THE VORTEX

The American Chemical Society - California Section Newsletter www.calacs.org

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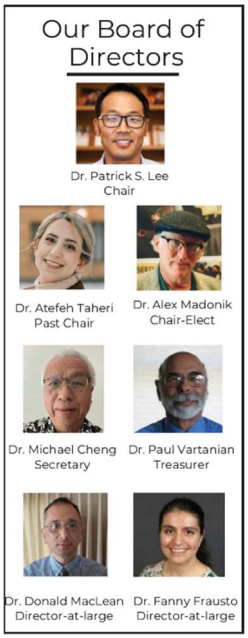
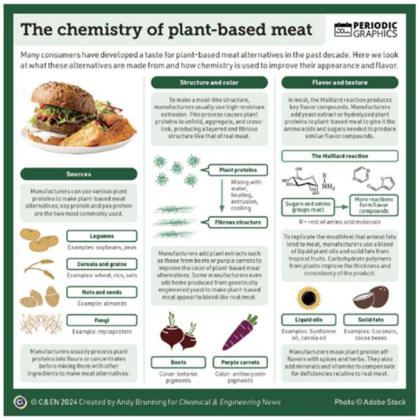
Up Coming Events

News



History, Education, Employment, and Career



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If you have material you think is worthy, submit it to donald.maclean.acs@gmail.com.

Upcoming Events

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

1. February 10th – WCC Winter Meeting- Speaker Sonya M. Schuh, PhD (Organizer: Elaine Yamaguchi). Toxic Beauty: The Effects of Phthalates and Bisphenols on Human Stem Cells and Embryo Development

Abstract

Dr. Schuh's research focuses on reproductive and developmental biology and toxicology. Her talk delves into the prevalent challenges of the current plastics and environmental toxin crisis, and their effects on human health, fertility, and congenital defects. Ubiquitous chemicals like bisphenol A (BPA) and phthalates, present in a wide variety of plastics, cosmetics, personal care, and household products, disrupt hormones and pathways and act as endocrine-disrupting chemicals (EDCs) in the body. Despite efforts over the last several years to replace BPA with alternatives labeled "BPA-Free," Dr. Schuh's work has revealed that these substitutes actually carry similar, and in some cases much worse, toxic risks. She and her all–woman undergraduate research team were recently featured in a docuseries on HBO Max entitled "Not So Pretty," which highlights their research on the toxic and teratogenic effects of bisphenols and phthalates on embryo development. Schuh, a self-proclaimed "Science Queen" and her team of "STEM Chicks," also did testing of chemicals in various beauty products featured by the series. The Schuh lab has since filmed for another upcoming documentary and has published several impactful manuscripts, with this work getting national and global attention. All of Dr. Schuh's recent findings emphasize the potential implications for human health and fertility, especially for women, urging consumer awareness, policy reform, sustainable alternatives, and putting 'people over profit'.

About The Speaker

Dr. Sonya Schuh is a passionate mother, teacher, scientist, artist, athlete, environmentalist, and STEMinist. Originally from San Diego and inland Southern California, she grew up exploring nature, the ocean, and enjoying all things outdoors. An inquisitive bold nature, fascination with life and the natural world, and being the product of educator parents, would eventually lead her to a science career. She earned a BS in Marine Biology and Zoology from Humboldt State University, where she conducted marine research and worked as a Marine Naturalist. She then completed her PhD in Physiology and Biophysics at the University of Washington in Seattle, 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. Joining Saint Mary's College of California in 2013, she initiated a research program on the impact of endocrine disruptors on embryos of various species and animal and human stem cells. Dedicated to teaching and diverse collaborations, her most cherished accomplishment is her three children, inspiring her ongoing commitment to shaping a better world. Dr. Sonya says, "Of all my

accolades and work, my three amazing children are hands-down my best and proudest accomplishments, with my long list of wonderful students coming in second. They all inspire me to continue paving new paths, breaking barriers, challenging status quos, and working towards a better future. We can make a difference by the way we pursue answers and solutions, communicate our work, treat other people, and care for all people and life of this earth. I still have a lot of hope."

Zoom link to be shared with attendees the day of the event.

Please register before Thursday, February 8, 2023, 12 noon. Your email address is needed to send the Zoom link, which will be shared with attendees on or before the day of the event via Brown Paper Tickets.

Please visit the CalACS website www.calacs.org to register for this meeting or use Brown Paper Tickets.

The event is FREE and open to the community. More information: e-mail WCC co-chair Elaine Yamaguchi.

ACS Local Section
Southern California

In conjunction with the Black History Month Celebration, SCALACS invites you to a free Virtual Seminar

TWISTS IN THE TALE: 2D SUPERLATTICES FOR ELECTROCHEMISTRY AND MAGNETISM

FEBRUARY 22, 2024 | **2:00 PM PACIFIC TIME**

presented by

PROF. DANIEL KWABENA BEDIAKO

Assistant Professor of Chemistry,
University of California, Berkeley, CA

RSVP: www.scalacs.org

Superlattice structures are a powerful means of tailoring physical and chemical properties of materials. This talk first will describe how azimuthal misalignment of atomically thin layers produces moiré superlattices that manifest a strong twist angle dependence of heterogeneous electrochemical kinetics in the case of twisted bilayer and twisted trilayer graphene electrodes with the greatest enhancement observed near the 'magic angles'.

In addition, the talk will show how transition metal dichalcogenides intercalated with open-shell transition metals allow fine control over the chemical and electronic structure of a magnetic material to bring about exotic magnetic orders in two-dimensional materials or bulk crystals. (Visit scalacs.org for a detailed abstract, references and bio.)

Professor Bediako's research considers charge transport and interfacial charge transfer in two-dimensional materials and heterostructures. He is also a member of the Editorial Advisory Board of the Journal of the American Chemical Society (JACS).

This is a Southern California Section of the American Chemical Society (SCALACS) event presented under the Diversity, Equity, Inclusion, and Respect (DEIR) grant from the American Chemical Society (ACS) in collaboration with New York ACS Local Section and Nigerian Affiliate International ACS Section.

3. Join CALACS and partners for a free virtual networking event “Catalyzing Diversity in Science” (followed by an in-person Get Together).

For Reservations: Please visit https://calacs.org/event/global-womens-breakfast-gwb2024-catalyzing-diversity-in-science/?instance_id=545 (If attending both the Zoom meeting and the In-Person Get Together for both events separately)

4. 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.**

5. March 28th – Science Night 5-7 pm- Loyalton Elementary School (K-6), Sierra County. Contact **Greti Sequin** if you want to participate.

6. (In planning stage) 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.

Donald MacLean Replaces Attila Pavlath as Director-at-Large

By Donald MacLean

Attila Pavlath has moved to the Atlanta, GA section and has stepped down from his position as Director-at-Large for the California Section. The remaining members of the California ACS Board of Directors selected Donald MacLean to finish out the remainder of Attila Pavlath's term.

The 2 Directors-at-Large have full power to conduct, manage, and direct the business affairs of the Section. Along with the section secretary, treasurer, and the 3 Chairs (chair-elect, chair, past-chair) the Directors' main yearly function is to approve the annual budget. Donald will serve with Fanny Frausto as the two Directors-at-Large. The other Board of Directors members are Michael Cheng (Secretary), Paul Vartanian (Treasurer), Patrick Lee (Chair), Alex Madonik (Chair-Elect), and Atefeh Taheri (Past Chair).

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Chair-elect, Alt Counc. 2025

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Section Admin

Celebrating Black Excellence: The Evolution and Impact of Black History Month

Atefeh Taheri

Black History Month is a significant annual observance that originated in the United States, known as African-American History Month. It is a time dedicated to recognizing and celebrating the achievements, contributions, and history of the Black community, including African American, African Caribbean, Afro-Latinx, biracial individuals, and all members of the African diaspora. This celebration has gained official recognition from governments in the United States and Canada, and United Kingdom.

The inception of what would eventually become Black History Month can be traced back to 1926 in the United States when historian Carter G. Woodson and the Association for the Study of Negro Life and History announced the second week of February as "Negro History Week." The creation of Negro History Week was driven by the recognition of the importance of Black history and the necessity of its inclusion in the national narrative.

By 1970, the observance had expanded from a week to a month-long celebration at Kent State University, thanks to the efforts of Black educators and students. This expansion reflected a growing recognition of the importance of Black history and culture. In 1976, President Gerald Ford officially recognized Black History Month, urging Americans to "seize the opportunity to honor the too-often neglected accomplishments of Black Americans in every area of endeavor throughout our history."

An integral part of Black History Month is acknowledging the contributions of Black professionals in various fields, including science and chemistry. The stories of Black chemists such as Alice Ball (editor's note – leprosy treatment), Percy Julian (editor's note – chemical synthesis of medicinal drugs from plants), and St. Elmo Brady (editor's note - first African American to obtain a Ph.D. in chemistry in the United States, and establishing education program at historically black colleges and universities) highlight the groundbreaking work and achievements that have often been overlooked or omitted from mainstream narratives. Their contributions not only advanced the field of chemistry but also paved the way for future generations of Black scientists. The article "Black chemists you should know about" on the Chemistry and Engineering News website shines a light on these unsung heroes, emphasizing the importance of including their stories in the broader history of science. This acknowledgment serves as a step towards equity, recognizing the significant impact of Black individuals in the scientific community and beyond.

Highlighting the progress and leadership within the scientific community, Dorothy J. Phillips, a distinguished Black chemist was recently elected as the 2024 president-elect of the American Chemical Society (ACS). With a rich history of more than 25 years in various ACS offices, including nine years on its board, Phillips is poised to focus her presidency on building chemistry careers, expanding the reach of ACS's investments in chemistry education, and furthering the society's commitment to

diversity, equity, inclusion, and respect (DEIR). Her election represents a significant milestone, not only for her personally but also as an inspiration for people of color and women in the field of chemistry.

As part of our Black History Month celebration, we also highlight an upcoming event that exemplifies the contributions of Black scientists to the field of chemistry. The Southern California Section of the American Chemical Society (SCALACS) is hosting a virtual seminar on February 22, 2024, featuring Prof. Daniel Kwabena Bediako, Assistant Professor of Chemistry at the University of California, Berkeley. This seminar, part of the DEIR initiative, showcases cutting-edge research in superlattice structures and charge transport in two-dimensional materials, further enriching our appreciation of Black excellence in science (flyer on page 5).

Black History Month serves as a powerful reminder of the contributions, achievements, and resilience of the African diaspora. It is a time for reflection, education, and celebration, encouraging a more inclusive and comprehensive understanding of history. As we continue to acknowledge and honor the contributions of Black individuals across all areas of society, including the sciences, we move closer to a future where diversity and inclusion are not just recognized but celebrated as essential to our collective progress.

In conclusion, it is important to note that at the American Chemical Society, both at the National level and within the California Section, DEIR is among our core values. These principles guide our commitment to celebrating diversity, fostering an inclusive environment, and promoting equity across all areas of our professional and community engagements. Through our continuous dedication to these values, we strive to create a more equitable and inclusive society, honoring the contributions and achievements of all individuals, particularly during Black History Month and beyond.

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Science Experience: Alternative Food Makeup is not Just Protein Based

Donald MacLean

This month's science experience is tasting and cooking non- animal derived nutrition alternatives. This article expands the January 8, 2024 issue of Chemical and Engineering News Periodic Graphics image.[1] The information image only mentions plant-based meat. However, several milk product alternatives based on oat, soy, and almonds are being sold as dairy alternatives. Egg alternatives such as Egg Beaters are liquid eggs with the yolk removed, but there is now an egg like product which uses mung bean as the protein base. Except for the cell cultured meats which have been FDA approved, but are not publicly available as of January 2024, these items can be found at the grocery store. One interesting turnabout is with packaged cereal products where the plant based material is being replaced or mixed with an animal derived product.

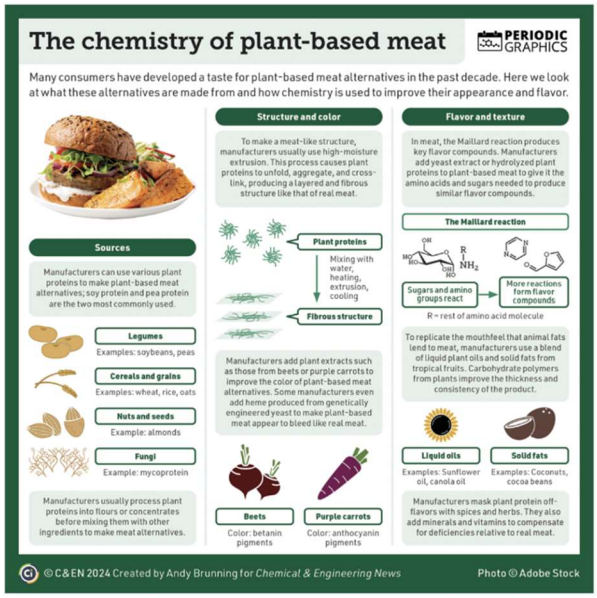

Figure 1. Chemistry of Meat Alternatives.[1]

Traditional animal derived items were modified, substituted, or eliminated but still maintained some animal derived component. Other items were substituted for non-animal derived components and were labeled as nonmeat or nondairy items. Recent non-animal derived products are named cheese, egg, and meat but do not contain dairy, egg, or flesh. These products cost more than their animal derived counterparts.

Product Modification:

Animal derived products can be modified to deal with an issue such as lactose intolerance by adding lactase to the milk to break down lactose into glucose and galactose. Lactose-free milk is sweeter than normal milk. Milk is also sold with varying levels of fat, where the fat is removed then added back at 0% (Nonfat), 1% (Low fat), 2% (reduced fat), and 4% milk fat. Ghee is butter that has had the proteins and lactose removed through heating. Egg Beaters is a product where the yolk is removed, and the resulting egg white product is sold in liquid form. This has health benefits as the cholesterol and lecithin are removed in the process.

Animal Derived Substitution or Reduction:

Substituting ingredients has been a major dietary theme.
Milk has been substituted for cream for those who seek weight reduction. Ice milk (3 to 5% milk fat)[2] contains less fat than light ice cream (5-7.5% fat solid), or regular ice cream (>10% fat solid with lots of sugar), which then affects its creaminess and its abundant ice crystals feel are a giveaway when eating ice milk. Another ice cream trick has been to replace the cream with oil, but again the texture is a giveaway, and the taste difference is noticeable.
Sometimes there is a substitution where one animal source is replaced with another, such as with imitation crab and lobster.

Non-Animal Derived Substitutions:

In the past the focus has been on reduced Calories, sugar, fat, salt, and cholesterol.
Margarine is a butter alternative made from vegetable material rather than milk fat. This results in an unsaturated fat from vegetable sources instead of saturated fats from animal sources.

Tofu is a soybean extract (126 g (half a cup), 21.8% protein, 17.6 mg sodium / serving).[3] This is popular protein source. Another well-known protein source uses a rice and bean combination as this contains protein with sufficient essential amino acids. Mung bean which has 28.9 % protein[4] is also a protein source, best known as the bean filling in Mochi.
Mushroom is sold as a meat substitute. Mushrooms contain mostly water (92.4% water, 3.1% protein) which is quite noticeable when cooking due to extreme shrinkage.[5]

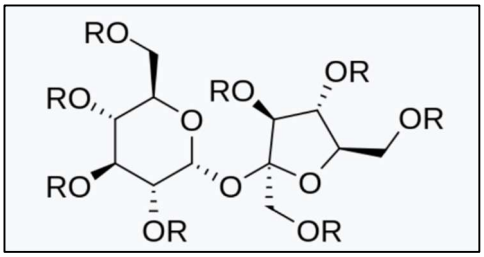

Figure 2. Olestra. Fat substitute that was used in late 1990s.[6] Olestra is a mixture of hexa-, hepta-, and octa-esters of sucrose, replacing the glycerol backbone.

Vegi burgers were meant to be fake meat substitutes, but many times the vegi burgers were obviously fake by their lack of texture and non umami taste.
One famous fat substitute was Olestra, a material that was placed in products in the latter 1990's. Olestra had a positive side effect, reduced blood cholesterol, but was later withdrawn due to its unpopular Gastrointestinal (diarrhea) side effect. Another issue with Olestra was its ability to interact with fat-soluble vitamins that would be excreted with the undigested Olestra leading to a vitamin deficiency. As a result, fat soluble vitamins were added to Olestra containing products.

The last 20 years have seen a new focus for non-animal derived substitute products. This is largely driven by the popularity of vegan diet and organic grown foods. In some cases there are health reasons such as obesity, diabetes, cholesterol, and high blood pressure. What a person eats is driven by what a person is focused on and what side effects are acceptable.

Dietary Definitions:

Vegan – eats no meat or animal products.

Vegetarian – eats no meat, fish, poultry, but can eat dairy, eggs, and honey.

Pescatarian – eats no meat, but fish and aquatic animals are okay.

Lacto ovarian – eats plant-based diet that excludes meat, fish, and poultry but includes dairy and eggs.

Carnivore diet – meat-based diet that can include dairy and eggs, but no produce, nuts, seeds, and legumes.

Atkin's diet – low carbohydrate intake.

Gluten – structural protein found in certain cereal grains.

Keto – low carbohydrate, high fat.

Animal Derived Food Issues:

1. Lactose intolerance – gastrointestinal
2. Cholesterol – Clogged arteries
3. Fat – obesity, clogged arteries
4. Microbial – Listeria in soft cheese, E Coli in grounded meat
5. Antibiotic and hormone pass through – drug resistance and growth development

Non-Animal Derived Substitute Based Food Issues:

1. Gluten can be the basis of imitation meats. Issues with celiac disease (an autoimmune disease) and gluten sensitivities.
2. Beans contain indigestible fiber leading to gastric distress.
3. Alternatives are not nutritionally equivalent and can lack relevant nutrients. Examples are vitamin B-12, zinc, omega fatty acid, iron, calcium, vitamin D found in meat, eggs, and poultry.
4. Allergies to legumes.
5. Taste and texture[7]

Meat Substitute Products:

Beyond Meat[8] – El Segundo, CA

Beyond Meat Product Ingredients			
	Steak	Chicken Tenders	Sweet Italian Sausage
Protein Source	Peas, Mung beans, Faba beans and Brown rice	Faba Bean	Pea and Rice
Flavor Source	Beet juice and Apple extract	Natural Flavors	Apple, lemon, etc.
Fat Source	Cocoa butter, Coconut oil and Canola oil	Coconut oil, Canola oil, Sunflower lecithin	Cocoa Butter, Canola oil
Binder	Potato starch and methylcellulose	Pea Starch	Methylcellulose and food starch
Coating Source		various	

Impossible Burger[9] - Redwood City, CA

Impossible Burger Product Ingredients				
	Beef	Chicken	Pork	Sausage
Protein Source	Soy	Soy	Soy and Potato	Soy
Flavor Source	Heme (iron)	Herbs and seasoning	Heme	Spices
Fat Source	Coconut oil and Sunflower oil	Sunflower oil	Coconut and Sunflower oils	Sunflower Oil Coconut Oil
Binder	Methylcellulose and starch	Methylcellulose and starch	Methylcellulose and food starch	Methylcellulose and food starch
Coating Source		Wheat flour		

Prime Roots[10] – Berkeley – Koji Fungus added with other ingredients. Predominately deli meats. Koji is best known for making miso (seasoning), soy sauce, and amazake (fermented rice drink).

Figure 3. Fungi fermented based meats produced by a local manufacturer. Taste, aesthetics, and texture can come close, but a difference is still noted. Price is high compared to the natural version.

Egg Substitute Products:

Eggless Mayonnaise – Vegenaise, Just Mayo, etc. "Mayonnaise" has to contain at least 65 percent vegetable oil by weight, acidifying ingredients agent such as vinegar and/or lemon juice, and egg yolk-containing ingredients.

Figure 4. Vegan Mayo Spread Ingredients.[11]
Left – avocado oil, water, vinegar salt, potato protein, tamarind gum, konjac gum, rosemary extract, mustard oil.
Right – canola oil, water, brown rice syrup, apple cider vinegar, sea salt, soymilk powder, lemon juice, mustard flour.

Eggless mayonnaise swaps the egg yolk for everything from chickpea, soy protein, or soymilk. Many brands make a vegan and non vegan version.

Just Egg[12] – Alameda - Mung Bean with soy lecithin. Pouring and cooking only allows for scrambled appearance. It sticks to the cooking pan when cooked. This product does not allow for egg white airy whipping used in sponge cakes or meringues. No cholesterol in product.

Egg and Egg Substitute Selected Nutrition Information			
	Real Egg[13]	Egg Beaters Original[14]	Just Egg[12]
Serving Size	1 large egg (50 g)	3 Tablespoons (estimate 28 g)	3 Tablespoons (46 g)
Calories	70	25	70
Cholesterol	185 mg		0 %
Total Fat	5 g	0 g	5 g
Saturated	1.5 g	0 g	0 g
Trans	0 g	0 g	0 g
Polyunsaturated	1 g	0 g	1.5 g
Monounsaturated	2 g	0 g	3 g
Protein	6 g	5 g	5 g
Cost per serving	$0.40	0.25	$0.80

Dairy Substitute Products (No cholesterol, or lactose present):

Almond based milk – A lot of manufactures based in the Central Valley, CA - blend almonds and water with the pulp strained out.

Oat based milk – A lot of manufacturers.

Pea based Milk - Ripple Foods (Made in Canada, distributed by a Berkeley company).

Miyoko's Cultured Vegan Butter – (Sonoma / Petaluma) coconut oil and organic cashew milk. No cholesterol in product.

Butter and Margarine Nutritional Information Comparison to Vegan Butter			
	Trader Joe's Unsalted Butter	Imperial Margarine[15]	Miyoko's Vegan Butter
Serving Size	1 Tablespoon (14 g)	1 Tablespoon (14 g)	1 Tablespoon (14 g)
Calories	100	60	90
Cholesterol	30 mg	None	0 %
Total Fat Saturated Trans Polyunsaturated Monounsaturated	11 g 7 g 0 g Not provided Not provided	7 g 2.5 g 0 g Not provided Not provided	10 g 8 g 0 g Not provided Not provided
Protein	0 g	0 g	0 g
Cost per serving	$0.12	$0.06	$0.50

Cheese - Nobell Foods[16] – (South San Francisco) plant based cheese using genetically engineered soybean casein. Does not contain lactose.

Products not yet available[17]:

1. Upside Foods - (has Emeryville location)[18] – chicken grown from stem cells in a bioreactor - $50 burger. FDA approved 2022, awaiting USDA approval.
2. Good Meat[19] – (Alameda) - chicken grown from stem cells in a bioreactor. FDA and USDA approved July 2023.

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