THE VORTEX

AMERICAN CHEMICAL SOCIETY **CALIFORNIA SECTION**
VOLUME LXXII NUMBER 8 **OCTOBER 2011**

Tony Wren of Butte College, recipient of the CALACS Teacher-Scholar Award for Community College Faculty

Table of Contents

THE VORTEX

Published monthly except July & August by the California Section, American Chemical Society. Opinions expressed by the editors or contributors to THE VORTEX do not necessarily reflect the official position of the Section. The publisher reserves the right to reject copy submitted. Subscription included in $13 annual dues payment. Nonmember subscription $15.

MAGAZINE OF THE CALIFORNIA SECTION, AMERICAN CHEMICAL SOCIETY

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:
Quantitiy Postcards
255 4th Street #101 Oakland CA 94607 510-268-9933
Printed in USA on recycled paper

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

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

CONTRIBUTING EDITORS:
Evaldo Kothny
William Motzer

EDITORIAL STAFF:
Glenn Fuller
Evaldo Kothny
Alex Madonik
Bryan Balazs

Volume LXXII October 2011 Number 8

Chair's Message

Bryan Balazs

What do the topics of sustainability and getting tipsy have to do with each other? Now that I have got your attention, allow me a small digression. Your liver can only process absorbed alcohol at a relatively fixed rate, and any increases over this amount circulate in the bloodstream until the liver can catch up. *Voila*, intoxication! A similar effect happens with sustainability: when we produce waste streams or toxins into the environment faster than Mother Nature (or man-made systems) can process them, the excess accumulates in the Earth's "bloodstream". The same effect occurs on the usage side: if we consume resources faster than they can easily be replaced, we have a shortage, i.e., a sustainability problem. There are many definitions of sustainability, but one way to define this is as an imbalance between the consumption of resources, or the generation of waste, and the capacity to replace the resources or neutralize the waste. As the above example is overly simplifying a very complex topic, the ACS has undertaken several initiatives to promote discussion of sustainability issues and potential strategies for addressing them, for example: Green Chemistry, atom economy, sustainable energy and water, mitigation strategies for accumulation of toxins in the environment, optimized industrial processes, etc. See: http://www.acs.org/sustainability. How does this translate to the local section level? The ACS' Committee on Economic Improvement is looking to find ways of assisting local sections in helping members, employers, and the general public understand sustainability and how we can get involved. The web link above contains resources that you, and our local section, can use to learn more and to help spread the word. The California Section already has substantial efforts in this area, such as involvement with Earth Day, National Chemistry Week (NCW), the ACS' Legislative Action Network (LAN), and others, but we can do more.

The California Section now has a Sustainability Coordinator, Dr. Alex Madonik, who is best known for his enormously effective efforts in coordinating our section's activities for Family Science Night and NCW. Alex has volunteered to coordinate our section's efforts to introduce topics of sustainability in our section events, and to provide resources for members, and for the public, on some of the issues and sustainable technologies that could address these. If you have ideas about what our

(continued on page 12)

CALACS 2011 Teacher-Scholar Award for Community College Faculty

The California Section is pleased to announce that its second Teacher-Scholar Award for Community College Faculty is presented to Anthony Wren of Butte College.

We congratulate Anthony Wren for his dedication to his students and his teaching accomplishments. We thank the committee of Peter Olds (chair), Joe Ledbetter, and Kent Campbell for selecting Anthony.

Anthony (Tony) Wren, has been a Community College Chemistry Teacher at Butte College in Oroville California for over thirty years, seven of which he served as Chair of the Chemistry Department.

Tony states that his greatest reward is the success of the several students that he mentors every year with on-going professional and personal support. He provides counseling to students on the preparation and expectation for degrees in the life and physical sciences as well as in professional programs such as pharmacology and Medicine.

He also mentors younger chemistry instructors as they join the faculty. In 2002, his peers at Butte College awarded him "The Outstanding Faculty Member of the Year."

Tony's collaborations with local high schools and four year colleges and universities, have assisted in more student transfers and better articulation between two and four year schools. One of his achievements as chair was to support the efforts of the department to stage several "Chemistry Day" events for the local high schools. He participated in the California Intersegmental Major Preparation Articulated Curriculum (IMPAC) project (www.cal-impac.org) a project that sought to improve articulation between California Community Colleges and the UC and CSU systems. This, in turn, led to a much stronger relationship between the department and the Chemistry Department at CSU-Chico, and has allowed Tony to better serve the needs of the students in his role as a professional advisor. Tony's continuing contribution to teaching includes his many years in active management of the Northern California Community College Computer Consortium (NC5), an organization of approximately 56 Community Colleges formed to promote and disseminate the use of computers and related technologies to improve instruction in colleges.

Tony has also enhanced the student and teaching experience at Butte College by being the lead author on writing and publishing two general chemistry laboratory manuals. Through his efforts and involvement, Tony was instrumental in obtaining funding for a research-quality GC/MS and state of the art FTIR spectrometer for student use.

Tony's dedication to young adults, training and community is demonstrated by his more than 20 years contribution to the Boy Scouts of America Adult Volunteer programs.

Butte Collge Orovile CA

Report From The ACS Meeting

Denver, CO, August 28- September 1, 2011

Highlights from the Denver meeting

It has been a long time since an ACS National meeting has been held in Denver, and ACS members were greeted to a new and expansive convention center and many new hotels that made this a very compact and easily navigated meeting. As always, this was a very full meeting, but smaller than many ACS meetings, most likely due to the economy and the distance of Denver from other major population centers.

The California local section was in attendance with its full complement of Councilors, its Board member, and Past-ACS President. Our Board member, Marinda Wu, who is a candidate for ACS President in the upcoming election (along with another Board member, Dennis Chamot), held forth at an assigned booth in the Exhibition area on Tuesday afternoon and was supported in her campaign by several other section members. The California section was honored as a nominee for the outstanding Project Seed effort at the Tuesday evening Chemluminary awards, celebrating the many volunteer efforts by members of ACS local sections and divisions. The long time Project Seed volunteer, Elaine Yamaguchi,was joined by other CAL-ACS members at the Section's poster presentation preceding the award program.

The overall theme of the Denver meeting was "Chemistry of Air, Space & Water." There were over 50 individual symposia across the various ACS Divisions, Committees, and plenary events at the meeting related to this theme, including a Sunday afternoon plenary session that included lectures on complexity and climate change, sustainable earth chemistry, and high temperature chemistry on planetary objects. Presidential events covered "Empowering Tomorrow's Science Super Heroes," "Science on the Hollywood Screen," and "Globalization: ACS and You." Kishore Hari, Director of the Bay Area Science Festival, was among the morning's speakers, and the afternoon session included three TV writers (one, Jane Espenson, is the daughter of a well-known inorganic chemist, James Espenson) as well as session organizer Donna Nelson, who is the scientific consultant for "Breaking Bad."

The Kavli Foundation has joined with

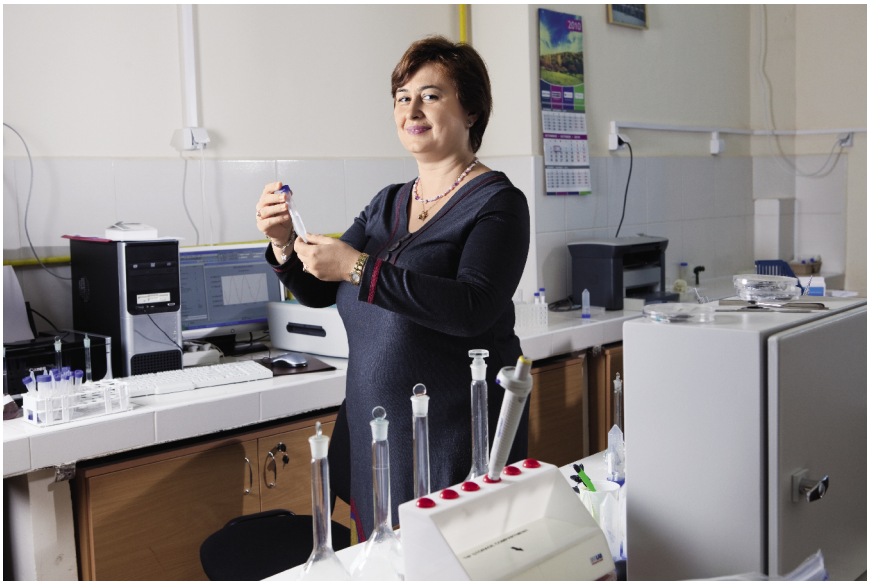
(continued on page 8

CALACS Councilors and Officers at the ACS Denver meeting Alex Madonik, Paul Vartanian,Elaine Yamaguchi, Bryan Balazs, Marinda Wu, Sheila Konodia, and Eileen Nottoli

Family Science Night/National Chemistry Week

This year's NCW theme is, "Chemistry—Our Health, Our Future!" We have FREE copies of the activity guide, "Celebrating Chemistry." Just let me know how many you need for your school. For more information about theme activities, please visit: <www.acs.org/ncw>

It is time to celebrate National Chemistry Week with another great Family Science Night event on Thursday, 6:00pm October 20th, 2011, hosted by Helms Middle School in San Pablo. Hope you can join us for an evening of music with the Scientific Jam, plus chemistry magic, liquid nitrogen ice cream, and a dozen hands on activities for kids of all ages. Volunteers are needed to help greet visitors and guide them through the night's activities. The message is, "Chemistry is Fun!" If you are interested, please contact Alex Madonik, NCW Coordinator, at 510-872-0528 or madonika@comcast.net



Dr. van Staden, October Section Meeting Speaker

The Sanitary Revolution (Part 3)

Bill Motzer

Introduction

In Part 2 (the Vortex, September 2011) I discussed the second part of the Sanitary Revolution and how, before the 20th Century, treatment of wastewater and sewage, European urban life had become virtually untenable. Modern Publicly Owned Treatment Works (POTWs) treat raw sewage through several rather complicated chemical-engineering processes or stages; these are designated as primary, secondary, and tertiary treatments. Chemistry plays an important role in each stage, of which only the major processes are briefly described below.

Primary wastewater treatment (PWT) mostly requires physical removal of insoluble substances including trash, large solids, grit, grease, and scum. A series of screens removes trash and larger solid particles, which are periodically scraped off of the screens with subsequent disposal. Many POTWs use power rakes and other devices to shred and grind solids, reducing them to smaller particles that are then returned to the sewage flow. Grit, generally consisting of sand and coffee grounds, has high settling velocities and is not normally biodegradable. Grit is allowed to settle in a tank under low-flow aerated conditions with subsequent mechanical scrapping of the tank's bottom. PWT sedimentation and filtration processes remove other floatable and settleable solids, including "greases" (composed of oils, waxes, free fatty acids, and insoluble soaps containing calcium and magnesium). During PWT sedimentation, flocculent particles tend to aggregate and for better settling, chemical flocculants are added to enhance this process. Normally, some grease settles with the primary sludge. However, enhanced removal of colloidal solids is more efficient by adding of aluminum and iron salts. When added to water, aluminum sulfate [$Al_2(SO_4)_3 \bullet 18H_2O$] readily hydrolyzes reducing alkalinity, producing a gelatinous precipitate; the reaction is:

$$Al(H_2O)_6^{3+} + 3HCO_3^- \rightarrow Al(OH)_3(s) + 3CO_2 + 6H_2O$$

The gelatinous hydroxide precipitate carries suspended solids with it as it settles. Hydrated iron(II) sulfate ($FeSO_4 \bullet 7H_2O$) may also be used as a coagulant, also forming a gelatinous precipitate of hydrated iron(III) oxide. However, to function adequately it must be oxidized to iron(III) by either increasing dissolved oxygen (DO) at a pH higher than 8.5, or by chlorine, which can also oxidize iron(II) at lower pH values.

Some POTWs use natural and synthetic polyelectrolytes as flocculants. Natural flocculants include starch and cellulose, proteinaceous substances, and polysaccharide gums. Synthetic polymers include neutral and anionic and cationic polyelectrolytes. For some POTWs, combined coagulation-filtration is more effective than coagulation alone.The process includes adding coagulants to promote aggregation to larger particles followed by filtration where the filter medium may be sand or anthracite coal. To reduce clogging, several media with progressively smaller interstitial spaces are used. For example, a rapid sand filter, consisting of sand and gravel layers is used with gravel sizes increasing with increasing depth. Coagulated material is removed by the sand but eventually the filter becomes clogged. This material must be periodically removed by back-flushing, which produces a secondary sewage sludge not removed in the initial the settling process; the amount of such material may be significant. Processes designed to remove suspended solids often remove 10 to 20 mg/L of organic matter from secondary sewage effluent. Also, small quantities of inorganic matter (mostly metals) are removed. These solids account for a large part of the biologic oxygen demand (BOD) in the effluent (see below) that may interfere with other aspects of tertiary wastewater treatment, such as clogging of membranes and microfilters used in reverse osmosis (RO) water treatment processes.

Secondary wastewater treatment (SWT) largely involves removal of biodegradable organic matter by biochemical processes.

(continued on page 13)

(continued from page 5)

the ACS to sponsor keynote presentations on Innovations in Chemistry at National meetings through 2013, and the second presentation in the series was made in Denver, entitled "Enduring challenges of

Candidate for Presidient-Elect
Dennis Chamot

ozone depletion and climate change: How planetary chemistry is changing science and society," by Dr. Susan Solomon of the University of Colorado, Boulder, on Monday evening, August 29th. An impressive booklet dealing with, and expanding upon, the same subject, "Our Changing Atmosphere – Discoveries from EOS Aura" was available at the NASA booth in the Exhibition area.

Abstracts of the papers and posters presented at the meeting are archived at www.acs.org and many of the plenary and symposium presentations were recorded and will be available with sequenced slides on the website in the near future. Meeting attendees should check at www.acs.org/meetingcontent.

Data from the ACS Career Fair at the Denver meeting continues to reflect a challenging employment situation for chemistry related careers, but was more positive than in Anaheim in the spring. Comparing numbers reported by the Committee on Economic and Professional Affairs (CEPA) since the downturn in 2008 for the Fall 2008 meeting in Philadelphia, the 2009 meetings in Salt Lake City and DC, the 2010 meetings in San Francisco and Boston, and the 2011 meetings in Anaheim and Denver, the key indicators respectively were: Employers (80, 32, 38, 40, 68, 39, 51), Positions (488, 176, 309, 116, 484, 182, 261), and Job seekers (1024, 504, 787, 1018, 1066, 795, 765). Doing the math, this means for every position available there were 2.1, 2.9, 2.5, 8.8, 2.2, 4.4, and 2.9 applicants respectively over these meetings, a considerable change from the 1960's when there were about four positions available for each applicant. The on-line "virtual" career fair held on the

(continued on page 9)

Candidate for Presidient-Elect Marinda Wu

(Continued from page 8)

Tuesday and Wednesday of the meeting added 3925 job seekers, 14 employers, and listed 362 additional positions. There was also an "Employers" aisle in the Exhibition area where 16 companies had booths specifically set up to connect with job candidates outside of the normal Career Fair job interview process. The Career Services area continues to offer many career related workshops at National meetings, including resume reviews and mock interviews. Our ACS Director, Marinda Wu, and Councilor, Mark Frishberg, continue to volunteer their services for the resume workshop presentations and resume reviews with candidates, respectively

In the exhibition area, the ACS' new major exhibit booth, unveiled in Anaheim, continued to attract large attendance as it pulls together the wide range of ACS exhibitors such as Chemical Abstracts and Scifinder, Publications, Membership, Insurance, etc. all under one roof, complete with a presentation theatre area. The reemergence of the ACS store of chemistry gifts again was popular, as was the International Year of Chemistry (IYC) section.

Four California local sections members, all from Cal-Berkeley, were named among the 213 ACS members honored in the 2011 Class of ACS Fellows: Drs. Robert G. Bergman, Judith P. Klinman, William A. Lester, Jr., and Heino Nitsche.

Report from the Council Meeting and other Society governance activities

California Local Section Councilors, our Board member, and our former ACS President were very active in Denver, representing the section at numerous governance functions including the Board and Chemistry and Public Affairs (Marinda Wu) and ACS committees: Committee on Committees (Bryan Balazs), Community Activities (Sheila Kanodia), Committee on Public Relations and Communication (Attila Pavlath), Local Section Activities (Lee Latimer – Chair), Membership Affairs (Mark Frishberg), Project Seed (Elaine Yamaguchi), and Environmental Improvement (Eileen Nottoli). Councilor Alex Madonik, who is active with the Sustainability Engagement Event (SEE) Action Team, and new Councilor in 2011, Paul Vartanian, also attended.

The Denver Council meeting was a relatively quiet and efficient one. The only controversial issue turned out to be the requested merger of the Divisions of Fuel Chemistry and Petroleum Chemistry to become the single Division of Energy and Fuels. The controversy was not over the merger, but the new name for the Division, which several other Divisions objected to as being too broad and potentially poaching on their membership and efforts in the areas of alternative energies and sustainability. The merger passed by a margin of 53% to 47%. Granting full status to the probationary Division of Catalysis Science and Technology passed with a voice vote and no objections.

Several very useful new member benefits were announced, starting right away or in 2012. See "News you might use" section below for more details.

Many ACS officers and committees commented on the too-numerous-to

(Continued on page 10)

(Continued from page 9)

mention-here activities occurring this year in conjunction with the UN International Year of Chemistry.

Presidential initiatives sponsored by incoming ACS President, Bassam Shakhasiri, for 2012 will be Advancing Chemistry and Communicating Chemistry. He began this focus in Denver by hosting a symposium, co-sponsored by the ACS Committee on Public Relations and Communications, on "Communicating Chemistry to the Public," which featured speakers such as the current Grady-Stack award winner for Interpreting Chemistry for the Public, Theodore Gray, and cookbook chemist author, Shirley Corriher. True to his focus and support, Dr. Shakhasiri introduced this symposium and remained in attendance throughout.

An open discussion session was held during the Council meeting on the subject of what measures the ACS can take to promote a culture for safety in academic laboratories, initiated in response to several recent fatal accidents and other injuries in academic labs. Many members contributed to the discussion, with the key observations that to be most effective, safety training and its application has to be an on-going daily consideration, supported actively by administrations and faculty, and not just brought up in response to an accident and then put on the shelf as the memory fades. A "Safety Culture" Task Force has been established and can be contacted through safety@acs.org.

The Presidential Task Force on Innovation in the Chemical Enterprise, appointed by past ACS President, Joseph Francisco, and led by George Whitesides at Harvard, has just published its report "Innovation, Chemistry, and Jobs – Meeting the Challenges of Tomorrow," containing several recommendations for the ACS: develop an organizational unit to assist entrepreneurs with affordable (free?) help; increase public awareness of the value and importance of early stage entrepreneurship; partner with academic and other relevant organizations to promote interest in entrepreneurial career paths and educational opportunities; and increase advocacy of policies at the federal and state level to improve the business environment. As an initial response, an ACS Entrepreneurship Initiative has been funded. Coincidental, but independent of the above effort, the ACS has just published a Special Discovery Report entitled "The Chemical Manufacturing Industry 2011 and Beyond: An Economic Forecast," which starts with a chapter entitled "What happened? 2008 to present," and then takes it from there.

The Local Section Activities Committee has funded 21 new innovative program grants totaling over $23,000 at this meeting, bringing the total for the year to 48 grants and $89,000. The Bridging the Gap mini-grant program that was initiated to provide grants up to $250 each to help support local section events to engage student members in section activities continues, as does a similar program to support local section IYC activities.

The Division Activities Committee has a similar innovative project grant program for divisions and funded $69,000 in grants. Division grants can be as large as $7500, while the LSAC grants are capped at $3000.

ACS past-President, Joseph Francisco, announced that he has compiled a history of ACS past-Presidents which should soon be made available at wwwacs.org under the "Governance" tab, then "About Us" tab, and then "Presidency."

Looking ahead to San Diego – March 25-29, 2012 The overall meeting theme will be "Chemistry of Life." The charge for advance registration for the meetings in 2012 will be $360.

The Committee on Science and the Division of Business Development and Management will co-sponsor a "Business Plan" writing competition in the area of Biotechnology at the San Diego meeting. Details are still being worked out as to how this will operate.

Beginning with the San Diego meeting, the ACS will now reimburse the expenses for non-Councilors serving on ACS national committees to attend, at one-half the amount currently offered to regular Councilors. No reimbursement for the expenses of non-Councilors to attend National ACS meetings has been offered in the past, save for those

(continued on page 11)

(Continued from page 10)

budgeting for the support of members of the Younger Chemists Committee to insure attracting top young chemists to serve on that committee.

A mentoring program has been established, for newly elected ACS Councilors, intended to match them up with experienced Councilors to help get them up to speed quicker in representing their local sections and divisions and contributing to ACS governance activities.

News you might use

Several new and exciting member benefits were announced by ACS Publications and C&EN. Starting with their membership renewal for 2012, ACS members will be offered access to download 25 free articles and/or book chapters from ACS publications, including the 39 ACS Web Editions, eBooks, and eArchives (the current comparable "Articles on Command" value of $35 each represents a potential savings of $875) per year. Beyond the 25 free articles, additional articles will be available for purchase at a 66% discount compared to the non-members price and will be $12 for journal articles and $5 for C&EN archives. Also, ACS members in good standing will be able to purchase Web Editions subscriptions to ACS journals at a uniform price of $85 per journal up to five per year. Archive access will be available for an additional $85. And, as an extra feature from C&EN, members will be offered free access to the mobile format of the weekly magazine beginning in January 2012, a savings over the normal purchase price of $2.99 per issue. And the app is free. Stay tuned for more complete announcements in your ACS membership renewal package, in C&EN, and at the ACS website.

National Chemistry Week (NCW) will take place the week of Oct. 16th, with the theme "Chemistry - Our Health, Our Future." The theme for 2012, the 25th anniversary year of NCW, will be "Nanotechnology."

Date changed for 2014 Fall meeting in San Francisco – a bit in advance, but for those who may be planning far ahead, the date of this national meeting has been moved from the end of August to two weeks earlier in the month, in response from students and faculty to try to avoid scheduling National meetings during the first week of classes.

A new video series has been launched by the ACS entitled "Spellbound: How Kids Became Scientists." This can be found at www.acs.org/spellbound, the ACS Video Theater on YouTube, and on DVD by request, and features a wide variety of true stories about how well known scientists started on that path through experiences while they were children.

Career forums can be accessed through the career website, generally the 2nd Tuesday of each month, and a webinar of interest to industrial members within small businesses continues to be scheduled for the 4th Thursday of each month http://acswebinars.org).

The ACS has established a roundtable on Research and Sustainable Manufacturing with the objective of offering independent counsel to Congress and other government bodies on critical issues.

Still active are the websites that have been set up to encourage ACS membership recruitment: www.acs.org/memberGetmember; for undergraduates (www.undergrad.ACS.org), graduate students (www.GradStudent.ACS.org), and potential international members (www.international.ACS.org), the latter three containing promotional video clips presented by members of the targeted audiences.

Interesting Statistics

Final attendance figures at Denver were 10,076, which included 6088 regular registrations and 2376 students. The total was significantly smaller than ACS National meetings over the past few years. There were 150 member and 3 exhibitor no-shows whose plans were interrupted by Hurricane Irene. The 7000 technical papers presented was also a low figure for a national meeting. It is expected that the lower combined attendance at the Anaheim and Denver national meetings in 2011, relative to the much larger meetings in San Francisco and Boston in 2010, will equate to a drop of a few thousand members in ACS membership this year, since a certain number of eligible chemists only join the ACS during years when they plan to attend a national meeting in order to take advantage

(continued on page 12)

(Continued from page 11)

of the member discount, and then let their membership lapse in years when they do not plan to attend. Hopefully, the meetings in San Diego and Philadelphia in 2012 will bring them back, although the yo-yo effect may continue in 2013 with meetings in New Orleans and Indianapolis.

Membership in the ACS reached 162,602 as of June 2011, of which student members accounted for 15,702. The total is up 1100 from the same time in 2010, and free memberships are down about 500, but the unpaid member total is up by 2000, the latter number somewhat anticipated as a result of adding student members, and the 2010 National meeting results mentioned above.

Over 850 visitors participated in the 10 hands-on activities at the Denver Natural Science Museum, sponsored by the Committee on Community Affairs on Saturday, Aug. 27th.

Of the 1144 students that have participated in the ACS Scholars program, 535 have graduated from college, 207 are in Ph.D. programs, 99 have obtained their Ph.D. degree, 400 work in industry, and 12 are on college faculty.

The 100th anniversary of Marie Curie's receiving her Nobel Prize in Chemistry, her second Nobel Prize, was celebrated by symposia in the Division of Physical Chemistry, a Science Café presentation in Denver, and as part of the brochure publication of the "Distinguished Women in Chemistry and Chemical Engineering" project honoring 23 women worldwide as part of the IYC celebration and the 2011 IUPAC World Congress.

There are now 80 speakers in the ACS Speakers Service.

The ACS Member Services call center in Columbus, OH, staffed by 12-17 trained workers, handled 60,000 emails, 37,000 phone calls, 1200 voice mails, 57,000 new member financial transactions, 85,000 member profile updates, and 11,000 requests for special dues category processing during the year from July 2010 through June 2011.

The number of colleges and universities offering ACS accredited undergraduate programs is 667.

Two new elements have been confirmed, although the decisions for their symbols and names have not been made.

Submitted by Mark Frishberg, CAL-ACS Councilor, with input from our other Councilors, Board Member, and past ACS-

(Continued from page 3)

section could do in the area of sustainability, whether it be actions related to energy and water usage, industrial or agricultural processes and their associated byproducts, economic factors, or anything else, please email them to Alex via our section email address at office@calacs.org.

(continued from page 7)

Raw wastewater is environmentally harmful because as natural bacteria consume or digest organic matter, they also consume large quantities of Dissolved oxygen (DO); this effect is also known as Biologic oxygen demand (BOD). Therefore SWT decreases BOD by adding additional oxygen to degrade both remaining suspended organic matter (SOM) and dissolved organic matter (DOM) until BOD has been reduced to acceptable levels. The POTW controls optimal bacterial growth under controlled conditions. One such process is by use of a trickling filter where wastewater is sprayed over rocks or other solid support material covered with microorganisms.

In the final SWT stage these microorganisms are removed by chlorination. However, SWT does not remove many disease-causing microorganisms such as protozoa, bacteria, and viruses. Bacteria commonly found in secondary sewage effluent are those causing tuberculosis, dysentery (Bacillus dysenteriae, Shigella dysenteriae, Shigella paradysenteriae, Proteus vulgaris), cholera (Vibrio cholerae), mud fever (Leptospira icterohemorrhagiae), and typhoid fever (Salmonella typhosa, Salmonella paratyphi). Also, viruses may remain that cause diarrhea, eye infections, infectious hepatitis, and polio.

Tertiary wastewater treatment (TWT), also known as advanced wastewater treatment (AWT), normally involves removal of any remaining suspended solids, DOM, and dissolved inorganic matter (DIOM), including algal nutrients. Each presents its own problems with regard to water quality. Any remaining suspended solids will interfere with BOD control. DOM is the most hazardous because of their potential toxicity and DIOM such as nitrates and phosphates may cause additional problems and must be removed. Also, many toxic metals occur with the DIOM.

TWT also requires more advanced disinfection of SWT effluent and chlorination is still the most common form of North American waste water disinfection because of its low cost and long-term history of effectiveness. However, chlorination of residual organic matter can generate harmful and carcinogenic chlorinated-organic compounds such as n-nitrosodimethylamine (NDMA) (see Part 1 of A Chemist's Conundrum, May 2010, *The Vortex*). Residual chlorine is toxic to aquatic species and therefore treated effluent must be chemically dechlorinated, thereby adding to treatment complexity and cost. In AWT to produce some types of recycled water, additional removal methods such as ultrafiltration and RO are used with enhanced oxidation methods such as ultraviolet light and ozonization. These will be discussed in more detail in my next article.

Finally, all of the sludge produced during the three processing stages must be treated and properly disposed. Treatment includes chlorination and dewatering; the remaining "biosolids," were once routinely landfilled or dumped into the ocean, but for many municipalities this is no longer an option because of more stringent environmental regulations. Therefore, other disposal methods have been developed, including biosolid use for fertilizer, soil reclamation, and stabilization, and mixing with coal for solid fuels.

Please check the website, www.calacs.org for information on the up coming Science Cafes and Section events and activities.

SURPRISE

our editor by calling and saying you appreciate the quality and content of our newsletter. Our editor works hard to maintain a publication of interest to our membership. Oh, and by the way you could also give credit to our advertisers who financially support us.

October Historical Events In Chemistry

Leopold May

October 1, 1868 Georg Bredig, a researcher on anomalous atomic weights of lead from different sources, was born on this date. He also did research on the catalytic action of colloidal platinum, the "poisoning" of catalysts, and the preparation of colloids by electrical means.

October 3, 1811 Two hundred years ago on this date, a long article on spontaneous combustion by A. S. (Adam Seyfert) appeared in the Philadelphia newspaper, Aurora: It was the second article submitted by the Columbian Chemical Society.

October 5, 1861 Fifty years ago on this date, The Chemical Society of Union College, the precursor of the American Chemical Society, was founded.

October 7, 1886 One hundred and twenty-five years ago on this date, Neil E.Gordon was born. He was the founder and editor of the *Journal of Chemical Education* and the founder of the Gibson Island Conferences, later known as the Gordon Research Conferences.

October 9, 1718 Pierre J. Macquer who was born on this date, studied platinum (Pt, 78) and discovered arsenates of potassium and sodium.

October 10, 1930 Ernest O. Lawrence invented the cyclotron on this date.

October 14,1886 One hundred and twenty-five years ago on this date, Jacobus H. Van't Hoff presented the law showing that osmotic pressure of a dilute solution obeys Boyle's, Charles's & Avogadro's Laws, and that pV = RT, before the Swedish Academy of Sciences.

October 17, 1873 Lev A. Chugaev**,** who was born on this day, developed complexing agents for analysis, studied inorganic chemistry of metal complexes, and xanthate pyrolysis.

October 18, 1955 Emilo Segrè and Owen Chamberlain discovered a new sub-atomic sub particle, a negative proton or antiproton, on this date.

October 23, 1875 Gilbert N. Lewis, who developed the theories of chemical bond and valency, was born on this date. He also did research in thermodynamics.

October 23, Any Year **Mole Day**, 6.02 a.m. through 6.02 p.m. (Mole time); Mole Moment: 50.453 s after 6.42 p.m.

October 24, 1817 Hippolyte Mège Mouriés discovered margarine, an oral formulation of the drug Copahin used against syphilis, and various patents relating to tanning and sugar extraction. He developed a health chocolate with his calcium phosphate protein and was born on this date.

October 29, 1870 Robert Bowie Owens, who was born on this date, discovered radon and thoron from thorium decay

BUSINESS DIRECTORY

INDEX OF ADVERTISERS

Recruitment

TIME VALUE

CALIFORNIA SECTION
AMERICAN CHEMICAL SOCIETY
2950 Merced St #225 San Leandro CA 9577

Non-Profit Organization
U.S. POSTAGE
PAID

PLEASE DO NOT DELAY - DATED NOTICE INSIDE