THE VORTEX

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THE VORTEX

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EDITOR:
Louis A. Rigali
309 4th St. #117, Oakland 94607 510-268-9933
ADVERTISING MANAGER:
Vince Gale, MBO Services
Box 1150 Marshfield MA 02050-1150 781-837-0424
OFFICE ADMINISTRATIVE ASSISTANT:
Julie Mason
2950 Merced St. # 225 San Leandro CA 94577 510-351-9922
PRINTER:
Quantity Postcards
255 4th Street #101 Oakland CA 94607 510-268-9933
Printed in USA on recycled paper

CONTRIBUTING EDITORS:
Evaldo Kothny
William Motzer

EDITORIAL STAFF:
Evaldo Kothny
Alex Madonik
Wally Yokoyama
Margareta Sequin
Linda Wraxall

For advertising and subscription information, call the California Section Office, 510 351 9922,

California Section Web Site: http://www.calacs.org

Chair's Message

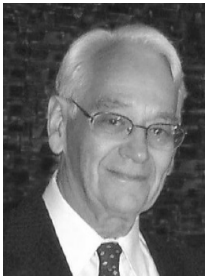
Wally Yokoyama

California, the world's 5th largest producer of food is the nation's leader in farm receipts, $43.5 billion. The state produces 400 different commodities and half the fruits, nuts, and vegetables consumed in the U.S. California is able to compete with other states and the world despite high land and labor costs. But Californians find solutions to their challenges.

In the professional society business the California section of ACS has also been highly productive. The American Chemical Society is the world's largest professional society and our current ACS president, Dr. Marinda Wu, is a California Section member. Dr. Attila Pavlath, also a California Section member, was ACS president in 2001. Both Dr. Wu and Dr. Pavlath are still active at the local section level. At the Spring National ACS meeting in New Orleans, councilors will have the opportunity to select two candidates for President-Elect of the society. One of the candidates, you guessed it, is a California Section member, Dr. Bryan Balazs. With leadership talent like this and hard working volunteers is why the Section is able to win awards year after year.

This month the California and Santa Clara sections will host the exams for the 45th International Chemistry Olympiad at the University of Santa Clara on April 13th. Our section Olympiad chair is Dr. Don McClean. Students from as far away as Chico take the exam because the California section extends from the Tehachapi mountains in the south to the Oregon border in the north with the exception of Sacramento and Santa Clara. Students qualifying for the international competition will go to Moscow, Russia, to compete with students from other countries. Good luck to all of them.

Another international activity by our section is to engage with ACS international Chapters. This month, on April 13, Prof. Sorin Rosca, President of the Romanian Chemical Society, has been invited by ACS President, Marinda Wu, to speak at a joint ACS and Electrochemical Society sponsored lunch and tour at Lawrence Berkeley National Laboratory. The section is also engaged in developing programs with other international chapters on the Pacific Rim such as Shanghai, Hong Kong and Thailand chapters. The California Section, like the California state agricultural sector, produces about 400 different activities a year and is active in world chemistry activities.



ELK-N-ACS

Evaldo Kothny

Potassium in Vegetation

The preferential absorption capacity of potassium in clay has been mentioned in a previous article. This preference has produced a relative enrichment of K over Na on land and it happens during runoff of leached substances. In summary, the balance of metals between water bodies, which are enriched in Na, and land surface where most K (also Ca) has remained with clay is obvious when comparing rocks with soil. Rocks may contain 2.8% Na and 2.5% K, the sea contains 1.1% Na and just 0.04% K and the leached soil contains 0.1 - 1% Na and 1 - 2% K.

Soil science: Comminuted rocks comprise resistant materials, sand, silt and colloids. All these materials are subject to hydrolysis. This is a modifying factor for the resistant particles. They change into smaller particles and by this process free a soluble portion from resistant materials such as from hornblende, mica, quartz, feldspar, and pyrite. The change involves formation of colloids, clay being one of these colloids. Clays may comprise montmorillonite, kaolinite, halloysite, bentonite, vermiculite, silica, illite (also called non-expanding hydrous mica), and hydrous oxides (Fe, Al, Ti. etc.). Weathering may release potassium from mica, feldspar, illite and smaller amounts of potassium from muscovite, biotite, microcline, and orthoclase. There is a close correlation between the surfaces of mica and potassium released by weathering and available for vegetation. In soil science, potassium may be assigned as fixed, replaceable or exchangeable. These parameters depend on the kind of clay, on the dry-wet (hydration) history of the material, and its exposure to other ions (i.e., Ca, Mg, Sr, Ba). Other factors include climate, ground cover, drainage, age, pH, parent material (with their dominant metal content, i.e., Ca, Mg, K, or its depletion). Exchange capacity of trace elements (Cd, Pb, Cu) may compete with cationic metals (Ca, Mg, Na, K), and these latter ones interact within each other. This parameter can be measured by analyzing the ammonium exchange capacity at about 18 inches depth. There is a straight relationship between the milli-equivalents of K and the ratio of silica/alumina.

Potassium in food: Values for K in the tables below are approximate, rounded off, and are given in mg per 100 gram. Accordingly, intensive cropping may deplete the K content of the soil, and K must be replenished by fertilization. This is very important for potatoes, beans and soya.

Seeds and flour:

Barley	120 mg/100g
Corn	60 mg/100g
Rice	110 ”
Rye	400 ”
Soya	1700 to 2000 mg/100g
Wheat, Graham	200 mg/100g
Wheat, white flour	90 ”

Fruits fresh, with skin and core:

Apples	100 mg/100g
Avocado	400 ”
Bananas	350 ”
Berries	200 ”
Cantaloupe	200 ”
Citrus	200 ”
Grapes	250 ”
Peaches	250 ”
Pears	120 ”

Vegetables

Beans	300 to 1700 mg/100g
Carrots	230 mg/100g
Peas	350 “
Potatoes	600 “
Tomatoes	290 “

Other:

Nuts	300 to 400 mg/100g
Cocoa	500 ”
Ground Coffee	2000 ”

April ACS-ECS Joint Meeting
"AUTHENTICATION OF ROMANIAN WINES USING SPECTROSCOPIC AND CHROMATOGRAPHIC METHODS"
Prof. Dr. Sorin Rosca, Politehnica University of Bucharest, President of Romanian Chemical Society
By Invitation of ACS President Marinda Wu, the ACS California Section and San Francisco Section of Electrochemical Society
Tours at Lawrence Berkeley Laboratory
Battery Laboratories Advanced Light Source (Synchrotron)

Date: Saturday, April 13, 2013
Time: 11:30 AM, lunch: LBL building 54, Bay View Cafeteria
1:00 PM: talk, Perseverance Hall, building 54 (cafeteria), room 130
2:00 pm Tours at LBL
Place: Lawrence Berkeley National Laboratory; 1 Cyclotron Road; Berkeley, CA 94720 Building 54 Room 130. **Security Requirements: LBL requires an RSVP with name and nationality at least one week prior to the meeting date. This requirement is for all who plan to attend either the talk or tour. No walk ins without the one week prior RSVP Site access: for US residents - a photo ID is required. Otherwise - a passport with Visa.**
Directions: www.lbl.gov/Workplace/Transportation.html Access through Blackberry gate: go all the way up Hearst Ave in Berkeley, then follow the signs. (www.lbl.gov/Workplace/lab-site-map-flash.html)
Parking: in front of the building 54 (cafeteria)
Lunch: Thinly-Sliced Roast Beef, Maple Ham, House-Roasted Turkey Breast, Natural Cheddar, Natural Swiss and Provolone Cheeses, with Condiments on Freshly-Baked Baguettes, served with Wavy Chips. Soft Drinks, Mineral and Spring Water, Juices.
Cost:

	Lunch and Talk	Talk Only
ECS/ACS Members	$12	Free
Non-Members	$12	Free
Students	$6	Free

RSVP: office@calacs.org (510-351-9922). By 1pm Friday, March 29, 2013

Romanian Wines

The Impacts of Impacts (Revisited)

Bill Motzer

It's like déjà vu all over again
Yogi Berra

In the weeks and days before the anticipated February 15, 2013 "fly-by" of a 45 to 50 m diameter asteroid (designated as 2012 DA14) to within 27,350 km of the Earth, both amateur and professional astronomers were looking forward to viewing and photographing it as it approached from a southern direction (Indonesia and Australia). Just 16 hours before, however, another unrelated, much smaller asteroid traveling in a completely different trajectory and with a velocity of 18 km/s disintegrated over the Russian Ural Mountains very near the city of Chelyabinsk. The resulting air burst (explosion) occurred at an altitude of 15 to 25 km with an estimated energy release of ~440 kilotons (kt) TNT (~1,800 TJ) or ~20 to 30 times that of the Hiroshima atomic bomb (12.5 kt of TNT or 52 TJ). Most of the released kinetic energy (~90 kt or 400 TJ) in the radiated fireball was absorbed by the atmosphere. This smaller asteroid (as designated by NASA) has been estimated at 17 m in diameter with a mass of 10,000 tons. The air burst and shock wave were large enough to register as a magnitude 2.7 seismic event.

Injuries occurred to about 1,500 people (mostly cuts from shattered glass windows) with two serious injuries but no reported deaths, and the shockwave damaged 7,200 buildings in six cities across the region. However, there appears to have been no significant environmental damage. Another similar Siberian impact occurred on June 30, 1908, known as the Tunguska event with an air burst at an altitude of 5 to 10 km; the object was ~45 to 70 m in diameter. Estimates of the blast's energy ranged from 10 to 15 Mt of TNT (4,200-6,300 TJ), about 1,000 times more powerful than the Hiroshima atomic bomb. The Tunguska explosion flattened ~80 million trees covering an area 2,150 km^2 (830 mi^2). The blast shock wave would have measured 5.0 on the Richter scale. Events Tunguska (of which the February 15th event is included) may occur once per 100 to 300 years.

Scientists have now identified the February 15th impact as belonging to a group of asteroids known as the Apollo asteroids, named after 1862 Apollo, the first of which was discovered by Karl Wilhelm Reinmuth. Apollo asteroids are Earth-orbit crossing asteroids with semi-major axes greater than (>) 1.0 astronomical units (1.0 AU = 149.6×10^6 km, the mean distance from Earth to the Sun) and perihelion distances less than (<) 1.017 AU. The largest known Apollo asteroid is 1866 Sisyphus (1972 XA) with a diameter of about 10 km - similar in size to the Chicxulub asteroid whose impact (just off Mexico's Yucatian Peninsula) may have wiped out the dinosaurs (65.5 million years ago) resulting in mass extinctions and millennia of biological and ecological damage (see the March, April, and May 2010 issues of the *Vortex* - "The Impacts of Impacts"). The Chicxulub impact delivered an estimated energy equivalent of 100 teratons of TNT (4.2×10^{23} J); such impact events may occur every 100 million years.

Recovered fragments have been identified as chondritic or chondrite meteorites, stony meteorites not modified by melting or differentiation of the parent body (see February 25, 2013 C&N News v. 91, no. 8, p. 8). They contain chondrules - millimeter-sized spherical fragments rich in the silicate minerals olivine and pyroxene. Chondrites also contain refractory calcium-aluminum, metallic iron-nickel, sulfide mineral inclusions, and minor amounts of water. Most of Earth's recovered meteorites are chondrites with 86.2% comprising all witnessed falls, resulting in more than 27,000 chondrites in world-wide collections. The largest individual recovered chondrite, part of the 1976 Jilin meteorite shower, weighed 1,770 kg. Chondrite falls range from single stones to showers consisting of thousands of individual stones, as occurred in the northern Arizona Holbrook fall, where an estimated 14,000 stones fell in 1912.

We were effectively "blind-sided" by the

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February 15th impact because it remained undetected approaching from the Sunís direction. So what are we doing to detect such objects? As of February 26, 2013, The Minor Planet Center (MPC), which operates the Smithsonian Astrophysical Observatory, identifies solar system minor bodies including asteroids, comets, and natural satellites. MPC is also responsible for collecting, computing, checking and disseminating astrometric observations and orbits for these bodies (see: http://www.minorplanetcenter.net). In the inner solar system there are currently 4,803 identified Apollos, 9,618 Near Earth Objects (NEOs) with 862 NEOS ?1.0 km. There are also 1,377 potentially hazardous asteroids.

Other surveys include:

NASA's NEO Program Office recently announced arrival of the Sentry Automatic Impact Monitoring System (Sentry) - in development for nearly two years. Sentry is a highly automated, accurate, and robust system continually updating orbits of future close Earth asteroid approaches, and Earth impact probabilities for all Near-Earth Asteroids (NEAs)

"Spaceguard" which includes the Lincoln Near-Earth Asteroid Research (LINEAR) program. In 1998, Congress mandated the Spaceguard Survey to determine or detect 90% of NEOs >1.0 km diameter by 2008, which could cause global devastation. This program may be extended by the George E. Brown, Jr. NEO Survey Act, requiring NASA to find 90% of NEOs with diameters of ≥140 m by 2020. Japan also has a Spaceguard Association.

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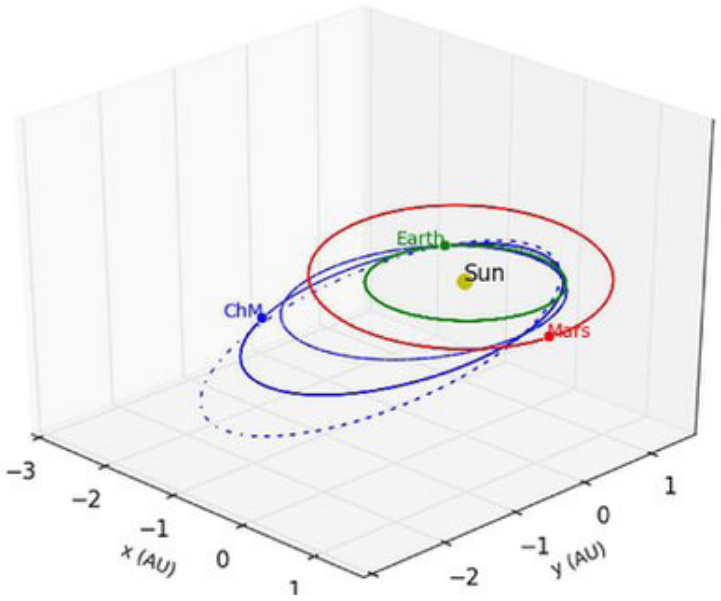

Chelyabinsk meteor orbit (labeled ChM) with Earth (green) and Mars (red) appears to have been on an elliptical orbit around the Sun before colliding with Earth. http://www.bbc.co.uk/news/science-environment-21579422

Report on the January 2013 Scientific Cafe Meeting

The Science Cafe Leture at the Lafayette Library and Learning Center, Orinda, CA was presented on January 22, 2013 by Dr. Filippenko. He was a member of one of two teams whose leaders received the 2011 Nobel Prize in Physics for the accelerating Universe discovery – most likely due to what is now called "dark energy." He began his talk by noting that the Universe's age is about 13.7 billion years, quoting Woody Allen that "eternity is a very long time, especially toward the end." He continued by reviewing the history that led to the Nobel Prize. Then, with only a few simple PowerPoint slides interspersed with considerable humor, he engaged and captivated a packed audience for over an hour with the Universe's wonders and mysteries.

In 1929, Edwin Hubble discovered and formulated "Hubble's Law" – in which he showed that the shift in stellar and galactic light spectra was toward the red end (red = "away", blue = "toward") meaning that galaxies have been receding from each other (and us) since the Big Bang and that space has stretched and continues stretching. With Isaac Newton's laws of gravitation one can then hypothesize that the Universe may go from a "Big Bang" (expansion) to a "Big Crunch" (recession) if gravity predominates or rules; this will occur if the Universe's density is high. However, if the Universe's density is low, it should expand forever resulting in a "Big Chill."

So Dr. Filippenko posed the question of what's really happening. In answering that question, he noted that light travels at one foot per nano second (10^{-9} s) or about 186,282 miles (mi)/s (299,792,458 meters (m)/s); a standard light year (LY) therefore is about 6 trillion mi (~10 trillion km). Space, by our standards, is immense! Most stars that we observe when staring up at the night sky are only 10 to 100 LY distant. Therefore, viewing more distant stars and galaxies is only possible with telescopes. Hubble observed and used Cepheid Variables (a class of very luminous stars) as a standard candle showing that galaxies are indeed receding from us and that the Universe is actually expanding. Subsequently, Type 1a supernovas (SN) have confirmed this, but because only one SN occurs in a galaxy per 100 years (1.0 SN/1.0 galaxies/100 yr), making such measurements is extremely difficult. However, if more galaxies are observed, the odds of detecting such SN increase exponentially (i.e., 1.0 SN/100 galaxies/yr, 10 SN/1,000 galaxies/yr, 100 SN/10,000 galaxies/yr, etc.). Today, astronomers use the Katzman Automatic Imaging Telescope (KAIT) to detect as many SN as possible. Dr. Filippenko showed us slides of such SN in very distant galaxies detected by his KAIT Supernova Search and Analysis Team; such observations are then used to measure galactic distances and recession rates (via their red shifts) due to the expansion of space.

So here is the result of these observations. In our local area (i.e., the Milky Way and surrounding galaxies) gravity dominates, but 100 million LY and beyond, gravity seems to "wane" and acceleration appears to dominate. This may be caused by dark energy – a hypothetical type of energy perhaps permeating all of space resulting in the accelerating expansion. Since the 1990s, dark energy is the most accepted hypothesis explaining observations that the Universe's expansion is indeed accelerating. Dr. Filippenko noted that dark energy may compose about 73% of the Universe with dark matter at 23%. Although both total 96%, their actual properties are a mystery. Of the remaining observable matter 3.6% is interstellar gas (mostly hydrogen with some helium and a few heavier elements) and 0.4% is regular matter (stars, planets, and people). Therefore, he stated: "we are the 'debris' of the Universe." (Dark energy may actually be a quantum property of the Universe, which is why some of my physicist friends give me knowing grins when I discuss the only 4% existence of baryonic matter.) Dr. Filippenko concluded his talk with a lengthy question and answer session that had to be finally halted by the moderator because no one wanted his talk to end.

Bill Motzer

Update on the 2013 American Chemical Society, Western Regional Meeting

A wide-ranging program is planned for the 44th Western Regional meeting to be held at a great location in Silicon Valley/the San Francisco Bay area. Some of the highlights of the meeting will be a Nuclear Chemistry Symposium in honor of Priestley Medalist Dr. Darleane Hoffman of LBNL, and the Cope Scholar Symposium in honor of Dr. Sarah Reisman of Cal Tech. Other events include Chemistry of Beer with Charles Bamforth, Chemistry and Flavors with Shirley Corriher and Sara Risch, and Awards Banquet with Richard Zare on "Why Shaken, not Stirred!"

The technical program will cover many aspects of chemistry from traditional areas of chemistry to more specialized programs. The planned sessions include:

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We now have the technology to confront and perhaps deflect such objects. Hopefully this was a wakeup call. As I concluded in my earlier *Vortex* paper: "It would be ironic if the 'cosmic cannonballs' that caused the extinction of so many species, also enabled the rise of sentient specie that could anticipate and prevent its own destruction. Perhaps the dinosaurs did not die in vain".

Bill Motzer

Circular hole in Chebarkul Lake ice, one reported impact site for the February 15, 2013 Chelyabinsk asteroid (meteorite). http://www.npr.org/blogs/thetwo-way/2013/02/26/172948753/scientists-trace-origin-of-destructive-russian-meteor

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There will also be several programs for educators at the high school and college levels. Workshops in career development, Leadership Development, Safety and a special workshop in pharmaceutical science, co-hosted by CACO-PBSS, are scheduled. Poster sessions are being scheduled throughout the meeting.

There will be a large Exhibition with vendors from many aspects of chemical sciences including presentation opportunities, and also university graduate school representatives.

Special events include the regional awards banquet, luncheon with ACS President Dr. Marinda Wu sponsored by the California Section WCC, an ACS Governance lunch meeting with members of the Board of Directors, special evening events with Dr. Charles Bamforth on beer, and Shirley Corriher and Sara Risch on flavor chemistry. A Sunday public outreach event at Great America is also in the works!

Make your plans now to join us for a great meeting!
Visit the website www.wrm2013.org

California Section - American Chemical Society
2013 Alameda County Science and Engineering Fair and San Francisco Bay Area Science Fair
Special Awards

The Section participated in both the Alameda County Science and Engineering Fair held March 9, and the San Francisco Bay Area Science Fair held on March 19 to 21, by judging entries for special awards. The Section awards are a certificate, $100, and a subscription to the ACS magazine CHEMMATTERS. One entry from each fair was selected for the Section awards. The awards are made for excellent entries that involve some principle of the chemical sciences. The Section judges were Charles Gluchowski and Paul Vartanian. The awards were presented to the students at the Alameda awards ceremony held by the Fair on March 9, and the San Francisco awards ceremony held March 21.

We congratulate all the Fair participants and especially the two students who received the Section's awards:

San Francisco Bay Area Science Fair (Golden Gate Park)

Student	**School**	**Entry Title**	**Teacher**
Gennevieve Springer	Cunha Intermediate (Half Moon Bay)	It's Not Easy Being Green,	Ms. Hitchner

Alameda County Science and Engineering Fair (Alameda County Fair Grounds)

Student	**School**	**Entry Title**	**Teacher**
Anjali Vachhani	Livermore High (Livermore)	Effect of Temperature and Oxygen on Vitamin C Concentration	Mr. Giles

Paul Vartanian

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