Pittsburgh Section

The Crucible

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Earth Day Illustrated Haiku Contest Winners

As part of the 2007 Chemists Celebrate Earth Day (CCED) celebration, the Pittsburgh Section sponsored an illustrated haiku contest for students in grades K-12. The topic for the 2007 CCED program was recycling and the theme was "Recycling - Chemistry Can." Winners were selected from four grade categories: K-2nd, 3rd-4th, 5th-8th, and 9th-12th. Each winner received a check for $50 and was entered into a national poetry contest sponsored by the ACS's Office of Community Activities and Committee on Community Activities.

And the winners of the Pittsburgh Section's illustrated haiku contest:

K-2nd Grade
Taryn Campbell
Grade 1
Streams Elementary School

3rd-4th Grade
Casadi Patterson*
Grade 4
Gastonville Elementary Center
*Won the national ACS's CCED illustrated haiku contest!
She also received a $150 Amazon.com gift certificate.

5th-8th Grade
Brendan Campbell
Grade 5
Boyce Middle School

9th-12th Grade
Zach Rinker
Grade 11
Penn-Trafford High School

Congratulations Taryn, Casadi, Brendan, and Zach! Additional congratulations go to Casadi Patterson for winning the national ACS's CCED illustrated haiku contest!

Submitted by
V. Michael Mautino
CCED Coordinator

In Memory of Theodore (Ted) Weismann

Theodore J. Weismann, 77, a noted Pittsburgh chemist, benefactor and teacher died peacefully at his home Wednesday June 6, 2007.

Ted was very instrumental in the success of Pittsburgh Section as a councilor and leader in the Duquesne University student affiliate group. His dedication to the Section and the student affiliate group is deeply appreciated. He will be missed by many.

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ChemShorts for Kids

Dr. Kathleen A. Carrado

Please note: All chemicals and experiments can entail an element of risk, and no experiments should be performed without proper adult supervision.

The Elementary Education Committee of the ACS Chicago Section presents this column. They hope that it will reach young children and help increase their science literacy. Please share with children and local teachers.

Homemade Floam

Kids, what is like slime with polystyrene beads in it that can be molded into shapes? It's a really fun toy called Floam™. You can sculpt with this colorful goop or use it to coat other objects. You can store it to reuse it or allow it to dry, if you want permanent creations. It's a lot of fun, but not always easy to locate. So, you can make a type of 'Floam' yourself. Like slime, it is generally safe, though anything containing food coloring can stain surfaces (don't eat it though, because polystyrene beads simply aren't food!).

Here is what to do:

Dissolve 2 tsp. borax completely in 1/2 cup water. (If you want slimier, more flexible 'Floam', then try 1 tsp. borax instead)

In a separate container, mix 1/4 cup white glue and 1/4 cup water. Stir in food coloring.

Pour the glue solution and about 1 1/3 cup of polystyrene beads into a Ziploc® plastic bag. Add borax solution and knead it until it's well mixed. Use 1 tbsp. of the borax solution for a very fluid Floam, 3 tbsp for average Floam, and the entire amount for stiff Floam.

To keep your Floam, store it in a sealed bag in the refrigerator (this discourages mold). Otherwise, you can allow it to dry into whatever shape you chose.
How it works:

Borax reacts to crosslink the polyvinyl acetate molecules in the glue. This forms a flexible polymer.

Tips:

If you use a 4% solution of polyvinyl alcohol instead of glue, you will get a more transparent product that will hold shapes better.

Polystyrene beads can be found at craft stores (e.g., JoAnn Fabrics), usually as fillers for bean bags or dolls. Or, for more hands on fun, you can grind Styrofoam™ cups using a cheese grater.

Reference:

Anne Marie Helmenstine's "About Chemistry" at http://chemistry.about.com/od/chemistryhowtoguide/ht/floam.htm

Reprinted with permission from Dr. Kathleen A. Carrado, Chicago Local Section. An archive of all previously published ChemShorts is available online at http://membership.acs.org/C/Chicago/home.html.

ACS Cut and Paste June/July 2007

Funds Available for Collaborative Career Development Activities

Proposals are being sought for Equipping the 2015 Chemical Technology Workforce mini-grants. Up to $500 will be awarded to collaborative activities that support technician education and career development.

Recognizing a need to support chemical technicians in the rapidly evolving chemical enterprise, several ACS units joined together in 2006 to start Equipping the 2015 Chemical Technology Workforce. The initiative kicked off at the 232nd ACS National Meeting with a Presidential Event highlighting its goals:

- Raise awareness of the changing needs of chemical technicians.

- Highlight opportunities for industry, academia, professional societies, and the community to collaborate on meeting those needs.

- Increase involvement of technicians in the American Chemical Society.

The winners of the first round of mini-grants, awarded in Spring 2007, are collaborating with industry, academia, and ACS local sections on such activities as chemical technology career fairs for high school students, discussion panels on employability skills for technicians, and technical programming at regional and national meetings on the vital role technicians play in the chemical enterprise.

Equally compelling proposals are being sought for a second round of mini-grants to be awarded in October 2007.

Continued on Page 5

Pittsburgh Section Honors 50 Year ACS Members

Pittsburgh Section Chair, Christina Mastromatteo (Top, 2nd from the left), and Sarah Sleppy (Top left) new Chair of the Pittsburgh Chemist Club, present awards to the 50 year ACS members. Sleppy replaces outgoing Chair of three years, Lew Morse (Center, bottom row).

The Pittsburgh Section presented 50 year membership awards at the Pittsburgh Chemists Club's meeting on May 29, 2007. The recipients received a certificate and a 50 year membership pin from the American Chemical Society. The 50 year ACS members are Fred Abraham, Amilcare Biancheria, Karl Bloss, Lloyd Guild, Don Harrison, Richard Hood, George Klein, Josef Roesmer, and George Wollaston**.**

Chemistry in the Community, New Digital Talking Book

In collaboration with gh, LLC, (an assistive technology company) the American Chemical Society has converted its high school chemistry textbook Chemistry in the Community into a digital talking book (DTB) format. This will be the first digital talking chemistry textbook on the market and is designed to help students who are blind or visual impaired study chemistry along with their sighted peers. Chemistry in the Community, DTB will also be a powerful tool for students who have reading difficulties or for whom English is a second language.

Converting a high school chemistry textbook into a DTB presented interesting challenges for ACS Education Division and gh staff, as chemistry textbooks contain unique features which must be accurately represented in the digital reading of the text. For example, the pictorial nature of a chemistry textbook (illustrations, figures, tables, graphs, molecular models, formulas and equations) makes the use of a "text only" access method ineffective. In order to make a chemistry text actually usable, the essential graphics need to be communicated so they can be understood by a student who is blind or visually impaired.

A careful review of the initial drafts of the product revealed the nuances of reading dimensional analysis, stock method naming, ionic charges, and catalyzed reactions. These items were addressed along with the other graphic elements to create a product that is now ready for field tests.

ACS is currently looking for interested teachers and students to help with this phase of the project. Teachers of blind and visual impaired students will be asked to use the DTB in their classrooms during the spring and early summer and to provide valuable input on the usability and effectiveness of the product. Student input regarding usability will also be solicited. The final digital talking book is expected to be released in the fall following the completion of the field tests. If you are interested in field testing this exciting new product please contact chemcom@acs.org.

ACS Cut and Paste June/July 2007

This Month in Chemical History

Harold Goldwhite, California State University, Los Angeles
hgoldwh@calstatela.edu

In the standard general chemistry courses that most of us have taken, or taught, or both the subject of the role of the electron in the current view of the structure of the atom usually encompasses the contributions of J.J. Thomson and Robert Millikan and then moves to Bohr's theory of the hydrogen atom. As I was reading C.H. Douglas Clark's book "The Basis of Modern Atomic Theory" (Methuen, London, 1926) I was reminded that the early history of the electron is much richer than that. In this column and the next I will explore the contributions of many early researchers to our understanding of the electron.

The story begins with Michael Faraday whose experimental work established the laws of electrolysis and who, in collaboration with William Whewell, invented the language of electrochemistry including the terms ion, anion, cation, and electrolyte. (QUIZ: For extra credit I challenge my readers to find the origin of the prefixes an- and cat- for the oppositely charged classes of ions.) Faraday's laws lead directly to the idea that different ions must carry electrical charges that are integral multiples of some fundamental amount of charge. For example, to use modern terminology, the electrolysis of (molten) lead chloride generates one mole of lead atoms from the lead ions for every two moles of chlorine atoms (appearing as one mole of chlorine molecules) from the chloride ions. Thus the total electric charge on the mole of lead ions must be exactly twice the charge on each mole of chloride ions. Despite this kind of observation many distinguished scientists of the time, including Maxwell, rejected the idea of discontinuous ionic charges.

In 1881 Helmholz, in his Faraday lecture, said the logical inference from Faraday's laws was that if matter is atomic, then electricity should also be "atomic". In the same year Johnstone Stoney endorsed the idea that when a valence bond was broken a definite amount of electricity was involved. In 1891 Stoney named this definite quantity an "electron". Using modern terminology again it is clear that if the total charge on a mole of ions is known from electrolytic experiments and if Avogadro's number can be determined, then the charge on a single electron can be calculated. Estimates of Avogadro's number date back to the 19th . Century and were based on kinetic theory of gases and early in the 20th . Century Perrin (remember Jean Perrin?) used observations on the sedimentation of colloidal particles to obtain a value of about 7 x 1023 .

In 1897 J. S. Townsend, one of J. J. Thomson's first graduate students, began work on the charges carried by ions in gases. Charges carried by gases have a long chemical history, some of the earliest observations being made by Lavoisier and Laplace who noted that when metals dissolve in acids the hydrogen produced is charged. Later Enright in 1890 showed that the charge is positive, and Townsend established that the charge was not due to spray but to the gas itself. He established that gases produced by electrolysis were also charged. Townsend showed that these charged gases provided centers for the condensation of water vapor, thus demonstrating the principle of the cloud chamber which became of great utility in nuclear research. Townsend then measured the total charge carried in a determined volume of a charged gas using a quadrant electrometer. Determination of the number of charged gas molecules was more challenging. He formed a cloud of charged droplets by passing the charged gas through water and assumed each charged molecule produced one droplet. Then by observing the average rate of fall of the droplets under gravity he estimated their average mass and size. Absorbing the cloud in sulfuric acid gave the total mass of the cloud and hence the number of droplets and ions. These data led Townsend to his estimate of the charge on both positive and negative ions in gases; his value of the charge on the electron was about 75% of the currently accepted value.

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This Month in Chemical History

Harold Goldwhite, California State University, Los Angeles
hgoldwh@calstatela.edu

In my last column, drawing on the excellent exposition in C.H. Douglas Clark's book "The Basis of Modern Atomic Theory" (Methuen, London, 1926) I gave a summary of the early experimental history of the electron up to J. S. Townsend's 1897 experiments in which he obtained an approximate value for the charge on the electron. Also in 1897 Townsend's mentor, J. J. Thomson, published his well-known work on the determination of e/m for cathode rays which led him to the assertion that electrons were a constituent of all atoms. Now that e/m was known with some precision there was a powerful incentive for researchers to get a better value for e, the charge on the electron.

From 1897 to1903 Thomson himself carried out a number of determinations of e by using ionizing agents including X-rays, ultraviolet light, and radioactive sources to produce ionized gases. He used Townsend's methods to determine the mass and number of ions – methods subject to major uncertainties including evaporation of the water drops during the experiments and the validity of applying Stokes' Law to the rate of settling of the drops. In 1903 H. A. Wilson introduced a new idea in the determination of e. While also using charged water drops he introduced an electrostatic field of some 2000 volts/cm within his equipment and by applying a charge he could influence the rate of settling of the cloud of water drops.

Enter Robert Millikan. In 1908, with Begeman, he initially adopted Wilson's method but with a field of 4000 volts/cm and by thus reducing the times of observation he reduced evaporation errors and obtained more precise and more accurate values of e. In 1909 he published his first observations on studying individual droplets, still of water. He adjusted the electrostatic field to halt the movement of a single droplet, and occasionally noted that suddenly a droplet would begin to move either up or down, showing that it had suddenly acquired or lost additional charge, By 1911 Millikan had overcome the evaporation problem by switching to observations on involatile oil droplets, and had determined a very good value of e and of Avogadro's number; values within 1% of those accepted today.

In conclusion a few brief comments on sub-electrons. Some of Millikan's early results seemed to suggest the existence of charges on drops that were less than e, though he did not include those results in his publications. At the same period Ehrenfest published results derived from experiments on tiny metal particles, similar in principle to those of Millikan, indicating charges of around one-third or two-thirds of e on some drops. Millikan strongly argued against these results. There has been some controversy in the history of science community about whether Millikan "fudged" his data by suppressing those results that did not agree with his views of a single value for the smallest possible electric charge. The current view of those best qualified to interpret Millikan's data is that the suppressed values were typically for those drops that carried very large numbers of electron charges (30e to 50e or the equivalent in positive charges) which, for a variety of reasons, are most susceptible to experimental errors.

If there is a moral to this long and involved tale of the history of the electron it is a familiar one. Even though fame's mantle may settle finally on a handful of individuals, generally their work depends on the work of many unsung heroes.

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Funds Available...Career Development
Continued from Page 2

To qualify for a mini-grant, activities must involve one or more sectors of the chemical enterprise (industry, academia, etc.) and be completed by the summer of 2008. Activities must also support one or more of the goals of Equipping the 2015 Chemical Technology Workforce. Proposals must be received by September 26, 2007.

To learn more about Equipping the 2015 Chemical Technology Workforce and the mini-grants, to get ideas for activities, or to gather information about the chemical technology profession in today's marketplace, please visit www.ChemTechLinks.org and click on "Equipping the 2015 Chemical Technology Workforce," or e-mail ChemTechLinks@acs.org.

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Pittsburgh Section Officers

Chair:
Christina Mastromatteo
PPG Industries
440 College Park Dr.
Monroeville, PA 15146
724-325-5318
mastromatteo@pittcon.org

Chair-Elect
Linda Peteanu
Carnegie Mellon University
4400 Fifth Ave. #139
Pittsburgh, PA 15213-2617
412-683-8373
peteanu@andrew.cmu.edu

Secretary
Mary Anne Alvin
U.S. DOE/NETL
Mail Stop 58-202A, P.O. Box 10940
Pittsburgh, PA 15236-0940
412-386-5498
maryanne.alvin@netl.doe.gov

Treasurer
Emanuel Schreiber
1940 Wightman St.
Pittsburgh, PA 15217-1549
412-624-6862

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Editor
Traci Johnsen
124 Moffett Run Rd.
Aliquippa, PA 15001
Phone: 724-378-9334
Fax: 724-378-9334
tracijohnsen@comcast.net

Advertising Editor
Vince Gale
MBO Services
P.O. Box 1150
Marshfield, MA 02050
Phone: 781-837-0424
Fax: 781-837-1453
cust-svc@adelphia.net

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Pittsburgh Area Calendar

We at The Crucible hope you are having a great summer.
Be sure to check out the September issue for all of the upcoming fall activities of the Pittsburgh Section!

The Crucible

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