THE VORTEX

AMERICAN CHEMICAL SOCIETY CALIFORNIA SECTION
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CALIFORNIA SECTION, ACS
OCTOBER SECTION MEETING
October 27, 2015
USDA in Albany CA
"The Closed-Loop Production of Mango Materials' Naturally Occurring Biopolymer" (How to transform waste into eco-friendly, affordable plastics.)

Date: Tuesday, October 27, 2015. Reception: 5:00 – 6:00 pm, Talk: 6:00-7:00pm.
Speakers: Jack Hardiman and Dr. Andrew Cal
Place: USDA, 800 Buchanan St., Albany, CA 94706.
Cost: $10 for light refreshments to be served from 5:00-6:00pm.
Reservations: email office@calacs.org or 510-351-9922. You may prepay by mailing your check to Cal. Section ACS at 2950 Merced St. #225, San Leandro CA 94577 or pay at door.
Note – Everyone attending must register in advance due to security regulations at USDA – no unregistered walk-ins on the day of the event.

Abstract:

Mango Materials produces biodegradable plastics from waste biogas (methane) that are economically competitive with conventional petroleum-based plastics. Mango Materials uses excess methane gas from facilities such as wastewater treatment plants or landfills to produce pellets of polyhydroxyalkanoate (PHA), a valuable polymer that is converted into a variety of high margin or high volume, eco-friendly plastic products such as children's toys, electronic casings, water bottles, and food packaging containers.

Due to a rising preference for green products from both consumers and government agencies, demand for biodegradable and non petroleum-based plastics is growing rapidly. The competition uses either petroleum, which is low cost but produces non-biodegradable plastic, or sugars, which are expensive but produce biodegradable plastic. In contrast, Mango Materials uses affordable methane gas and a process that competes favorably with petroleum-based plastics to produce low-cost, biodegradable plastics.

Currently, Mango Materials is in the process of scaling up from small bench top reactors to a demonstration facility that will produce commercial samples of PHA. This technology gives methane producers another profitable use for their waste biogas while transforming a greenhouse gas into a valuable commodity. This presentation will discuss the concept of using methane to produce biodegradable polymers and the effort Mango Materials' team is putting into starting a company in the bioplastics space.

Biographies:

Andrew Cal studies the production of PHA copolymers by methanotrophic bacteria as a Postdoctoral Research Molecular Biologist at the USDA's Western Regional Research Center. He has been involved in the collaboration between Mango Materials and the USDA since September 2013. Previously, Dr. Cal was a Postdoctoral Fellow at the International Rice Research Institute in the Philippines where he studied drought physiology. Dr. Cal received his PhD in Molecular Genetics and Cell Biology from the University of Chicago, examining the genetic architecture transcriptome variation in the model plant Arabidopsis thaliana, and his BS in Plant Science from Cornell University.

Jack Hardiman joined Mango Materials in July of 2013. After working for a few years optimizing the bacterial fermentation process and characterizing the biodegradable polymer, he has recently been integrated into the Marketing/Customer Development team. Before his time at Mango, he completed a B.S. in Biochemistry, Biophysics and Molecular Biology from Whitman College.

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Chair's Message

With October, we have started the final quarter of 2015. With summer officially over and fall starting, this is an extremely busy time for CALACS, so let me touch on a number of key items.

First of all, October is a very active month for chemists locally and around the world. One big event this month is the Nobel prize for Chemistry announcement which takes place on October 7. Perhaps several members of our section may be waiting with anticipation for a call from Sweden early that morning. In any event, it certainly is an occasion for the world to recognize the contributions that chemists make to society and to our broader understanding of the world around us. Further, it is also a great time for California section members to think about participating in local section activities such as National Chemistry Week which takes place October 18-24 this year. We have several activities planned where volunteers would be very welcome. Please contact Julie Mason, our office manager at office@calacs.org to volunteer.

Our Executive Committee continues to be quite busy planning new initiatives and wrapping up several that have been ongoing for a number of months. Our objective with these efforts is to further enhance the California section's role in serving its members and providing chemistry education to the public. One initiative has been the revision of the Vision and Mission for the California Section. Marinda Wu has spearheaded that effort, and we are nearly done with the process. A second initiative which will be completed in November, has been the development of a Long Range Plan for the section. This effort has been led patiently and painstakingly by Lou Rigali, our Chair-Elect and a small team of Executive Committee members. One manifestation of that effort is the online, Survey Monkey member survey that you have received. We look forward to your response – again developing meaningful and relevant programming for our members is our primary objective. As members, we all need to participate in helping to develop those activities. Answering the survey is a key step in that process.

Finally, October is also the month that the California Section leadership will finalize the budget for section activities during 2016. Nothing in life is free; as such we are constantly on the search for contributions to finance our programs. Generally, although many of our activities have a nominal charge for participation, that charge usually does not cover the full cost of the activity - the section covers the rest of the cost. During 2015, we have been able to get some

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What's Your Favorite Color? -- The California Section at the 2015 Solano Stroll

The California Section returned to the Solano Stroll on September 13th, 2015, for another busy day of outreach to the public. Well over 100,000 people attend the Stroll, and our booth attracted a constant stream of visitors. The display included NCW and "Chemistry for Life" banners, as well as our poster from the recent ChemLuminary Awards celebration at the Boston national meeting, featuring some of our most successful events from 2014.

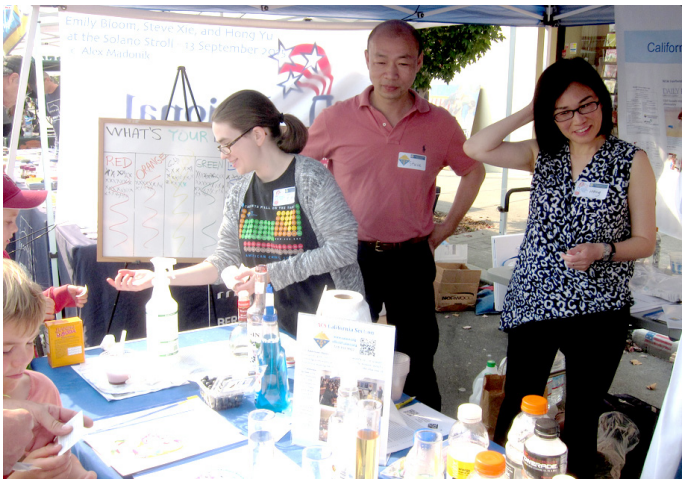
In preparation for National Chemistry Week, we introduced the 2015 NCW theme, "Chemistry Colors Our World." We handed out at least 200 copies of Celebrating Chemistry and invited visitors to try one of the featured activities, adding acids and bases to blueberries or black currant syrup, and observing the color changes. Of course, neutralizing baking soda with vinegar always adds to the fun!

Eileen Nottoli set up a new activity that reveals the sugar content of popular drinks, using hydrometers, which measure density, and therefore sugar concentration. She prepared standard solutions containing two, four, six, or eight teaspoons of sugar per cup, and also filled some empty sports drink bottles with the amount of sugar they would usually contain. Surprisingly, apple juice contains double the sugar of most sport drinks, but Coke contains even more.

In order to keep some record of the number of visitors to our booth, I set up a whiteboard with columns for the colors of the visible light spectrum (Red - Orange - Yellow - Green - Blue - Indigo - Violet, or Roy G. Biv) and our volunteers asked everyone, "What's your favorite color?" Blue was the clear winner. We collected 231 responses, and our volunteers talked with at least 300 to 400 people total. Most of the kids tried their hands at the activities, and their rewards included NCW and "Proud to be a Chemist" stickers, as well as Periodic Table cards.

Thanks again to Charles Lee, Eileen Nottoli, and Elaine Yamaguchi for their help with set up, and to Charlie Gluchowski, Lee Latimer, Soheil Pourshahian, Erin Creel, Iris Young, Margareta Séquin, Hong Yu, Emily Bloom, Dan Calef, and Steve Xie for staffing our booth. Special thanks to Dan who took charge of cleanup. This event was another great opportunity to encourage science education and publicize the work of the California Section.

Alex Madonik,National Chemistry Week Coordinator



Volunteers at the Cal ACS Solano stroll Booth, Left to right, Emily Bloom, Steve Xie, and Hong Yu.

Save The Date November 2015 CALACS Section Meeting

Date: November 12
Venue: Chevron Technology Center, Richmond
Schedule: 5:30 Social time with light snacks and refreshments
6:30 Presentation (1 hour)
Cost: $10
Topic: Thorium nuclear fuel: benefits and challenges
Speaker: Prof. Massimiliano Fratoni
UC Berkeley Nuclear Engineering Department

Summary:

Thorium has been considered as a potential nuclear reactor fuel since the advent of the nuclear industry. Four times more abundant than uranium and with practically no fissile plutonium generated in the fuel cycle, thorium is often praised as a better alternative to uranium. This talk will explain the basic properties of thorium as a nuclear fuel, will review reactor and fuel cycle concepts aimed to use thorium, and will discuss potential benefits and associated challenges.

October Seminar sponsored by Santa Clara Valley Section Tuesday October 27, Register by October 21

"The Story of Light and Single Molecules, From Early Spectroscopy in Solids to Super-Resolution Nanoscopy in Cells and Beyond"

W. E. Moerner, 2014 Chemistry Nobel Laureate

Stanford Professor. W.E. Moerner was awarded the Nobel Prize in Chemistry in 2014 for his work in super-resolution fluorescence microscopy. The three winners of the 2014 prize – Moerner, Eric Betzig of the Howard Hughes Medical Institute, and Stefan Hell of the Max Planck Institute - pioneered techniques that capture optical images on the nanometer scale.

Moerner established himself early in the field of super-resolution spectroscopy at the start of his career in another research institution in the Santa Clara Valley ACS area – the IBM Almaden Research Center. In 1989 he and his IBM group reported measuring the light absorption of a single molecule.

His group at Stanford has extended the 2D and 3D super-resolution imaging into cells, capturing the motion of cellular components in three dimensions in real time. They also study the photodynamics of single trapped biomolecules in solution.

Professor Moerner will speak about the road to the Nobel Prize, how it arose out of spectroscopy at an industrial lab, and the impact of where it is leading.

Registration form can be found at http://scvacs.org/Local_Folder/din_mtg.html or email chair@scvacs.org

The VORTEX Published Articles

by
Bill Motzer

Over the past year several colleagues and friends ask for a list of the articles that I have published in the Vortex. So I compiled the list and was, to paraphrase Captain Renault in Casablanca, "shocked, shocked" to discover that as of the September 2015 issue I had written 75 columns. So here's the list; numbers in bold font indicate back issues of the Vortex available on-line.

No.	Issue Date		Title	Topic Explanation (where applicable)
	Yr.	Month		
1	2006	Nov.	*Perchlorate Revisited*	ClO_4^- contamination and forensics
2		Dec.	*Methylating Mercury*	Methylated compounds of Hg and other elements
3	2007	Jan.	*The Perils of Polonium*	Po forensics
4		Feb.	*Arsenic and Old Poop*	Arsenic in animal feed
5		Mar.	*Radioactive Sleuthing: The "New" Science of Nuclear Forensics*	
6		Apr.	*It's a Biogeochemical World*	Extremophile bacteria and chemistry
7		Jun.	*"Bugging" Bugs: The Science of Bacterial Forensics*	
8		Sept.	*Amalgamating Mercury*	
9		Oct.	*"Valencing" Oxidation States: A Legacy of Erin Brokovitch*	Chemical terminology correct usage
10		Nov.	*Nanites in My Soup*	New nanotechnology chemistry and its potential environmental impacts
11		Dec.	*Where Has All the Carbon Dioxide Gone?*	Geologic history of atmospheric CO_2 concentrations
12	2008	Jan.	*Getting the Lead Out – Part 1*	Lead isotopes in chemical forensics
13		Feb.	*Getting the Lead Out – Part 2*	
14		Mar.	*Getting the Lead Out – Part 3*	
15		Apr.	*Where Has All the CO_2 Gone? Comment and Reply*	Carbon cycle geochemistry
16		Jun.	*Celebrating Concrete – Part 1*	Cement/concrete chemistry and forensics
17		Sept.	*Celebrating Concrete – Part 2*	
18		Oct.	*Celebrating Concrete – Part 3*	
19		Nov.	*Bottling Bubbles and Bucks– Part 1*	Chemistry of mineral and bottled water
20	2010	Jan.	*Bottling Bubbles and Bucks – Part 2*	
21		Feb.	*Bottling Bubbles and Bucks – Part 3*	
22		Mar.	*The Impacts of Impacts– Part 1*	Aspects of climate and ecological changes by asteroid impacts
23		Apr.	*The Impacts of Impacts – Part 2*	
24		May	*The Impacts of Impacts – Part 3*	
25		Jun.	*A Chemists Conundrum – Part 1*	Emerging chemical contaminants in surface and groundwater
26		Sept.	*A Chemists Conundrum – Part 2*	
27		Oct.	*A Chemists Conundrum – Part 3*	
28		Nov.	*Splenda in the Water*	Sucralose in wastewater/groundwater contamination and as a forensic indicator
29		Dec.	*The First Chemists – Part 1*	Ancient Egyptians: beginnings of chemistry and first synthetic dye
30	2011	Jan.	*The First Chemists – Part 2*	
31		Feb.	*The First Chemists – Part 3*	
32		Mar.	*How Rare is Rare – Part 1*	Occurrence/geochemistry of lanthanide

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33		Apr.	*How Rare is Rare – Part 2*	series elements in the Earth's crust
34		May	*How Rare is Rare – Part 3*	
35		Jun.	*The Sanitary Revolution – Part 1*	History and chemistry of drinking and waste water chlorination
36		Sept.	*The Sanitary Revolution – Part 2*	
37		Oct.	*The Sanitary Revolution – Part 3*	
38		Nov.	*California's First Analytical Chemist?*	California's Gold Rush and the "first" nugget analysis
39		Dec.	*Recycling Water – Part I*	Recycled water chemistry and California regulations
40		Jan.	*Recycling Water – Part II*	
41		Feb.	*Recycling Water – Part III*	
42		Mar.	*Mysteries of Chinese Purple – Part I*	Development of the another "first" synthetic dye
43		Apr.	*Mysteries of Chinese Purple – Part II*	
44		May	*Mysteries of Chinese Purple – Part III*	
45	2012	Jun.	*Crusty Chemistry*	Calculating the Earth's crust chemical elements
46		Sept.	*Goldilocks and the Three Zones – Part 1*	On planetary habitable zones (HZ-1), origin, and chemistry of life in the solar system
47		Nov.	*Of Groundwater & Graves*	Cemetery chemical contamination issues
48		Dec.	*Goldilocks and the Three Zones – Part 2*	Continuation of Part 1
49		Jan.	*The Dirt on Dry Cleaning – Part 1*	Solvent use history and contamination chemistry
50		Feb.	*Goldilocks and the Three Zones – Part 3*	On galactic habitable zones (HZ-2)
51		Mar.	*The Dirt on Dry Cleaning – Part 2*	
52		Apr.	*The Impacts of Impacts (Revisited)*	Feb. 15, 2013 Chelyabinsk, Russia asteroid impact
53	2013	May	*Volcanic Violence – Part 1*	Volcanic impacts to the environment
54		Jun.	*The Dirt on Dry Cleaning – Part 3*	
55		Sept.	*The Dirt on Dry Cleaning – Part 4*	
56		Oct.	*The Background on Background*	Definition of background geochemistry
57		Nov.	*The Dirt on Dry Cleaning – Part 5*	Chlorinated solvent plume forensics
58		Dec.	*Saluting Stable Isotopes – Part 1*	Stable isotope use in geochemistry
59		Jan.	*Saluting Stable Isotopes – Part 2*	
60		Feb.	*Methylating Mercury (Revisited) – Part 1*	Revisiting Hg methylation (MeHg) chemistry
61		Mar.	*Goldilocks and the Three Zones – Part 4*	On the universe's habitable zones (HZ-3)
62		Apr.	*Fingerprinting Water – Part 1*	Water quality analysis diagrams
63		May	*Volcanic Violence – Part 2*	Volcanic eruption impacts on atmospheric chemistry
64	2014	Jun.	*Fingerprinting Water – Part 2*	Water balance and water quality chemical analysis diagrams
65		Sept.	*Toxic Terra – Part 1*	Naturally occurring toxic elements and compounds
66		Oct.	*Earthquake Chemistry – Part 1*	Groundwater chemistry and earthquake prediction
67		Nov.	*Saluting Stable Isotopes – Part 3: Osteochemistry*	Chemical/isotope forensics of King Richard III's skeleton
68		Dec.	*Methylating Mercury (Revisited) – Part 2*	Environmental transport/fate of Hg and MeHg
69		Jan.	*Saluting Stable Isotopes – Part 4: Osteochemistry*	Continuation of Part 3
70		Feb.	*Toxic Terra – Part 2: Arsenic*	Arsenic groundwater geochemistry
71		Mar.	*Problems with Prions – Part 1*	Prion disease's potential impacts to soil and groundwater
72	2015	Apr.	*Problems with Prions – Part 2*	
73		May	*Problems with Prions – Part 3*	
74		Jun.	*Volcanic Violence – Part 3*	On super volcano eruptions
75		Sept.	*Toxic Terra – Part 3 Arsenic (continued)*	

REPORT FROM THE ACS NATIONAL MEETING Boston – August 15-21, 2015

Highlights from the Boston Meeting

ACS hosted its 250th national meeting in Boston, traditionally one of our members' favorite locations for a National ACS meeting. A nice compact city with many historical sites, great food, and an extensive and convenient transit system – and the Red Sox were in town the whole week of this meeting. The weather can be pretty hot and muggy in August and a shock for those of us coming from the Bay Area, but it was not too bad this time, unless you got caught outside in the big thunderstorm Saturday night or had a long wait for a shuttle bus in the mid-day sun and humidity.

For California Local Section members this was a very busy and eventful meeting, especially for our two members currently running for National ACS offices. CAL-ACS Councilor and Past Chair Bryan Balazs is running for President-Elect of the ACS (the other candidate is Allison Campbell from the Richland Local Section) and participated in a "Meet the Candidates" event within the ACS Exhibition area on Monday. CAL-ACS Councilor and Past Chair Lee Latimer is running for Director-at-Large (the other candidates being Willem Leenstra, Ingrid Montes, Mary Jo Ondrechen, and Thomas Smith) and participated in the "Meet the Candidates" Town Hall meeting on Sunday afternoon.

In a ceremony Monday afternoon, ACS Past President and Director and former CAL-ACS Councilor and Chair Marinda Wu and CAL-ACS Councilor and Immediate Past Chair Mark Frishberg were honored by their induction into the 2015 Class of ACS Fellows.

CAL-ACS was well represented on Tuesday evening at the ChemLuminary Awards. Elaine Yamaguchi, Sheila Yeh and our other active WCC members should be very proud of their efforts of last year that led to this award which can be found documented in last year's Annual Report. For those CAL-ACS members in attendance, it was especially satisfying to see Elaine's excitement in hopping up on stage to accept the award.

CAL-ACS was a finalist for four other awards: Outstanding Project SEED Program, Local Section Global Engagement Award, Creative & Innovative Use of the Chemists Celebrate Earth Day Theme, and Outstanding NCW Event for a Specific Audience. The overall theme of the Boston meeting was "Innovation from Discovery to Application." As usual a plenary session on Sunday afternoon highlighted and introduced the overall theme, while Division programs related to the theme continued throughout the week. A most memorable plenary talk was surely the one given by Patrick Brown, founder and CEO of Impossible Foods, who described how his Redwood City-based company has developed plant-based foods that look, smell, and taste like ground beef – while his daughter proceeded to grill one of their burgers on the stage and then share it with the speaker and the session chair.

Report from the Council Meeting and other Society governance activities

All CAL-ACS Councilors and our two Past ACS Presidents were present at the Council meeting and participated on National ACS committees. Information on some of the activities of the committees to which they are affiliated can be found below.

The Boston Council meeting was a relatively quiet and efficient one. As usual, there was some dissension over financial matters, such as the advance registration fee for 2016 being raised to $415 and that hard-copy meeting programs would need to be purchased separately, but nothing overly contentious or with extended discussion like there was at the Spring meeting

It was reported that the new meeting abstracts programming system (MAPS), which replaces PACS and was initiated for the Denver meeting, has been improved and several of its glitches removed, although there is still work to be done.

Petitions on bylaws changes covering preferential voting in National ACS elections and expulsion of members were approved.

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In both cases, the Procedures were also approved by a vote contingent on the passage of the relevant Bylaws.

In other actions of note, Council voted to approve petitions to charter International Chapters in Australia, Brazil, Nigeria, Peru, and the United Arab Emirates, subject to Board confirmation. This adds to the current chapters in Hong Kong, Hungary, India, Malaysia, Romania, Saudi Arabia, Shanghai, South Africa, South Korea, Taiwan, and Thailand. The ACS has also chartered 15 International Student Chapters since the initiation of this program last year.

ACS Past President and CAL-ACS member Attila Pavlath read a moving memoriam in the Council meeting to Eli Pearce, former President of the ACS who died recently.

Looking ahead to San Diego – March 13-17, 2016, the overall meeting theme will be "Computers in Chemistry." As noted before, the advance registration fee for this meeting will be $415.

News you might use

Abstracts of the papers and posters presented at the meeting are archived at www.acs.org, and those plenary and symposium presentations that were recorded, with sequenced slides, can be found at www.acs.org/meetingcontent.

A Virtual Career Fair will be held on September 16th for ACS members seeking employment. Check C&EN and the ACS website for more information. Both an on-site and virtual career fair will be held at the San Diego meeting in March.

For members looking ahead to the fall meeting in Philadelphia in 2016, there is a chance that the meeting dates, as presented on our ACS membership cards, could be moved a week later should Philadelphia be awarded the Democratic National Convention, which is in conflict with our current meeting dates. Stay tuned for further updates if you are planning this far ahead.

For members looking ahead to Boston in 2018 or think they may visit Boston at other times, there is now an express bus to and from Logan Airport and the Back Bay/Hynes Convention Center area. Cost is $5 one-way or free if you have a Mass Transit Charlie Card.

The ACS Member Insurance Program is now offering Chemical Educators Legal Liability insurance up to $1 million. For information visit https://acs-aiche.haysaffinity.com and the ACS Comment in the August 31 issue of C&EN.

Any members interested in the latest ACS financial performance can look at www.acs.org, click on the "About ACS" tab at the bottom and then "ACS Financial Information."

Information regarding grants offered by all ACS committees can be found at www.acs.org/getinvolved.

ACS President, Diane Schmidt continues to encourage faculty from Ph.D. granting institutions to give ACS membership as an award for outstanding chemistry students and will match each gift by paying another student's membership from her Presidential funds.

The new 2015 ACS Guidelines for Bachelor's Degree Programs were approved at the winter meeting of the Committee on Professional Training and can be found on the ACS website.

Interesting Statistics

There are now 2050 people who have joined the American Association of Chemistry Teachers (AACT) launched by the ACS last year, over 88% of whom are K-12 chemistry teachers. Dow Chemical Company has provided a gift of $1 Million to become the sole Founding Partner of AACT.

Attendance at the Boston meeting as of the Council meeting was 13,888, including 8129 regular attendees, 3462 students, and 1248 exhibitors. This was slightly less than the spring meeting in Denver, with a larger number of regular members and exhibitors and fewer students. The exhibition was the largest since before the 2008 recession, with 475 booths and 325 exhibiting companies.

ACS ChemCensus data showed domestic unemployment of ACS members increased slightly from 2014, from 2.9% to 3.1%, versus the national average of 5.5%, with very modest salary increases. The

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unemployment rate for new graduates remains high, over 12%. This data is all self-reported and represents a modest percentage of ACS members. For more information, see the reports in C&EN.

The ACS Career Fair finally began to show an increase in recruiting with double the number of employers attending and triple the number of job openings relative to the spring Denver meeting. There were 846 job seekers, 58 employers offering 229 positions, and 12 recruitment booths in the Expo. As a new offering at the Career Fair, professional "headshots" were offered to registrants for use in on-line networking and 513 members took advantage of this opportunity. In conjunction with these activities, as a benefit to members on site, Career workshops were held, along with 444 resume reviews and 254 mock interviews. CAL-ACS members, Mark Frishberg and Marinda Wu, who are ACS Career Consultants, actively participated in these offerings.

ACS membership had a slight decline in 2015 and now stands at 156,251, including 25,989 International members. The retention rate for US members is 84% and for International members it is 85%. Much of the variation is in the joining and dropping of student members and those members in the first five years of their membership.

Submitted by Mark Frishberg, CAL-ACS Councilor, with input from our other Councilors and Past ACS Presidents – September 10, 2015

Editor's note

The report has been edited for space considerations in the *Vortex*, an unedited version is at www.calacs.org

(Chair continued from page 3)

corporate sponsorship for a number of our activities which has been helpful in defraying our costs and keeping the costs low for members to participate. We hope to expand that sponsorship process during 2016 as well. If you are aware of potential sponsors, please pass that info on to me directly – charles.gluchowski@gmail.com. In addition, we welcome contributions to the section from individual members too. Since the National ACS has sent out membership renewal forms to all members, I certainly encourage you to check the box to include a voluntary contribution to our local activities. Alternatively, you may send a contribution directly to the section. As a 501(c)(3), non-profit your contribution may be tax exempt. In addition, it will greatly assist us as we plan member and outreach activities. I look forward to seeing you during our October events. Again, check us out at www.calacs.org.

Gifts & Donations

The Section wishes to acknowledge and thank the following companies and individuals for their donations in supporting the Section's meetings and programs.

Dow
Pharmatek
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Bryan Balazs
Wallace Yokoyama

You can help support the Section's outreach programs through your donations. Call or email and find out how your valued contribution would be used. Lou Rigali LR101898@aol.com

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