

THE VORTEX

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THE TRUST EQUATION

$$\text{TRUST} = \frac{C + R + I}{S}$$

C: CREDIBILITY (THEY KNOW THEIR STUFF)
 R: RELIABILITY (THEY ALWAYS DELIVER)
 I: INTIMACY (I FEEL SAFE WITH THEM)
 S: SELF-ORIENTATION (ARE THEY FOCUSED ON MY INTERESTS OR THEIRS)

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Left: Poster for Event – Jim Postma

Center: Donald MacLean

Right: Presentation by Philip DeShong

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Upcoming Events

Julie Mason, Alex Madonik, Jim Postma, Greti Sequin, and Donald MacLean

1. March 9th – North Bay Science Discovery 10:00 am -4:00 pm - Sonoma County Fairgrounds.

North Bay Science Discovery

March 9, 2024 @ 10:00 am – 4:00 pm America/Los Angeles Time Zone

Sonoma County Fairgrounds

1350 Bennett Valley Rd

Santa Rosa, CA 95404

COST: Free

See: <https://www.northbayscience.org>

North Bay Science Discovery Day returns to Santa Rosa on Saturday, March 9th, 2024, and Cal ACS will be there for one of our favorite public outreach events. Rain or shine, we'll join close to 100 community organizations and companies to present hands-on science to a varied and enthusiastic crowd. **If you're interested in helping out, please contact [Alex Madonik](#).**



2. March 28th – Science Night 5-7 pm- Loyalton Elementary School (K-6), Sierra County. Contact [Greti Sequin](#) if you want to participate.
3. April 20th - Earth Day at the John Muir Historical Site
4. April 22 at 1 p.m. – Northern California Subsection (Chico) – Nobel Laureate Dr, Jennifer Doudna speaking virtually about her success and challenges as a woman in STEM on the pathway and to finding mentorship to help you flourish in your career and life, as well as how these factors shaped her identity as a scientist and ultimately contributed to her inspiring research and life.

Molecular Scale Engineering of Polymer Membranes for Environment, Energy and Health

Hee Jeung Oh, Assistant Professor of Chemical Engineering and Materials Science and Engineering at Penn State University

Thursday, March 28th at noon Pacific Time

Please visit the [Cal ACS web site](#) to register for the Zoom link.

Assistant Professor Hee Jeung Oh of Penn State University will present a free webinar on novel, solvent-free methods for preparing semipermeable membranes used in water purification and time-release pharmaceutical applications.



Abstract

Designing new polymer membranes with a set of previously unachievable transport properties will have an enormous impact on various applications, including energy-efficient separations, energy storage and health-related devices. The advancement of these technologies is dependent on polymer membranes which selectively transport only desired penetrants while maintaining chemical stability. Molecular transport in polymer membranes is greatly influenced by the chemical and morphological structures of polymers. Here two research projects are presented for designing new membranes using charged polymers for improved molecule separations. The transport mechanism in the polymer membranes is studied from the fundamental perspectives of polymer-penetrant interactions and templating diffusion pathways for selective transport of small molecules.

First, solvent-free, melt processed ion-exchange membranes based on sulfonated polymers are presented for water purification and desalination. Most membranes currently used in industry are prepared by solvent processing using large volumes of hazardous solvents. Despite the negative environmental impact, solvent processing is the only method to form thin film membranes on the order of 10-200 nm thickness. In stark contrast to conventional solvent processing, robust ion-exchange membranes based on sulfonated polymers were prepared by solvent-free melt processing, for the first time. The transport of small molecules in resultant membranes is significantly affected by different membrane formation methods.

Second, designing nanostructured polymer membranes for a new emerging biomedical application, “drug capture”, to minimize the toxic side effects of cancer chemotherapy drugs, is discussed. Typically, more than 90% of the injected drug is not trapped in the target organ, causing systemic toxic side effects. We designed 3D printed biosponge absorbers for capturing toxic drugs downstream of tumors before they spread through the body.

Hee Jeung Oh

Hee Jeung Oh is an Assistant Professor of Chemical Engineering and Materials Science and Engineering at Penn State University. The Oh lab designs multifunctional polymer membranes for separations. Specifically, the Oh lab studies the relationship between polymer chemistry, processing, structure, and transport properties for separation science, and explores the influence of a polymer's chemical and physical structures on transport properties such as sorption, diffusion, permeation, and conduction of small molecules in polymers and polymer-based materials. These fundamental studies are critical for designing membranes for liquid, gas and vapor separations, energy storage, selective removal of unwanted molecules from various chemical streams, selective recovery of critical and precious elements, biomedical devices, controlled drug-delivery, and barrier materials for food and packaging. Dr. Oh earned her B.S. in Chemical Engineering from the Korea Advanced Institute of Science and Technology (KAIST). Dr. Oh completed her Ph.D. in Chemical Engineering working in Drs. Benny Freeman's and Donald Paul's research groups at the University of Texas at Austin, exploring a variety of polymeric materials for membrane-based separation, with a particular emphasis on membranes for water purification, and focusing on transport of small molecules such as water and ions in polymer membranes. Dr. Oh first developed solvent-free, melt-processed, robust ion-exchange membranes based on sulfonated polymers, and evaluated water and salt permeation, sorption, and diffusion in the membranes. Her postdoctoral training, working in Dr. Nitash Balsara's research group at UC Berkeley, focuses on designing porous nanostructured polymers for energy storage, as well as a new emerging biomedical application, "drug capture," to minimize toxic side effects of cancer chemotherapy drugs. She first designed and developed a 3D printed absorber for capturing chemotherapy drugs downstream of tumors before they spread through the body and cause the toxic side effects. Dr. Oh has been recognized in honors and awards including 3M Non-Tenured Faculty Award, Young Membrane Scientist Award from the North American Membrane Society (NAMS), Hanwha Non-Tenured Faculty Award, and the University of Texas Professional Development Award. She was invited to National Academy of Engineering (NAE)'s Grainger Foundation Frontiers of Engineering (FOE) Symposium and was selected as one of the two recipients of the National Academy of Engineering (NAE)'s Grainger Foundation Frontiers of Engineering (FOE) grants in 2023.

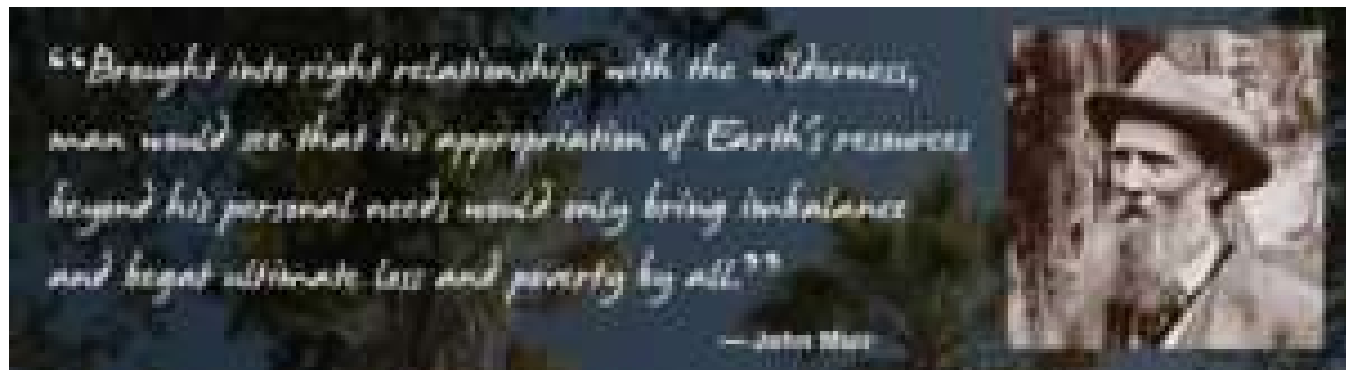
Earth Day At the John Muir Historical Site

By Alex Madonik

April 20, 2024 @ 10:00 am – 4:00 pm

John Muir Historical Site

4202 Alhambra Ave Martinez CA 94553



Celebrating John Muir's 186th Birthday And The 54rd Anniversary Of Earth Day

Cal ACS will be there with hands-on chemistry, featuring the 2024 Earth Week theme,

Get A Charge Out Of Chemistry Recárgate Con La Química

The California Section will join numerous other community and educational organizations for the return of this Earth Day celebration to Martinez. Look for the Cal ACS canopy, where visitors will discover how to build a battery like the one Alessandro Volta invented in 1799. They can also try splitting water by electrolysis, using electricity from photovoltaic panels. And they can make their



own UV light-detecting bracelet using photochromic beads.

If you can help out at the ACS booth, please contact [Sushila Kanodia](#). See you there!

2020 CHEMISTRY NOBEL LAUREATE DR. JENNIFER DOUDNA "HOW BACTERIA TAUGHT US TO CURE GENETIC DISEASE"

PRESENTED BY CSU, CHICO



Dr. Jennifer Doudna
*Li Ka Shing Chancellor's
Professor of Biomedical
Science,
UC Berkeley*

Scan to RSVP!



<https://forms.office.com/r/NCkxwZ3aaJ>

Date

Monday,
April 22, 2024

12:00 pm to 3:00 pm

Location

CSU, Chico

Performing Arts Center

Room 144

Abstract

Fundamental research to understand how bacteria fight viral infections uncovered the function of CRISPR-Cas programmable proteins that detect and cut specific DNA or RNA sequences. I will discuss my personal and professional journey to this breakthrough.

Highlights

Free food, drink, and prize giveaways!

Schedule

12:00 pm: Refreshments

12:30 pm: Women Chemist Panel

12:55 pm: Introduction

1:00 pm: Seminar

1:30 pm: Q&A with Dr. Doudna

1:45 pm: Breakout Group Discussion

2:30 pm: Debrief & Prize Giveaways



California State
University Chico

**Co-sponsored by California Section of the American Chemical Society,
CSU Chico's Women in STEM, & Department of Chemistry and Biochemistry**

Empowering Women in Chemistry: Celebrating International Women's Month

Written by Atefeh Taheri and Edited by Donald MacLean

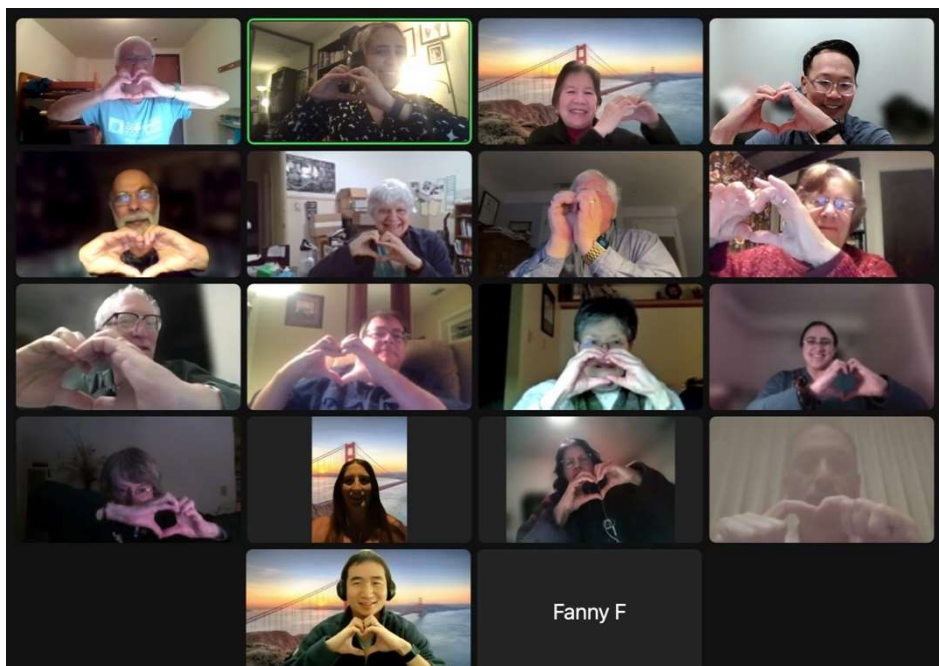
We at the California Section of the American Chemical Society (Cal ACS) are honored to commemorate International Women's Month—a time to celebrate the achievements and contributions of women across the globe. This year, the theme for International Women's Day is "Inspire Inclusion," a call to action for all of us to foster a more inclusive world where women's sense of belonging, relevance, and empowerment is at the forefront.

Last year, we strongly emphasized recognizing the outstanding women in our section. In the March 2023 edition of Vortex, we featured several inspiring women volunteers, highlighting their dedication and impact. I encourage you to revisit these profiles and join us in celebrating their achievements.

In our pursuit of inclusion during the past few years, Cal ACS has forged a meaningful partnership with the Association for Women in Science (AWIS) East Bay. Together, we have collaborated on various initiatives to support diversity, equity, inclusion, and respect (DEIR) in the scientific community. Our partnership with AWIS East Bay is a testament to our commitment to increasing inclusive behaviors and creating a supportive environment for all women in science.

Celebrating Our Executive Committee's Commitment to Inclusion

This month, we're thrilled to share a photograph from our most recent virtual meeting of the executive committee. This image not only captures our committee's dedication to leading with inclusion in mind but also serves as a reminder of our collective responsibility to foster environments where every member feels valued and empowered.



Spotlight on Inclusion in Education: Los Medanos College

We're also proud to feature a photograph contributed by Dr. Nancy Peters and Melina Capes, showcasing students from Los Medanos College. Dr. Peters, a retired chemistry professor and an ACS member for over 35 years, wrote "I have dealt with challenging situations in a male-dominated field. It appalls me that we might lose scientific advances that help all humankind if we exclude some portion of that humankind. Or make it hard for them. Or ignore them. Even more basic, I think it is just fundamental that we treat others as we would like to be treated".



Inspiring Future Forensic Scientists at California State University, Los Angeles

Adding to our celebration, we present a picture from Elena Mosham, Rayana Ramirez, and Marilyn Heidecker in an Analytical Chemistry lab at California State University, Los Angeles. Elena wrote "Here are my lab partners and me aiming to 'Inspire Inclusion.' Our career goals are to be Forensic Scientists. It is important to inspire inclusion as women in STEM who are applying our scientific knowledge to Forensic Science".



March also marks the American Chemical Society National Spring Meeting, which will be held in New Orleans this year. I urge you not to miss the Women Chemists Committee (WCC) events, which include symposia, networking breakfasts, and receptions dedicated to celebrating the achievements of women in the chemical enterprise. These events provide a platform for all chemists to connect, share their experiences, and inspire one another.

Last year, the ACS released its first member-diversity report, providing insight into the society's membership

demographics. According to the report, 67.4% of ACS members are men, 32.4% are women, and 0.2% are nonbinary or self-described their gender. Regarding race and ethnicity, 70.3% of ACS members are White, 19.0% are Asian and Pacific Islander, 4.5% are Hispanic, and 2.9% are Black and African American. The report also highlights that over half of ACS members are 51 or older, and 63.2% have a doctorate or equivalent. This data underscores the importance of our ongoing efforts to embrace and advance inclusion in chemistry.

As we celebrate International Women's Month, let us reflect on the progress we have made and the work that still lies ahead. Let us continue to inspire inclusion, empower women, and collectively strive for a more inclusive world for women in chemistry and beyond.

References:

- 1) International Women's Day 2024: <https://www.internationalwomensday.com/>
- 2) 2023 March Edition of Vortex: <https://calacs.org/2023/03/vortex-march-2023/>
- 3) Association for Women in Science, AWIS East Bay: <https://ebawis.org/>
- 4) ACS National Spring Meeting: <https://www.acs.org/meetings/acs-meetings/spring.html>
- 5) Women Chemists Committee, Programs and Events: <https://acswcc.org/programs-events/>
- 6) Krystal Vasquez (2023), ACS releases first member-diversity report, *C&EN*, 101 (17): 16. <https://pubs.acs.org/doi/full/10.1021/cen-10117-polcon2#>
- 7) Megha Satyanarayana, Marsha-Ann Watson, Nicholas St. Fleur, Darryl Boyd (Feb 27, 2019), Black chemists you should know about, These inventors, educators, and unsung heroes changed lives through their work in chemistry, <https://cen.acs.org/people/profiles/Six-black-chemists-should-know/97/web/2019/02>



Recommended Activity – California Raptor Center at UC Davis

Donald MacLean

This month's recommended science activity visiting the California Raptor Center located on the south side of UC Davis. The location is a bit unique as it is not part of the university building complex and the center is open every day except holidays. The site is operated ad lib or with a tour by prior arrangement. The season will dictate what is going on as the center is a rehabilitation center and the birds on display (ambassadors) are those that cannot be released due to injury.

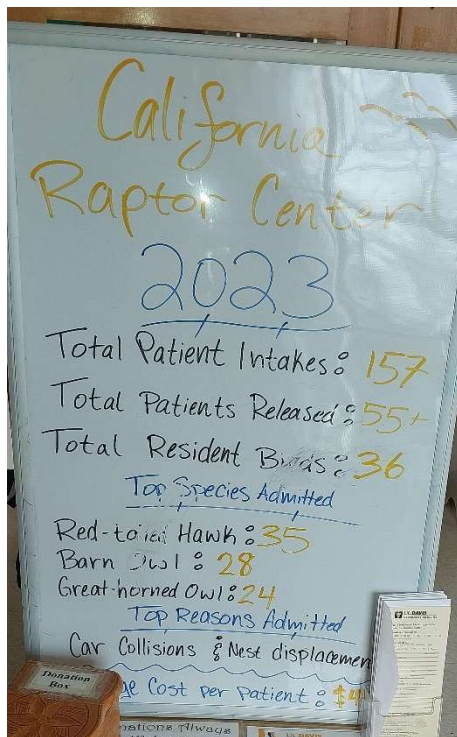


Figure 1. Number of Intakes in 2023 as Displayed in February 2024.

Raptors are birds of prey (predatory) with talons and curved beaks. Most notable raptors are eagles, hawks, falcons, harriers, kites, osprey, owls, and vultures which the center emphasizes. Technically, less notable raptors are woodpeckers, parrots, and songbirds. However, birds that are carnivores that do not use talons to capture animals such as the kingfisher and stork are not considered raptors.

Rescue & Rehabilitation

The California Raptor Center (CRC) is dedicated to the rehabilitation of injured and orphaned raptors. Non raptors are sent elsewhere as the center is not equipped to manage other bird types. The CRC and the UCD Veterinary Medical Teaching Hospital receive about 100-200 injured or ill raptors each year (See Figure 1). Many of the raptors treated are admitted due to adverse contact with human activity (i.e., auto collisions). After treatment, the birds are admitted to the CRC. Through care and rehabilitation about 60% of these birds are released.

A place for learning

The CRC uses un-releasable birds to serve as ambassadors to educate the public about science and conservation. At the CRC, these programs include both public outreach classes and on-site



Figure 2. Education Center Display Match Feather with the Raptor. Note collecting raptor feathers can be illegal without a permit due to federal law. Check Fish and Wildlife Service.²





Diurnal Raptor Comparison Chart				
Type/Shape	Description	Beak	Legs/Feet	Eyes
 <p>Eagles Genus <i>Aquila</i>/Genus <i>Haliaeetus</i> 2 Species</p>	Eagles are our largest raptors. They have proportionally longer wings than other raptors and soar with wings held nearly straight and horizontal. Because of their large size they must have large open areas for hunting i.e., mountains, prairie, lakes, and rivers. They are capable of taking the largest game from spectacular stoops. Two species: Bald Eagle and Golden Eagle. The Bald Eagle is primarily a fish eater. The Golden Eagle takes both birds and mammals.	Eagles have deeper more highly arched beaks.	Eagles have proportionally larger and more powerful legs and feet for catching the largest of prey. The word Raptor means one who seizes by force. Raptors feet work like a ratchet so when prey is held it is difficult to release.	Raptors have a bony protrusion over the eye called the supraciliary ridge that protects the eyes when chasing prey and provides shading like a cap.
 <p>Broad Winged Hawks Genus <i>Buteo</i> 12 Species</p>	Buteos are medium to large size raptors with large heads and robust bodies. They have short tails with broad wings with deeply notched primaries for soaring, which they all do frequently. This genus inhabits just about every type of habitat i.e., forest, mountain, desert, prairie, swamps, urban areas. Four common species: Ferruginous Hawk, Red-tailed Hawk, Red-shouldered Hawk, Broad-winged Hawk. Buteos prey upon mammals primarily but some birds.	Buteos have large beaks but not as large in comparison to eagles.	Buteos toes are short and powerful, suitable for mammalian prey.	Raptors have binocular vision (eyes in the front), which gives sharper vision and two foveas, which are zones of maximum visual sharpness. This is why you see raptors bobbing their head to focus. Their eyes are also larger and flatter than ours, which allows a larger area to be in focus. They have more rods and cones in their retina too.
 <p>True Hawks Genus <i>Accipiter</i> 3 Species</p>	Accipiters are small to medium size raptors with proportionally smaller heads and a slender built. With short rounded wings for very rapid acceleration and a long tail for maneuverability they are ideally suited for hunting in forest. All three species are excellent bird hunters. All raptors have a sexual dimorphism, with females larger than males, but it is more pronounced in the accipiter. Sexual dimorphism help provide for a wider range of prey species for nesting. Three species: Goshawk, Cooper's Hawk and Sharp-shinned Hawk. This group are bird eaters, but the larger Goshawk also includes mammalian prey.	Accipiters have a relatively short and deep beak.	Accipiters have proportionally longer tarsus and long and slender toes with conspicuous bumps underneath for better grasping feathered prey.	Raptors have a transparent nictitating membrane that protects the surface of the eye from scratches.
 <p>True Falcons Genus <i>Falco</i> 7 Species</p>	Falcons are small to medium size raptors with large squarish heads and long pointed wings with tail tapered at the tip. Feathers are hard and compact. Falcons are birds of the open i.e., urban areas, prairie, valleys, fields. Their flight is fast and during their stoops they reach the fastest speeds of any animal. Three common species: Kestrel, Peregrine Falcon, Prairie Falcon. This group is primarily bird eaters but the Kestrel also includes mice and large insects.	Falcons have short wide beaks with a special notch for severing the spinal cord of their avian prey. They have a bony protrusion in the center of their nostril to help them breath when stooping.	Falcons have proportionally shorter tarsus better for striking prey at high speeds and longer toes with conspicuous bumps underneath for better grasping of feathered prey.	Falcons have a more pronounced bare orbital region or eye ring than other raptors. They also have a moustache under the eye presumably to prevent glare.

Figure 3. Part of the Education Center Display.

educational tours. Photography is allowed, but the live ambassador birds images are not good enough to print due to the cage netting and wires affecting the camera autofocus. You must take in the ambience without the camera.

In the museum building, you can search photographs for an owl camouflaged in a tree or match feathers to images of birds of prey while older kids admire the feet and skulls of various raptors (Figure 2). The interesting parts are the taxidermed birds while the most educational are the posters.



Figure 4. Ambassador Bird web page shot – Select on the image and a new story popup will appear.³

The center has volunteer opportunities.

Locations

1340 Equine Lane, Davis, CA 95616 (next to the levee)

Parking not an issue

Cost: Free, open 9 am to 3 pm

References

1. California Raptor Center: crc.vetmed.ucdavis.edu
2. US Fish and Wildlife Service: <https://www.fws.gov/law/migratory-bird-treaty-act-1918>
3. Ambassador Birds: <https://crc.vetmed.ucdavis.edu/our-residents>
4. Sibley Guide to Birds – these are books and posters that are good references.

Talk by Sonya Schuh, Ph. D., on “Toxic Beauty: The Effects of Phthalates and Bisphenols on Human Stem Cells and Embryo Development”, presented at our Women Chemists Committee Meeting on Feb. 10, 2024

By Margareta Sequin

Our first Women Chemists Committee meeting this year featured a captivating talk by Dr. Sonya Schuh, a professor at St. Mary's College, Moraga, California.

The ZOOM meeting that had an attendance of about forty-five people was introduced by WCC Chair Elaine Yamaguchi. She stressed how important it is to network and how the events of the WCC provide a great opportunity to practice networking and to chat with fellow chemistry professionals in a comfortable environment. To enhance this, attendees met in various breakout rooms before the talk presentation. Dr. Yamaguchi stressed how our careers are a process of “becoming” and encouraged the audience to pay also special attention to how the speaker's career developed to becoming a professor.

Dr. Schuh had been interested in science early on. She started her talk by describing her career pathway, from being a student at Humboldt State to graduate school at the University of Washington in Seattle where she completed her PhD in Physiology and Biophysics, focusing on chemical effects on sperm. Later, at Stanford's Stem Cell Biology Institute, she delved into genes and environmental factors affecting human fertility and led the largest study to date on genes linked with ovarian reserve (oocyte number) in women. Following this she continued as a teacher and researcher. She stressed the great contributions of her all-women research team at St. Mary's by pointing out several publications on which they have worked.

Dr. Schuh then focused on her research work there and the theme of her talk of “Toxic Beauty: The Effects of Phthalates and Bisphenols on Human Stem Cells and Embryo Development”. She pointed out how human fertility, male and female, has been going down globally each year, and that exposure to various chemical compounds, including the plastic chemical additives bisphenols and phthalates, have strongly contributed to this effect. Dr. Schuh described how she had first been attracted to her research area by viewing dividing embryo cells, in conjunction with learning about greenhouse emissions, the plastic crisis, and especially about the leaching out of plastic chemicals. These chemical additives can provide durability to plastic materials, enhance the desired softness or rigidity, or hold in fragrances in widespread daily materials in our lives. They can be found in the lining of cans in canned foods, in fast-food packaging, in sports equipment, also in syringes and in plastic tubing, in children's plastic toys, and notably in cosmetics.

Dr. Schuh's research group, a team of hard-working women students (whom she calls her “STEM Chicks”, with her as the self-proclaimed “Science Queen”), investigate the health impacts of endocrine-disrupting chemicals (EDCs), namely bisphenols (BPAs) and phthalates, that had long been known to lead to reduced sperm counts, to female reproductive cancers, and to an increase in miscarriages. EDCs have been common additives in daily beauty products. They have, for instance, been used in many lotions used in cosmetics, also in hair straighteners, which are all consumer products more commonly used by women. Dr. Schuh's research team tests the effects of BPAs and phthalates on chicken embryos and tadpoles, and on human adult female stem cells. The research team has commonly detected and registered the damaging

impacts of BPAs and phthalates as well as of BPA alternatives, finding severe defects and deformations all the way to cell death in their test sample results.

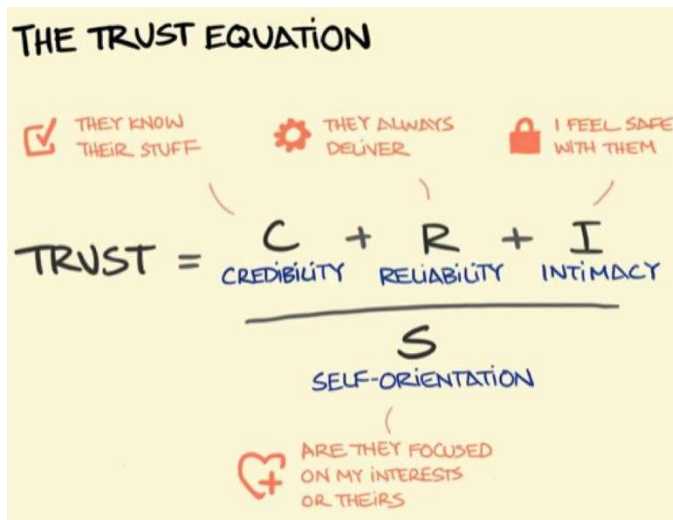
There is little regulation of the use of EDCs in beauty products, many of which contain petrochemical products, where pursuit of profits clashes directly with customers' health concerns. Dr. Schuh concluded her talk by suggesting answers to the question: What can we do? She reminded us to cut down on use of plastics, to reduce intake of fast foods (which are often wrapped in plastic), to avoid excessive use of cosmetics, and to use glass or metal instead of plastic materials whenever possible. She encouraged her audience to be generally proactive, wise consumers.

A lively discussion followed the presentation in which organizations were mentioned that address the problems of toxic additives in daily products, and apps. that provide information about the presence of EDC additives in consumer products.

Review: Introduction to Responsible Conduct of Research (RCR) at Academic Institutions by Philip DeShong

By Alex Madonik

Professor DeShong presented a webinar on Thursday, February 22nd that traced the path from 1981 to the present of government oversight of research integrity leading to the training and reporting requirements of the 2022 CHIPS Act [editor note: the CHIPS Act provided new funding to boost domestic research and manufacturing of semiconductors in the United States] and other recent legislation (NSPM33) [editor note: National Security Presidential Memorandum-33 requires all federal research funding agencies to strengthen and standardize disclosure requirements for federally funded awards].



The entire research enterprise is built on trust. Without it, progress is impossible because it depends on previous results published by others. Traditionally, these values are shared within each research group, where we began our scientific apprenticeships and started building the relationships that are the basis for our professional careers. We heard about notorious examples of scientific misconduct, and we understood that bad actors would be caught when their results could not be reproduced. In his own laboratory, Professor Philip DeShong has always displayed the "Trust Equation" (taken from Charles Green). Clearly, trust is built through good conduct and relationships.

In 1981 the Office of Research Integrity (ORI) was created to actively investigate suspected cases of research fraud. As we learned from Professor DeShong, this was the first step toward more formal regulation of academic research, leading to today's required training in Responsible Conduct of Research (RCR). Key excerpts from his slides:

ORI (1994) mandated that:

- Universities receiving NIH funds must have formal scientific misconduct policy.
- NIH requires training grant recipients (graduate students/postdocs) to receive RCR education in person.

- Today, most federal funding agencies require RCR education for anyone paid with federal funds.

NSPM-33 (Jan. 2022)

"... [support] the values that distinguish the U.S. research enterprise: openness, transparency, honesty, equity, fair competition, objectivity, and democratic participation.

NSPM-33 directs a series of actions for Federal research agencies, with an emphasis on developing standardized policies and practices for disclosing information to assess conflicts of interest and conflicts of commitment among researchers and research organizations applying for Federal R&D awards."

Chips-CHIPS & Science Act (HR-4346; Aug. 2022)

(Sec. 10337)"NSF grant applicants [must receive] training and oversight in the responsible and ethical conduct of research. The section requires such training and oversight to be provided to postdoctoral researchers, faculty, and other senior personnel and requires the training and oversight to include (1) mentor training and mentorship; (2) training to raise awareness of potential research security threats; and (3) federal export control, disclosure, and reporting requirements."

Clearly, these regulations seek not just research integrity but also career equity and, in addition, compliance with export controls and protection of national security. Requirements for the disclosure of conflicts of interest are now explicit. Universities are charged with training students and staff, and with investigating allegations of misconduct. Professor DeShong described specific cases of misconduct, identified faulty mentorship, and the key failure in most cases. Students who lack guidance or supervision may be tempted to cheat. Students who are under too much pressure to complete a project may also be tempted to cheat, with the effective collusion of their mentor.

Over the past two decades, the teaching of Responsible Conduct of Research (RCR, previously called Professional Ethics) has become a regular curriculum item for both undergraduates, graduate students, and dedicated research professionals, including faculty, at academic institutions. Key topics:

- | | |
|---------------------------|-------------------------------|
| • Responsible Authorship | • Data Management & Ownership |
| • Responsible Peer Review | • Conflict of Interest |
| • Mentorship | • Conflict of Commitment |
| • Research Misconduct | • Collaborative Research |
| • Human Subjects | • Financial Management |
| • Animal Subjects | • Biohazards & Biosafety |

Emerging RCR topics include artificial intelligence and authorship, data integrity and management, and reproducibility of biological materials (cell lines, antibodies, reagents).

UMD (University of Maryland) offers a variety of online RCR courses; administration and record-keeping are the responsibility of individual departments, which may also offer more specialized training in relevant issues. In an entrepreneurial environment, conflict-of-interest

is a critical issue. Like many universities, UMD uses online courses and infrastructure provided by CITI (a private company).

During the Q&A, Elaine Yamaguchi mentioned that Project SEED includes training on plagiarism.

Professor DeShong noted that out of the two million research papers published last year, approximately 11,000 were retracted because of plagiarism, which is now easily detected by software. The role of the ACS should be to clarify issues and set standards, especially in publications. Because researchers in industry and in government laboratories tend to work in large teams, the standards are transparent.

My thanks to Professor DeShong for this timely presentation, and to Sushila Kanodia for introducing me to her colleague on the ACS Committee on Ethics. The webinar was recorded, and links to the recording and to Professor DeShong's slides can be found on the Cal ACS web site.

Professor DeShong obtained his B.S. Chemistry with Honors and Special Honors in Chemistry at the University of Texas at Austin and his Sc. D. in Organic Chemistry (with Professor George H. Büchi) in 1971. He joined the University of Maryland as Associate Professor in 1986 and was promoted to Professor in 1990, retiring as Emeritus Professor in 2022.

His research interests include synthesis of nanomaterials with novel optical properties; synthesis and characterization of functionalized nanomaterials for applications in drug delivery, diagnostics, and vaccine development; total synthesis of heterocyclic natural products, development of methodology for organic synthesis, mechanistic organometallic chemistry, synthesis of complex oligosaccharides and glycoprotein derivatives, chemistry of hypervalent silicon derivatives.

