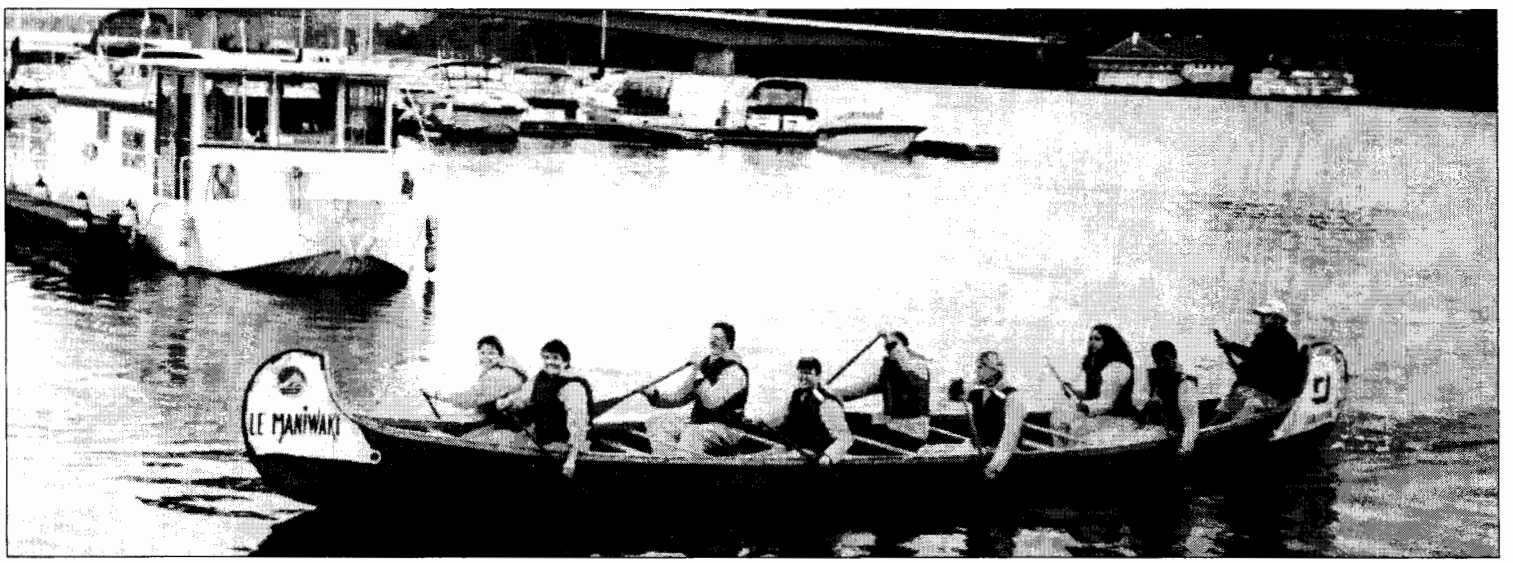
C3 News

Newsletter of College Chemistry Canada / La Chimie Collégiale au Canada



The C3 membership mounts their attack on Ottawa by Voyageur canoe

TO HULL AND BACK — The 22nd College Chemistry Canada Conference

This year's annual conference was hosted by Heritage College in Hull, Quebec. From the introductory wine and cheese to the concluding voyageur canoe trip this was a very successful conference. This issue of *C3 News* contains synopses of many of the talks and highlights of the conference. We also have a preview of what is to come next when we all head north to the Yukon!

Yukon Ho! – 1996 Conference to be held north of 60°

This is the law of the Yukon, and ever she makes it plain:

"Send not your foolish and feeble; send me your strong and your sane—

—Robert Service

On August 16, 1896, prospector George Carmack and his friends Skookum Jim and Tagish Charley pulled a thumb-sized lump of gold out of Rabbit Creek, near the present day Dawson City, Yukon, and started one of the greatest gold rushes in history. In July of the following year, two ships, one docking in Seattle and the other in San Francisco, brought the first news of gold fields "rich beyond anyone's wildest dreams' to the outside world. Thousands of people quit their jobs, took all of their savings, left their families, and headed for the Yukon. One hundred years later you are invited to keep your jobs, bring some of your savings, and your families, and join us in the Yukon for the 23rd annual conference of College Chemistry Canada.

The conference will be held at Yukon College in Whitehorse on June 7, 8, and 9, 1996. With the theme "100 Years of Chemistry in the North", organizers are planning an eclectic program with talks ranging from environmental chemistry to distance education in the north. And of course there will be talks on the history and chemistry of the gold rush.

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C3 Business:

Membership Renewals:

Please check your mailing label on this issue to ensure your membership is up to date. Your membership expiry date is in the lower right hand corner of your mailing label. To renew, send your $20 to our secretary, Bob Perkins. A big thanks to all of you who have already renewed for 1995/96.

Newsletter Contributions:

Your contributions are welcome and needed for the newsletter. Send me handwritten, type written, computer disks, or e-mail, contributions. This years contribution deadlines are: Oct. 15, Jan. 15, and April 1.

Call for nominations:

Unfortunately at this years conference the C3 Award in Chemical Education went unawarded. Below are the guidelines for the C3 award, and note that nominations must be received by the secretary by January 1, 1996.

The C3 Award in Chemical Education

1. The awards shall be offered annually to a person who has made substantial contributions to chemical education at the College level. In selecting the recipient of the Award, the committee shall consider primarily the contributions of the nominee to enhancing the quality of teaching in an area of chemistry, biochemistry, or chemical technology. Meritorious contributions to furthering chemical education through C3 is also to receive due consideration.
2. The Award shall be presented at the annual College Chemistry Canada Conference.
3. The Award shall consist of an appropriate scroll and $600 to assist the award winner to attend the annual C3 conference.
4. The Award winner must be a member of C3 in good standing and have been a member of C3 for the past five consecutive years.
5. Nominations for the Awards must be submitted in writing to the Secretary of C3 by January 1 of the year the award is to be presented. The nominations shall include a detailed description of the contributions of the candidate to chemical education and to the C3 organization. Each nomination is to remain in effect for three years. Each nomination is to be accompanied by three letters of recommendation from peers of the nominee.
6. The Selection Committee for the Award shall consist of the President, Past President or President Elect, Secretary, Treasurer, and Editor of College Chemistry Canada.

HULL AND BACK *Continued from page 1*

If you have never been to the Yukon, you should plan to spend some of your vacation time and experience this unique and beautiful territory. The next issue of *C3 News* will have some ideas for you to consider including; hiking, canoeing/kayaking, tours of Dawson City, and excursions on the old White Pass and Yukon narrow gauge railway.

This is going to be a conference of firsts: the first conference north of 60°, the first conference co-hosted by colleges 2600 km apart, and the first conference to be advertised on the Web. Yes, that's right all you net surfers, if you want the latest information, just point your World Wide Web browser to: http://www.douglas.bc.ca/chem/c3/c3conf.html and it will all be there. We are hoping to be able to do registration electronically by next year as well.

So start thinking about the conference and your Yukon vacation now, and we'll see you in Whitehorse in '96.

C3 News

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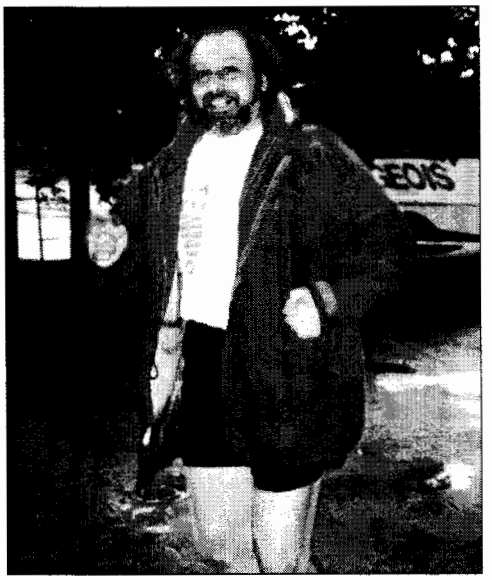
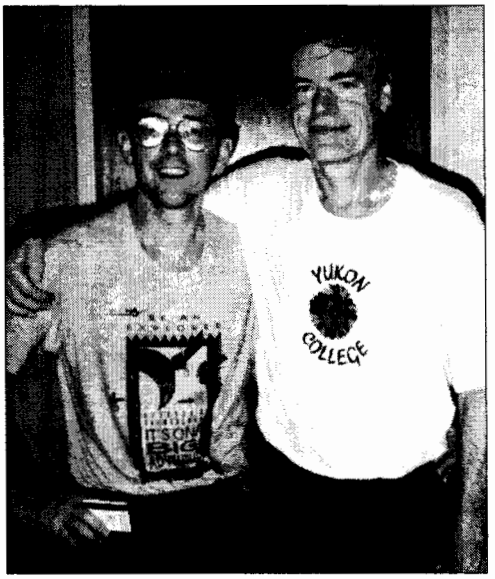
Conference Highlights

Introductory Remarks —Mita Saha

Mita, in her introductory remarks to the conference spoke on the theme of the conference; "Reaching Chemistry in the 21st Century". She looked back at the massive changes that our society has undergone in the last century and how these changes have affected us as educators and our students as learners. And, she looked forward to how we will have to change and adapt to what is to come; how teaching methods and delivery systems will adapt to the changing demands of tomorrow's students. Mita also acknowledged all of those involved, either as a member of the steering committee or by volunteering their services and helping to make this a very successful conference.

Thanks to all of you: Mita Saha, Rod Restivo, Pierre Dupont, Dick Kroeger, Dinesh Bhatnagar, Gerald Dube, Genevieve Braconnie, Jackie Thomsing, Sumeet Dang, Asma Syed, Alex Nadon, Kim Dalupan, Tony Pocard, Jim Nuyens, Bijoy Bora, Stanley Cain, Grazana Czarorski, Shazia Syed, Raj Kumarathasan, Lien Hoang, Robert Wassell, Kathy Lauzon, Claude Chenier, Mary Anne Prefontaine, Alain Beauparlant.





The die-hard wet fun(????) runners.

Community Colleges: Towards the Year 2000 and Beyond —Dr. A.T. Easley

Bob Perkins

Dr. Tim Easley came to the conference in the role of College President of Lambton College (his 2nd day on the job). He proceeded to paint a picture of the future of community colleges in North America from the perspective of a college administrator. A very engaging speaker, he outlined several "mega trends" rapidly confronting the ways in which instruction has been traditionally carried out at post secondary institutions. His basic message was that with the looming cut in transfer payments from the federal government, greater attention will have to be placed on the "accountability" to those providing the $$$ for education. The new paradigms to be developed will have to be based upon "doing more with less", and colleges will have to become "learning institutions" in addition to "institutions of learning" in order to effectively deal with the needs of a rapidly aging workforce. The "just in time" training needed by these individuals to respond to downsizing and technological changes on the job site will mean changes in the current 12 to 14 week semester-based models of instruction. He predicted greater movement from the traditional teacher centered delivery, "time and place bound", to a combination of modular learning, "place bound", and distance education (neither place nor time bound). He referred to the new paradigm as "seamless education" where credit for prior learning would become much more important than it is today.

He suggested that the biggest challenge to be faced by faculty/administrators/board members will be the best way to arrive at "right-sizing" the institution. Dr. Easley conceded that existing collective agreements with staff and faculty at institutions will require creative solutions to the problem. As there are already 5000 credit courses available on the Internet, it will no longer make economical sense for an institution to be "all things to all people" in the community that it serves. Education must become more "client-centered" and in order to succeed, an institution must demand rigour and excellence by all: students, faculty, staff, and administration. proper The role of the college instructor would move to that of "learning manager", and a greater emphasis on technology will "make time" in the course for students to develop the higher level skills required by the workplace.

A very interesting presentation, and a very frank message to all of us presently working in the post-secondary education scene. The decreased funding from the feds will begin to affect how we do our jobs in the not-too-distant future. How will we respond, or better yet, how will the administrations of our institutions respond? Stay tuned for the answers to these and other fun questions.

Teaching Chemistry in the 21st Century; Research, Training, Versatility and Interdisciplinarity —Dr. Arthur Carty, President of the National Research Council of Canada.

Gary Wilson

This keynote message by Dr. Carty opened the 22nd annual C_3 conference.

Modern technical challenges are not solvable from the perspective of a single discipline, not even from that of a central and flexible science like chemistry. This need for

an interdisciplinary problem solving approach indeed is likely to intensify in the 21st century.

Since we are unable to predict where our next discoveries will be, tomorrow's graduate will need to be competent, flexible, adaptable, and a team worker. To survive, the new scientist must have an appreciation for the realities of the economics of world markets and to be able to communicate his or her ideas in a clear and persuasive manner. Industrial captains are included in the new audience for scientific ideas.

As educators we must therefore provide our students with a solid foundation but in a way which broaches our current institutionalized barriers between the disciplines. Emphasis on good communication, team work and the use of computer technologies must be provided.

Canadian Science and Technology for the Global Market —Jon Gerrard, Secretary of State for Science, Research and Development

Bill Blann

With the shift in the nature of jobs and employment since the late 1980's has emerged a need for science and technological strength to understand the work, the business and management of business in almost every field of endeavor: be it to understand the technical requirements in the workplace, to know the credibiliry of data or information reported, or to communicate to science content in the everyday world.

The confluence of these revolutions: the information technology revolution, the biotechnology revolution, and the environmental revolution, has generated the need to help students become able to equip themselves with the ability to find information and to learn the skills necessary to meet the challenges of these revolutions.

Chemistry is the fundamental cornerstone of abilities needed by the young people who must build the revised world needed to meet these challenges. The challenge presented by Jon Gerrard to teachers (i.e. us) is in instilling in young minds the excitement to explore the unknown, to use their imagination in making hypotheses, testing and improving them, to use their innate creativity and capacity for learning, and basically in inspiring the confidence of the young to use their creativity.

It is important to get youth to see the relevance of basic science to the practical science and technology that they need to use and live with every day. The tools necessary to cope with the new generation of jobs that will result from the current revolutions, in a world where science must be more readily available to everybody will require the use of the new technologies and adaptations of our approaches to meet the challenge of expanded needs in the face of perhaps dwindling financial resources. (The innovation and creativity we will need to make this challenge an opportunity may well reflect what we need to inspire our students to enjoy rising to.)

Chemmate for Windows, Software for WHMIS —Philippe Ducas

Dave Steiner

WHMIS is the acronym that will cause the eyes of even the most dedicated chemist to glaze over. It is not that WHMIS has no value to those who work with chemicals, but to keep track of those chemicals and their products is cumbersome, time consuming and costly. Furthermore we cannot avoid WHMIS because it is required by law.

Atrion Systems, Quebec based software company, has developed a system that they claim will make the management of WHMIS much simpler. This system, called Chemmate, was demonstrated by Philippe Ducas.

Chemmate has a data base that contains all the existing WHMIS regulations and pictograms and data on a wide range of chemical substances.

When physical or chemical data on a product of mixture is entered, this data is processed by an algorithm that combines the data with the current WHMIS regulations for that particular product or mixture creating a PIDS (Product Information Data Set). From the PIDS one can automatically generate a Material Safety Data Sheet (MSS) and a set of standard labels of different sizes. The information can be presented in either English, French, or Spanish and can be instantly translated from one language to the other on these documents.

During the question period, a member of the audience asked Mr. Ducas to enter a 15% ethanol solution as data, calling the product RED WINE. The program generated a MSDS that indicated RED WINE was a flammable liquid which had toxic effects, and that this material should be handled with gloves, splash goggles and a lab coat. (Needless to say a 15% ethanol solution should never be ingested.) Although a 15% Ethanol solution is not flammable, Mr. Ducas explained that WHMIS regulations require that a solution of any flammable substance be shown as such unless the solution is less than 1.0%.

Mr. Ducas, with great aplomb, ended his talk by removing both the splash goggles and the gloves from the MSDS, but leaving the lab coat pictogram to protect the RED WINE user's clothing from accidental spills.

Review of Analytical Techniques in Forensic Analysis —Dr. Marthe Dalpe-Scott

Diana T. Messervy

Dr. Dalpe-Scott gave a lively dissertation centered around Chemistry as the basis of forensic science. She gave new meaning to the applications; accessions of Analytical Chemistry in a venue that would fascinate any emerging young scientist, as well as appeal to many of those who might otherwise consider chemistry to be dull.

Approximately 300 scientists work in the six labs operated by the RCMP across Canada. The five main areas of crime investigation are: counterfeit money, alcohol, firearms, toxicology, and documents. Dr. Dalpe-Scott is a toxicologist and deals mainly with investigations of drug abuse.

Analytical methods used in forensic science for extraction and analysis include: gas chromatography (GC), liquid chromatography (HPLC), thin layer chromatography (TLC) and mass spectrometry (MS). Infrared spectroscopy is widely used for identification, primarily for alcohol and drugs.

Dr. Dalpe-Scott cited several interesting instances where results of instrumental analyzes were indisputable in solving crimes. In one instance, TLC was used to distinguish two different inks in a cheque that had been altered illegally.

What every fashionable chemist wears in Hull.

This man is coordinating next year's conference!!

Household Bleach in The Chemistry Laboratory

Bob Perkins, Kwantlen University College

In our current age of everdecreasing funding and the urge to do more for less, Bob Perkins has shown us how we can run a series of chemistry labs with the main required chemical being common household bleach. What follows are procedures in brief for three of his bleach experiments.

Analysis of Javex

Procedure:

1. Pipet 10.00 mL of your unknown bleach sample into a 100 mL volumetric flask and fill to the mark with distilled water.
2. Pipet 10.00 mL of this diluted bleach solution into an Erlenmeyer flask into which 10 mL of sulphuric acid (1M) and 10 mL of potassium iodide (0.5 M) solution have been placed. The solution should now be a deep reddish-brown colour due to the presence of iodine (I_2).
3. Titrate this solution against a 0.1 M standard solution of sodium thiosulphate. As the sodium thiosulphate solution is added, the reddish-brown colour in the flask fades to yellow. When it is a pale yellow, add 3 drops of starch indicator solution. This will make it easier to observe the endpoint which occurs when the blue-black colour of the iodine/starch complex disappears completely giving a colourless solution.
4. Repeat the titration as many times as you feel is necessary.
5. Determine the density of your undiluted bleach sample by transferring a 10.00 mL portion to a previously weighed (analytical balance) 25 mL Erlenmeyer flask. Be sure to keep your bleach sample covered with parafilm while weighing, as it has a strong odour.

Photochlorination of 1-chlorobutane

Procedure (all steps must be done in the fumehood):

1. Using calibrated pipets, add 1 mL of 1-chlorobutane and 1 mL of Javex to a small test tube.
2. Using a calibrated pipet, add 0.5 mL of dilute hydrochloric acid (3 M) to the test tube and place a rubber stopper in the top.
3. Shake the test tube (gently) to extract the Cl_2 generated from the reaction of Javex with HCl into the organic phase, and then irradiate the contents of the test tube with a light bulb.
4. Shake the test tube (gently) in front of the bulb until the colour is gone.
5. Carefully add 100 mg of anhydrous sodium carbonate to neutralize the HCl produced in the reaction. When the bubbling (CO_2) has ceased, stopper the test tube and shake vigorously.
6. Remove the major portion of the organic layer (make certain you know which one it is) with a pipet and place it in a clean, dry test tube along with 50 mg of anhydroussodium sulphate. This will remove any traces of water from the product.
7. Analyze the product by gas chromatography.

Preparation of Benzoic Acid.

Procedure:

1. Place a magnetic stirring bar and 100 mL Javex in a 250 mL Erlenmeyer flask. Place the flask on a magnetic stirrer in the fumehood, turn on the stirrer and add 3.0 mL of acetophenone.

—continued on page 6

Latest from the Literature.....

Sudhir Abhyankar
Sir Wilfred Grenfell College, Corner Brook, Newfoundland, A2H 6R6

This is the first of what will be a regular feature of *C3 News*. It will contain reviews of general interest and chemical and science education articles that have appeared in recent literature.

Discussion of the report of the American National Research Council, NRC, "Reshaping the Graduate Education of Scientists and Engineers" appeared in the *Chemical and Engineering News, 29 May, 1995, p. 44.* The report outlines how science and engineering programs could better prepare students for careers outside basic research. The American Chemical Society, ACS, Task Force on Doctoral education in Chemistry recommends a 20% reduction in number of Ph.D. graduates in Chemistry.

Chemists at the Scripps Research Institute in California have found a new family of naturally occurring sleep inducing brain lipids. The class of lipid amines induce sleep in rats. It is expected that this research would eventually lead to drugs for treating sleep-disorders. The structure of these lipid amines and their action is reported in *Science, vol. 268, 1995, p. 1506.*

In his article, "Lessons from the History of Chemistry", *accounts of Chemical Research, vol. 28, no. 4, 1995, p. 187,* Keith Laidler discusses incorrect attributions, forgotten geniuses, controversy or neglect and the curious incident of the Nobel prizes.

An instructors Self-Assessment Program for improvement of undergraduate science instruction is discussed in detail in the *Journal of College Science Teaching, vol. 24, no. 6, p. 410.* This program, according to the author, provides prompt feed-back regarding instructional practices that may affect student participation, understanding and attitudes toward subjects taught in college and university classrooms.

The relevance of Chemistry to Non-Science Majors is discussed in the *Journal of Chemical Education, vol. 72, no. 5, 1995, p. 432.* The article describes students' opinions, views and thoughts on why they think Chemistry is not relevant in their major field of study.

Diemethylether (DME), is shaping up as an ultra clean alternative fuel for diesel engines according to a report discussed in the *Chemical and Engineering News, 29 May 1995, p. 37.* Preliminary studies carried out in Denmark showed that DME has the potential to reduce the amount of soot and oxides of nitrogen. It is also reported that emissions with DME meets most proposed European limits for heavy duty trucks.

A brief summary of discovery and isolation, extraction, geochemistry and biochemistry of strontium appeared in *Education in Chemistry, May 1995, vol. 32, no. 3, p. 74.*

The IUPAC provisional recommendations to nomenclature of carbohydrates is outlined in *Chemistry International, 1995, vol. 7, no. 3, p. 98.* These recommendations deal with acyclic and cyclic forms of monosaccharides and their simple derivatives, as well as, the nomenclature of ogliosaccharides and polysaccharides. According to the recommendations, a three letter abbreviation for D-Glucose, as an example, is D-Glc and for D-Mannose is D-Man.

First year college students' understanding of the mole concept and its use in problem solving is the topic of an article in *Journal of Research in Science Teaching, 1995, vol. 32, n0. 2, p. 177.* One of the findings of the study suggests that students' explanations are vague and contain missing or improperly connected parts, when asked to explain the numerical identity between the atomic or molecular mass of a substance and its molar mass. The message to chemistry instructors, according to the authors, is to pay careful attention to students' prior ideas about the mole concept, regardless of the extent of students' background in chemistry.

Conference Highlights *continued from page 5*

2. The temperature if the solution will gradually rise (record the maximum) as the reaction proceeds, and the yellow colour should gradually disappear. Allow the reaction to proceed (with stirring) for a total of one hour. While you are waiting, see the demonstration on preparing a sample for the infrared spectrometer.

3. Cool the solution in an ice bath and remove any droplets of trichloromethane (place in the waste bottle for chlorinated solvents) using a transfer pipet. Add 1 g of solid sodium sulphite to destroy any excess Javex in the solution. Be careful to keep the solution cold and cautiously add sulphuric acid (6M) until the solution is acidic (litmus). A thick white precipitate of benzoic acid should be present at this point.

4. Collect the crude product using suction filtration and wash it with a small amount of ice-cold water. Do not use a large volume as benzoic acid is appreciably soluble in water. Save a small amount of the impure benzoic acid for a melting point determination and proceed to the next step.

5. Place the crude benzoic acid in 10 mL of water in a 50 mL Erlenmeyer flask and heat to the boiling point. Gradually add more water (if necessary) until the last of the solid just dissolves. Allow the solution to cool to room temperature and then chill in an ice bath.

6. Collect the white solid by suction filtration, allow it to dry, and determine the mass (and % yield) of benzoic acid Determine the melting points of the impure and pure benzoic acid, and take an infrared spectrum of the pure product.

Stay tuned for next year when Bob shows how to do ALL of first year chemistry using only Javex and Alka-Seltzer!

CCC (Critical Comment Corner)

Watch Out For Those Misconceptions!!

Bob Perkins, Kwantlen University College

Demonstrations, when carefully and safely performed, can be extremely useful in illustrating many of the topics in our courses. One of my favourite topics in introductory chemistry is the behaviour of gases. There are many different demonstrations which can be used to ensure that the students have a "visual trigger" to aid their understanding. This past semester I was made aware once more that as instructors, we can never assume that everyone in the class has "gotten the point" of the demonstration. We should use the demonstration to establish whether any misconceptions from prior learning are causing confusion. In this note I would like to describe a demonstration involving the evolution of a gas in which some confusion did take place.

Shaking a container partially filled with a carbonated beverage will allow one to demonstrate that carbon dioxide has been liberated in a physical process.[1] What is not immediately apparent to the students is the thermochemistry associated with the process. The formation of copper(II) sulphate from the pentahydrate and subsequent hydration of the anhydrous salt[2] may be used to demonstrate the exothermic and endothermic nature of the reactions. Boiling water in a Florence flask with and without a balloon[3] may also be used to illustrate the differences between the terms "heat" and "work" A misconception crept into the proceedings in the minds of some of my students when I went on to illustrate the differences between the decomposition of hydrogen peroxide and the reaction of an Alka-Seltzer tablet in water.

I placed a few drops of dilute $H_2O_2(aq)$ in the bottom of a small test tube followed by a couple of crystals of KI(s). A balloon was attached to the top of the test tube and it gradually inflated as $O_2(g)$ was released. Touching the bottom of the test tube revealed the exothermic nature of the reaction; i.e., it was hot, heat was being released at the same time as the evolution of the gas. I repeated the process with a portion of an Alka-seltzer tablet dropped into a small volume of water in a test tube, attached the balloon, and the class watched it inflate from the production of $CO_2(g)$. Touching the base of the test tube this time revealed the endothermic nature of the reaction; i.e., it was cold, heat was being absorbed from the solution at the same time as the evolution of the gas. As I began probing the class to ensure that incorporation of this new information was taking place, I discovered that several students were troubled. They wanted to know **"why didn't it get hot"** like the other cases?

I was initially taken aback and asked them to expand upon their question. The response was that if a gas was being evolved, then the process had to be exothermic. They stated that in any combustion process the evolution of a gaseous product was accompanied by the evolution of heat. As examples they suggested paper or gasoline combining with oxygen from the air, as well as the detonation of dynamite or dehydration of sugar with sulphuric acid. I reminded them that they had already observed that in order to form steam; i.e., inflate the balloon over the Florence flask, heat had to be added to boil the water. This was true they replied, but it was a **special case** as it was only a **physical change**. Eventually we had to go back and re-examine what the ΔH for a physical or chemical process implies. The value of ΔH is determined from a comparison of the enthalpy content of the products and reactants. Whether a gas is evolved or not does not change how ΔH is determined.

As a result of this experience I would recommend that you try the demonstration with your students and see what the outcome is. The Department of Education has recently removed the gas laws from the high school syllabus in British Columbia, and although many teachers are still covering the topic, not all of them are. We can no longer assume that the behaviour of gases has been adequately covered by the students entering our post-secondary chemistry classes. As instructors, it is imperative that we are aware of the possible misconceptions held by our students[4] and try our best to use them to initiate discussion in order to foster a better understanding of the chemical principles in our courses.

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4. R. Perkins, *B.C. Catalyst*, Spring 1992 (issue #3), page 22

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