College Chemistry Canada
La Chimie Collégiale au Canada

Newsletter

VOLUME 42, ISSUE 2 OCTOBER, 2019

In This Issue

THE 2019 C3 CONFERENCE INVESTIGATED THE ART OF CHEMISTRY

Program graphic from the 2019 C3 conference hosted by Camosun College

Camosun College hosted the 2019 C3 conference with the theme "The Art of Chemistry".

Dr. Peter Mahaffy, from the Chemistry Department and the King's Centre for Visualization in Science at the King's University, Edmonton, Alberta, delivered the plenary lecture. Peter explained the principles of systems thinking and demonstrated a tool called Systems Oriented Concept Map Extensions (SOCMEs) which can be used to visualize molecular connections within systems. Peter made the case that systems thinking provides the conceptual framework for students to develop a more holistic understanding of chemistry and hopefully provide them with the required tools to tackle the current global sustainability challenges.

Peter Mahaffy, Chemistry Department , The King's University

IN RECOGNITION OF.....

A number of awards were presented at the 2019 C3 conference banquet.

The C3 Host Student Scholarship was awarded to Kourosh "Kookie" Pazandeh. Kookie has been accepted into the competitive Food Science Program at UBC.

The C3 General Student Scholarship was awarded to Erin Envoy, who has a passion for chemical education, and is currently working towards a PhD at UBC, with a focus on the physical properties of atmospheric aerosols.

The C3 Award for Chemical Education was awarded to Peter Mahaffy for his outstanding and internationally recognized contributions to chemical education.

Kourosh Pazandeh, recipient of the C3 Host Student Scholarship

Erin Evoy receiving the C3 General Student Scholarship from John Lee and Jimmy Lowe

Peter Mahaffy receiving the C3 Award for Chemical Education from Bruno Cinel and Jimmy Lowe

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GROUP PHOTOS….. AND MORE RECOGNITION

Attendees of the 2019 C3 conference *pose for the annual group picture just outside the Fisher building, Lansdowne Campus, Camosun College.*

Brenda Addison Jones *was recognized at the C3 Banquet for her 8 years of service as C3 treasurer (2010-2018). John Eng has stepped up to fill her shoes and has been treasurer since the Fall 2018.*

View from Mount Tolmie *and the C3 scooter gang—the Friday afternoon excursion was one of many highlights of the 2019 C3 conference.*

CHEM ED CONFERENCES FOR 2020

There are a number of options for professional development in chemistry education in 2020, including our own C3 conference:

225th Conference of the 2YC3, May 15-16, 2020

This conference, from our sister organization in the US, will be hosted by Rochester Community and Technical College, Rochester, MN. Conference website: https://sites.google.com/view/2yc3rctc2020

47th College Chemistry Canada (C3) Conference, May 22-24, 2020

The 2020 C3 conference will be hosted by Université de Saint-Boniface (Winnipeg, Manitoba). Conference flyer: http://www.collegechemistrycanada.ca/conferences/20conf/Winvite.pdf

103rd Canadian Chemistry Conference and Exhibition , May 24-28, 2020

The 2020 conference will be held in Winnipeg, MB. Watch this website for more information: http://www.csc2020.ca/

26th Biennial Conference on Chemical Education (BCCE), July 18 – 23, 2020

Oregon State University, located in Corvallis, Oregon will be hosting the 26th BCCE conference from July 18 to 23. Conference website: https://bcce2020.org

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INUIT CHEMISTRY

Chaim Christiana Andersen and Geoff Rayner-Canham (grcanham@grenfell.mun.ca),
Grenfell Campus, Memorial University, Corner Brook, Newfoundland.

One of us (GRC) has been taking Chemistry Outreach to Inuit communities, usually in Nunatsiavut, and also ten years ago, across Nunavut. What was, and still is, apparent is the thirst for knowledge among the young Inuit, particularly science relevant to their lives. This enthusiasm was captured in the iconic photo below taken at Quqshuun Ilihakvik Junior School, Gjoa Haven, Nunavut.

***Figure 1**. Fascinated junior students watching the Chemistry Outreach show at Goa Haven, Nunavut.*

Such enthusiasm raised the question as to why there are not hundreds of Inuit clamouring to enter university science programs. It was the other co-author (CCA) who provided a major reason: that is, chemistry is taught in Inuit schools without any relevance to the students' lives.

The two of us decided to remedy the situation. Between us, we chose specific aspects of Inuit life and culture which rely upon the underlying chemistry.

In one of the case studies, we identified some Inuit traditional herbal remedies and researched the underlying chemistry. For example, Labrador tea, dissolved in a water/seal oil emulsion, is consumed as a healthful drink. The active ingredient is a low-polarity sesquiterpene, germacrone, Thus the seal oil, a low-polarity liquid, plays an essential role as solvent for the sesquiterpene.

We decided that the most appropriate place to submit this series of articles was *Chem13 News*. Publishing in this Magazine enables the modules to be read by as many Canadian high school science teachers and their students as possible.

After each article is published, it is made publically-available at: https://uwaterloo.ca/chem13-news-magazine/categories/chemistry-and-inuit-life-and-culture.

There are more articles currently in preparation. Living and thriving in the Arctic, as the Inuit do, would not be possible without knowledge of the materials around them. And it is chemistry which can provide the Inuit students with an understanding of the molecular properties underlying their lives and culture. When the series is complete, it is planned to publish them as a volume – "Inuit Chemistry" – which will be distributed to all schools in Canada.

We hope our work will fire the enthusiasm of Inuit students, present and future, to learn chemistry and proceed into science degree programs. In our view, it is crucial for Inuit, and for all Canadians, that the people of the North produce scientifically-educated graduates who can make a difference to the future of their communities.

***Figure 2.** Chaim (right) with a pack of Labrador tea, Geoff (left) with a ball-and-stick model of germacrone, the active ingredient.*

About the Authors

Chaim, Inuk of the *Nunatsiavummiut*, is currently an undergraduate student in the Environmental Science (Chemistry) program at the Grenfell Campus of Memorial University, Corner Brook, Newfoundland. She was an invited Keynote Speaker on **Making Chemistry Relevant to Inuit** at the Western Conference on Science Education, London, Ontario, 3-5 July 2019. Geoff is (still) Professor of Chemistry at the Grenfell Campus.

PRE-LABORATORY PREPARATION FOR ACTIVATION OF BACKGROUND KNOWLEDGE

Kelly Resmer (kelly.resmer@msvu.ca), Mount Saint Vincent University , Halifax, NS.

In the lab, learning occurs when students have adequate knowledge of the experiment to understand the theory, calculations and procedure. Proper pre-lab preparation is essential for a meaningful learning experience, but also for the lab to run safely and efficiently. Providing students with the necessary background information is also an aspect of Universal Design for Learning (UDL). UDL checkpoint 3.1 encourages instructors to 'activate or supply background knowledge'(Centre for Applied Special Technologies - CAST (2018). UDL and the learning brain. Wakefield, MA. Retrieved from http://www.cast.org/our-work/publications/2018/udl-learning-brain-neuroscience.html (accessed April 16, 2019)). Carefully designing prelab activities can help facilitate the activation of background knowledge and "prepares the mind for learning" (Chem. Educ. Res. Pract. 2007, 8, 2, 172-185).

Previously in my lab, quizzes were written at the beginning of the lab, on paper, but this took up valuable lab time and created additional stress for students. Now, prelab quizzes are completed online, electronically through our course management software, Moodle. This provides an efficient way for students to test their knowledge before carrying out the experiment. The online quizzes include calculations, relevant vocabulary and theory needed to understand the upcoming experiment. Often, the theory may have been covered already in lecture, and making connections to activate background knowledge can be done by pointing out the textbook pages or specific lectures to review. Since quizzes are done online and graded by the computer, the feedback can be delivered instantaneously to the students. Viewing the results in advance of the lab provides me with feedback on the class as a whole; I tailor my pre-lab lectures to reflect students' level of understanding. If there is one question that was not well understood I will spend a few extra minutes covering the material in my lecture.

Videos are also a way to supply background knowledge to students in advance of the lab. For calculations, I use the free software, Screencast-o-matic (https://screencast-o-matic.com/) to record a screen capture of myself working through a practice problem. I describe how I approach the problem and explain my thought process. I upload the mp4 file to Youtube and provide a link to students to view. I check that the Youtube video is 'unlisted' so only those with a link can view the video. Youtube provides automatic closed captioning that is easily edited. I have received very positive feedback on videos from students. Students report they can view the video at their own pace, as many times as they need and can pause and review as needed. Research published in the Journal of Chemical Education supports the use of pre-lab videos as effective preparation for experiments (J. Chem. Educ. 2017, 94, 7, 859-866, J. Chem. Educ. 2018, 95, 8, 1260-1266). I am currently using H5P to make videos interactive (https://h5p.org/) by incorporating quiz questions and activities directly into the videos. Stayed tuned for my upcoming C3 presentation on this technology!

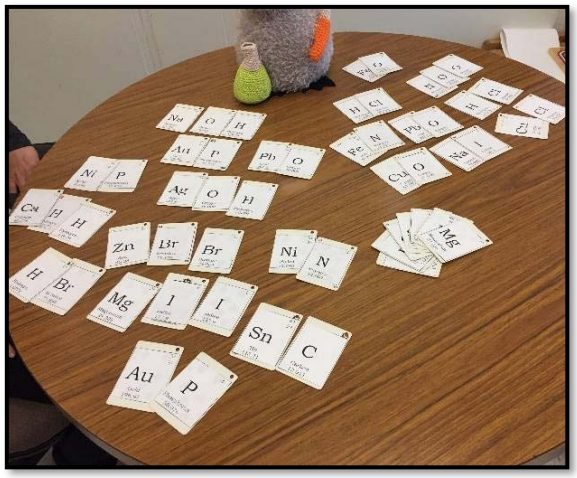
IT'S ALL FUN AND GAMES UNTIL SOMETHING GETS LEARNT

Melanie Kaban (melaniek@nait.ca), NAIT, Edmonton, AB.

How to incorporate general Chemistry concepts into games?

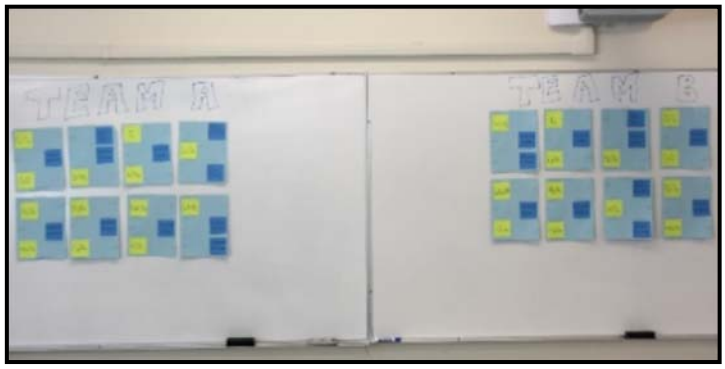
Step 1: Think of your favorite game. Could be a board game, card game, relays, sport etc.
Step 2: Now spin some Chemistry topics into it. You can turn any game into some learning opportunity. I'm assuming this is how people come up with new games all the time.

IT'S ALL FUN AND GAMES UNTIL SOMETHING GETS LEARNT—CONTINUED



Chemistry Card Games: Poker, War, Compounds, Go Fish, War etc.
Materials: A deck of cards with chemical symbols, name, charges and molar mass.
Basic Level: Matching elements (Go Fish), War (Highest atomic number wins), Speed (Highest atomic number wins), Memory game, Skip-Bo (discard in atomic number order).
Higher Level: Use Compounds instead of just elements.

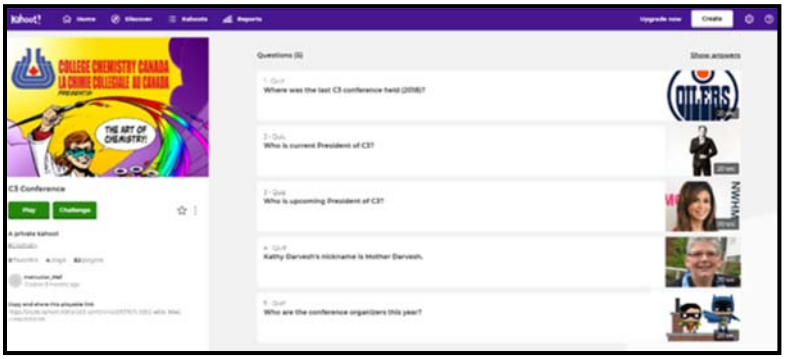
VSEPR Matching Sheets:
Purpose: Match the given cards with the correct row and column category.
Materials: Paper Clips, Coloured paper, Cue Cards.
Categories: Molecular Formula, Lewis Dot Structure, Valence electrons, Stereochemical Structure and intermolecular forces.
Adaptation: Nomenclature, categorizing, balancing chemical reactions.



Nomenclature Relay:
Materials: Paper Clips, coloured paper, Ionic and molecular compound names and formulas.
Basic Level: Matching cards to formula, then relay.
Next Level: Categories, Chemical Reactions, Balancing.

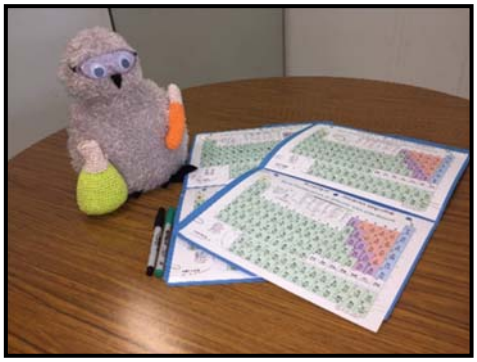
Kahoot:
To create: www.kahoot.com
To play: www.kahoot.it

- Great for review
- Students get to use their phone
- Friendly competition



IT'S ALL FUN AND GAMES UNTIL SOMETHING GETS LEARNT —CONTINUED

Chemistry Battleship:
Materials: Laminated periodic table, file folders, paperclips, dry erase markers.
Basic Level: Elements
Next Level: Compounds



If you have tried a different adaptation of a chemistry concept, please share with me. I am always looking for new ways of incorporating concepts into games. Happy Chemistry Gaming!

CHEMISTRY SCHOLARS DAY: A NEW OUTREACH EVENT

Kris Quilin (kquinlan@chem.utoronto.ca), University of Toronto, Toronto, ON.

"Irreplaceable learning opportunity" were the words used by a Gr. 11 chemistry student to describe Chemistry Scholars Days, the newest addition to the University of Toronto, Department of Chemistry's roster of Outreach events.

For the past three years, we have hosted between 30 and 54 talented Gr. 11 students from up to 27 different schools. Chemistry Scholars Day is filled with events, such as research talks, a building tour, breakout groups with our undergraduate program students and a career panel:

Sample schedule

9:15 – 9:30	Check-In
9:30 – 9:45	Welcome and Introduction
9:50 – 10:25	Research Talk #1
10:30 – 11:40	Building Tours (research and undergrad lab, NMR facility)
11:40 – 12:25	Lunch
12:30 – 1:30	Career Panel
1:30 – 2:15	Interaction with Program Students
2:20 – 2:55	Research talk #2
3:00 – 3:10	Concluding remarks, surveys, certificates

The event was created to be a single day (run during our February Reading Week), sustainable event with high student engagement. I wanted to showcase chemistry in both academic and non-academic settings with a focus on careers and also allow students to imagine themselves as chemistry students at U of T. An additional goal was to reach a diverse student population.

With these goals in mind, we reached out to public high schools across the Greater Toronto Area in October and invited them to select their two top Gr. 11 Chemistry students, based both on aptitude and enthusiasm. Once the students were selected in December, communication occurred directly with the students.

To ensure strong student participation, the selected students were sent biographical information of the career panel participants and the faculty members giving research talks and asked to prepare questions ahead of time. This helped set the expectations high for an interactive day with the students being actively engaged throughout.

Surveys indicate that students enjoy all parts of the day. They commented that they liked seeing the utility of chemistry and cutting edge science in the research talks. Faculty members discuss their pathway from a high school student to their current position, as well as their research at a grade-appropriate level. Lots of time is set aside for questions and the students make good use of this time.

The career panel was one of the most important and successful aspects of the day. Typically, high school students have limited exposure to careers in the sciences, with the exception of medicine, and this is a significant barrier to them imagining future careers in chemistry and other science disciplines. The career panelists, 4-5 per year, have included a patent lawyer, a chemical technician, an executive working in property management and a forensic scientist. After brief intro-

ductions by each of the panelists, the students were invited to ask questions. The questions solicited a broad range of information from the panelists, included detailed descriptions of a typical day in their job, their pathway to get to their current career, the value of a chemistry degree, the cost of education, the value of hard work, general advice for success and much more.

The students appreciated the building tours with chemistry undergraduate students tour guides. They visited the NMR facility, an undergraduate teaching lab and two research labs. Students commented that the facilities were cool and that it allowed them to imagine being at U of T.

Finally, students meet in rotating, smaller groups with chemistry undergraduate students to get another perspective on university life. The breakout groups allowed the high school students to explore a number of topics such as the transition from high school to first-year science, clubs and the culture of the chemistry department, research opportunities and program selection. It also enabled them to put faces to students in chemistry and the comfort of asking more personal questions.

The Department of Chemistry sponsored lunch for the students, as well as the undergraduate program students, several faculty members and the career panelists to allow less formal interaction. A student commented that one of her favourite parts of the day was the informal conversation at lunch with faculty members. To wrap up the day, students completed surveys, were given information about upcoming chemistry events and a certificate of participation.

Overall, the event has been very successful in meeting the goals. The high school students were very engaged and asked insightful questions. If you are interested in organizing a similar event at your institution and would like more detailed information, please feel free to contact me at kristine.quinlan@utoronto.ca.

PERIODIC TABLE COLOURING BOOK—A DAWSON COLLEGE INITIATIVE COMES TO FULL COLOUR AT OKANAGAN COLLEGE

At the 2019 C3 conference, Yann Brouilette (Dawson College) described his Periodic Table Colouring Book initiative which was completed in collaboration with the Dawson College Illustration and Design students. Each page shows the element symbol and, in most cases, a common use for that element. With Yann's blessing, the pages from the colouring book were printed and arranged in an (almost) complete layout at the Vernon campus of Okanagan College. The students (and faculty) at the college have been busy colouring away and the picture above is the outcome of their efforts.

LATEST FROM THE LITERATURE

Sudhir B. Abhyankar (sudhir@grenfell.mun.ca), Memorial University of Newfoundland, Corner Brook, NL.

In a thought provoking article by Deborah Herrington and fifteen coauthors, titled "Supporting the Growth and Impact of the Chemistry-Education-Research Community" published in the Journal of Chemical Education, 2019, 96, 3, 393-397, the authors claim that even though Chemistry-education research (CER) has progressed considerably in the United States since emerging as a discipline in the 1970s, CER can still be a novel entity to many traditional chemists. They pose two questions to the CER community: (1) How do we strategically grow the CER community, considering the multiple pathways by which people enter CER? and (2) What can be done to make CER a more widely accepted and recognizable discipline?

Kanapathy, S. *et al*. in their article entitled "Sustainable development concept in the chemistry curriculum. An exploration of foundation students' perspective" (International Journal of Sustainability in Higher Education, 2019, 20, 2–22) state that in general, the chemistry learners have good knowledge and attitude concerning the sustainable development concept. However, their knowledge and attitude do not reflect in their behavior as an individual, as well as in the classroom. Moreover, their knowledge, attitude and behavior focus more on environmental dimension, as compared to other sustainable development dimensions.

The article "Evaluating Benefits and Drawbacks of Hybrid Courses: Perspectives of College Instructors" by Simon Lei and Stacey Lei published in Education, 2019, 140, 1, 1-8, claims that hybrid courses at the college level have become increasingly popular for over two decades. Traditional, face-to-face and distance learning (online) have satisfied a large number of students in terms of effectively learning new course materials and retaining these materials long after college graduation. Hybrid courses attempt to end the sharp divide between traditional and online instruction. Multiple hybrid course formats have been developed and taught in order to accommodate additional groups of students who can benefit from the best of both traditional and online learning. However, college instructors, students, and administrators must realize that not all students are suited for a hybrid design. Instructors have both positive and negative experiences in teaching hybrid courses from different subject areas and at various academic levels (graduate and undergraduate). This article evaluates previously published literature regarding the benefits and drawbacks of hybrid courses from the perspectives of college instructors.

Australian authors Sarah Stevens, Rebecca Mills and Louise Kuchel share the findings of their study in the article titled "Teaching communication in general science degrees: highly valued but missing the mark" published in the journal Assessment & Evaluation in Higher Education, 2019, 44, 8, 1163-1176. Their evidence suggests that employers and academics are dissatisfied with the communication skills of many science graduates. Their analysis suggests that science academics place high value on developing the ability of students to communicate, with 66% of all science units (n = 1225) using one or more communication tasks as assessment (mean weighting 44%). However, opportunities for students to communicate in a variety of contexts are lacking.

A Systems Thinking in Chemistry Education framework illustrates one way to integrate knowledge about the molecular world with the sustainability of Earth and societal systems. The article is authored by our own Peter Mahaffy and three others and is published in Nature Sustainability, 2019, 2, 362-370.

In the article titled "Organic Chemistry, Life, the Universe and Everything (OCLUE): A Transformed Organic Chemistry Curriculum" by Melanie Cooper *et al*. and published in the Journal of Chemical Education, 2019, 96, 9, 1858-1872, the authors maintain that the fundamental structure of a typical mainstream two-semester organic chemistry course, populated mostly by life science majors and taught at universities throughout the United States, has changed little since the 1970s. However, much of the research on learning in organic chemistry has been devoted to characterizing student difficulties of various types, and there is now persuasive evidence that organic chemistry as currently taught is neither effective nor relevant for a majority of students. In an attempt to address the problems with traditional approaches to organic chemistry instruction, they have developed an approach to the design of a transformed organic chemistry course (Organic Chemistry,

LATEST FROM THE LITERATURE—CONTINUED

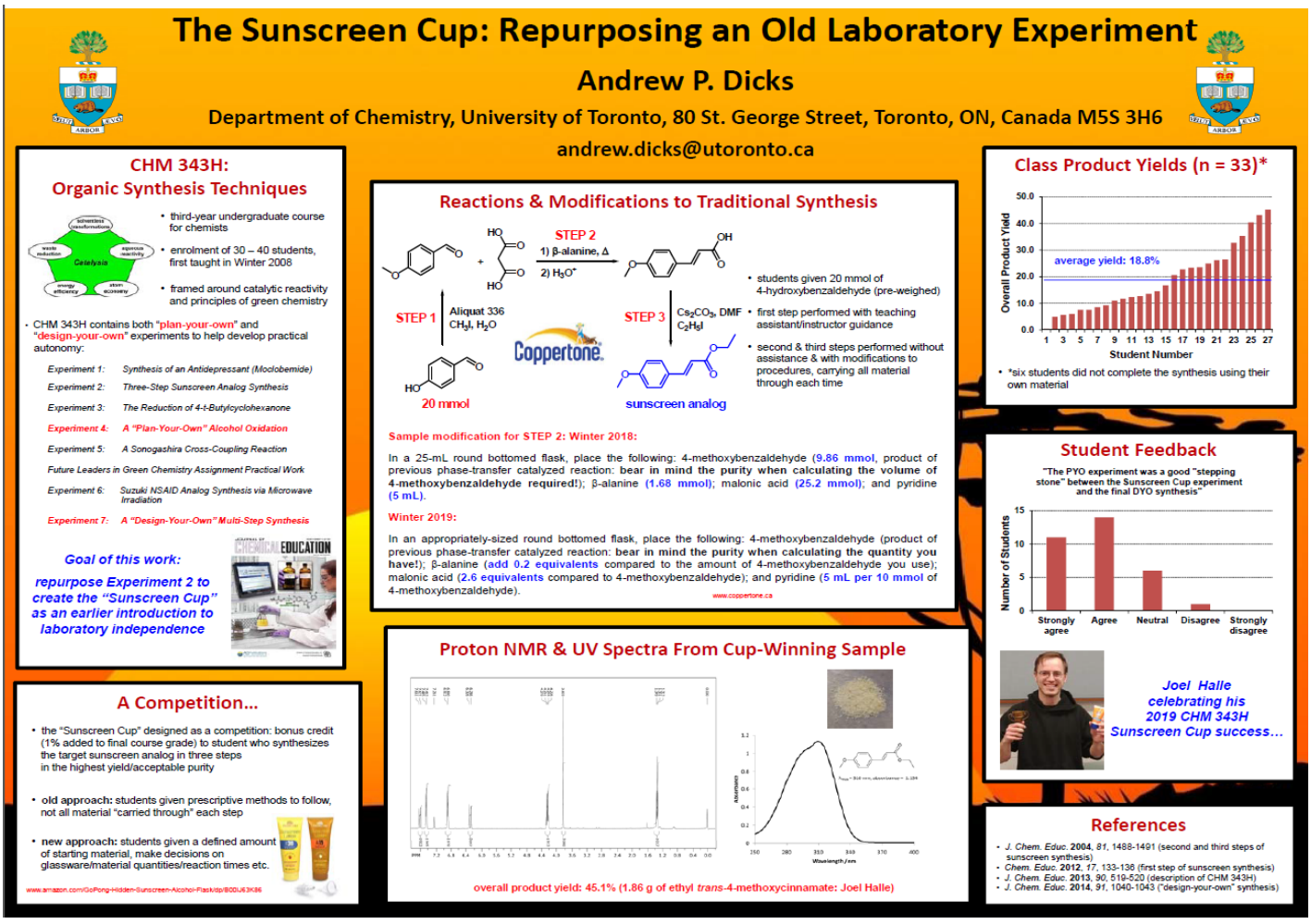
Life, the Universe and Everything or OCLUE) suitable for the vast majority of organic chemistry students that includes (1) using the Framework of three-dimensional learning (3DL) to support knowledge in use and (2) emphasizing biologically important mechanisms.

Cesar Ortiz discusses chemical bonding perception and comprehension in the article published in the International Journal on Language, Research and Educational Studies, 2019, 3, 1, 33-42 and titled "Students' Understanding of Pre-Organic Chemistry Concepts: Chemical Bonding". His research findings suggest that generally, the students had functional misconceptions of chemical bonding. This manifests that the students had vigorous misconceptions in which they were holding on to their initial beliefs which had enabled them to answer questions correctly, but for wrong reasons. This situation most often goes undetected because usually the tests do not probe into the reasons supporting initial students' response.

REINVENTING PAST EXPERIMENTS: WE ALL SCREAM FOR SUNSCREEN

Andy Dicks (andrew.dicks@utoronto.ca), University of Toronto, Toronto, ON

At the 2019 C3 in Vicotria, Andy presented a talk "Reinventing Past Experiments: We All Scream for Sunscreen". The following poster outlines the highlights from this talk. Details on the poster can be easily seen by using the resize feature of the pdf document.



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A CALL FOR NOMINATIONS

Each year College Chemistry Canada presents awards in a number of categories including 1. C3 Award in Chemical Education, 2. C3 Host College Student Scholarship, and 3. the C3 General Student Scholarship. More information about these awards can be found on the C3 website, but it is worth noting that the deadline for nominations for the 2020 awards is fast approaching (January 1 for the Chemical Education award and March 31 for the General Student Scholarship). Also note that contributors to the C3 newsletter are eligible for the C3 Editor's Award. Winners of this year's Editor's Award were Kelly Resmer and Sudhir B. Abhyankar. The C3 newsletter editor gives a grateful shout out to Bill Blann for supplying the pictures of the awardees.

Paula Hawrysz (current C3 President) and Jimmy Lowe (Past-President)

THE PRESIDENT'S MESSAGE

Welcome back to what I am sure will amount to another fantastic academic year! It's hard to believe that we are already a month into it. This time of year is so busy both at work and at home. I am up to my armpits in tomatoes. This year I am investigating canning them as in the past I have always just put them whole in the freezer. This year, I am also contemplating the logic of growing so many tomatoes.

Looking back, I would like to thank Jimmy for all the work and time he put into being the past president and providing me with the guidance to get started. Also, to John Lee and everyone at Camosun for hosting a spectacular conference in May.

Looking forward, a few general service announcements (that will look oddly familiar – Thanks Jimmy):

1) this year the 2020 C3 Conference will be held at L'Université de Saint-Boniface, in Winnipeg;
2) nominate a worthy student or deserving colleague respectively for the General Student Scholarship or the Award I Chemical Education;
3) renew your membership (still an incredible $20). This helps to fund a portion of our awards;
4) pass this newsletter on to other chemical educators.

If you have any questions, comments or suggestions that C3 may be able to address, don't hesitate to contact us.

Have a great fall semester.
Paula

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