 x 10–16 of detected/undetected molecules.

On this basis, some may wish to re-evaluate our definition of pure. Ivory Snow claims to be 99 44/100% pure. This leaves 0.56% impurities which is 560 mg/L or 560 ppm, a huge amount compared to today's allowable levels of pollutants!

Editor's note: Even in Vancouver, the hot summer of 1992 made us appreciate the value of water. In an end of summer article, the Vancouver Sun reminded us of how blessed we are: $1.00 buys you 75 ml of cheap wine, about 1L of milk, less than 2L of gasoline, and over 4000L of drinkable, clean water.

Organise a National Chemistry Week Activity!

Geoff Rayner-Canham
Sir Wilfred Grenfell College

Most of us would agree that the public image of chemistry leaves a lot to be desired. Children's cartoons show scientists as deranged elderly males trying to destroy the world. Among adults, the image is little better: chemists are the people destroying the ozone layer and contaminating the surface of the planet with PCBs! To combat this public chemophobia, a National Chemistry Week was proposed.

The idea originated in Australia in 1982 and it has since spread among the English-speaking countries — to Eire, New Zealand, United Kingdom, United States, and finally to Canada in 1989. In this country, National Chemistry Week (NCW) is in October, timed to coincide with Science and Technology Week. The organization of NCW is being carried out by a committee of the Chemical Institute of Canada. Two years ago, I complained at a CSC Chemical Education Division meeting that the only people invited to organise NCW activities were those at University chemistry departments. I pointed out the important role of the two-year colleges in teaching chemistry in this country. As well, I commented on the talented and enthusiastic instructors at these institutions. As you can probably guess, I was immediately nominated as Two-Year College Liaison on the NCW Planning Committee!

For the past two years, my main publicity route has been to write to the head of chemistry at each two-year college in the country. However, to catch the real enthusiasts, *C3 News* is obviously the way to go! So what can you do towards making National Week a success? First of all, get on the NCW mailing list by contacting me — write (G.R.–C, SWGC, Corner Brook, NF A2H 6P9), fax (709-639-8125) or e-mail (gcanham@kean.ucs.mun.ca). Then you will be provided with information and ideas. Once on the list, you can request a Resource Book, posters, buttons, balloons, bookmarks, and pocket Periodic Tables from the NCW Office. As well, insurance for public activities can be obtained through the CIC.

What sort of events can you organise? You could become involved in the National crystal-growing contest. Or you could try our route of a local high school chemistry essay competition. Or you could have a display in a local shopping centre. Or you could give presentations in local schools. Any activity that raises the community awareness of chemistry. The only venture that I have personal reservations about is the chemistry magic show. Unless it is very well planned to teach some chemistry, such a show can have the opposite effect to what we want. That is, it can reinforce the view that chemistry is magic.

Beaker: An Expert System for the Organic Chemistry Student

Bob Perkins, Kwantlen College, Richmond, B.C.

This wonderful software package (ISBN 0-534-15973-7 - $29.95 US - marketed by Brooks-Cole - 511 Forest Lodge Road, Pacific Grove, CA, USA 93950-5098), is worth buying a Mac for if your institution does not have one. The complete program will run on any Mac which has an 800K; by stripping out the system file I even could run it at home on my old 512 Mac which only has a 400K drive. The most efficient route of course is to have it on the hard drive. Rather than being presented with a pre-selected set of drill questions, the student can use the program explore various aspects of introductory organic chemistry. I shall briefly describe some of the available features.

One can type in the name of a compound and the computer will respond with the line structure of the compound. By using a pull-down menu, the student then has the option of displaying all the atoms, with or without the non-bonding electrons. Functional groups can be identified; bond lengths, angles, and polarities checked; staggered and eclipsed Newman projections portrayed; nmr spectrum (with or without integration) checked; pKa values of individual C-H bonds displayed; and simple chemical reactions examined.

The student can also draw the structure of a compound and the computer will provide the IUPAC name. Templates for saturated rings as well as benzene are provide, and it is a simple matter to modify structures and then print them. One is only restricted to having no more than 64 atoms on the screen at one time. If one types in a molecular formula, the computer will provide the structures of the possible isomers (not including geometric). An error message will be displayed if there are more than 120 isomeric compounds.

I heartily recommend the program, I cannot imagine a better buy for the money. I have used the program for one semester with a single Mac in the classroom, and hope to be able to have better access for the students this fall in the math-science computer lab at our new campus in Richmond, B.C.

1993 Joint C_3 $124C_3$ Conference

The site of the 20th C_3 confetence is Providence, Rhode island. Rhode Island (the smallest state in the union at 3000 sq km) is sandwiched between Massachusetts and Connecticut on the eastern seaboard. Actually the full name of the state is "The State of Rhode Island and Providence Plantations". The island is the largest of the several islands in Narragansett Bay, and is often referred to by its original name, Aquidneck Island, and its major city is Newport. Providence is the capital of the state, and is located on the mainland coast where the bay meets the Providence River. Getting to Providence (from my recollection of an involved conversation with Tom Whitfield), is not so straightforward, but there will be full details and tips for the easiest and cheapest route in later editions of *C_3 News*. In the meantime, set aside some time for the conference and for some travel in and around New England. There is a lot of history to explore and plenty of fine scenery to appreciate. The climate is milder than that of the New England States and the Narragansett Bay coast is a favourite summer resort area. Inland, the state is 2/3rds covered by forests, with many small but fast flowing rivers upon which the major manufacturing industries (textiles & silverware) originally relied for their power.

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