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Call for 2027 Nominations

Dr. Marie Maynard Daly Award

Presented by the New York ACS Local section

To honor excellence in the profession and in supporting and encouraging individuals from underrepresented groups to pursue careers in the chemical sciences.

ACS Local Section New York

This award honors **outstanding active professionals** in the fields of **chemistry and chemical engineering** who are high achievers in research careers in academic, industrial or government settings, and who have a demonstrated record of successfully mentoring and supporting individuals from underrepresented groups to pursue careers in the chemical sciences The awardee's career path to excellence should serve as an inspirational model for K-12 students, college students and early to mid-career scientists

Nominees need to be active professionals in the United States or United States Territories as well as members of the American Chemical Society in good standing.

Nomination package (nominator's form, nominee CV, and two recommendation letters) should be sent as a single PDF to: Daly-award@newyorkacs.org

Deadline: June 2nd, 2026

About Dr. Marie M. Daly

In 1947 Dr. Marie M. Daly became the first Black woman to receive a PhD in chemistry in the United States (Columbia University). In addition to her outstanding research in Biochemistry (proteins, sugars, and cholesterol) she helped support programs to promote the inclusion of underrepresented groups in the chemistry profession. Learn more by watching this NYACS produced video

Dr. Marie Maynard Daly Award
Call for Nominations

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ACS Local Section New York — ACS Local Section North Jersey

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www.theindicator.org

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THE Indicator

http://www.theindicator.org/

The monthly newsletter of the New York & North Jersey Local Sections of the American Chemical Society. Published jointly by the two sections and distributed to their 6,200 members.

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All views expressed are those of the editor and contributors and do not necessarily represent the official position of the New York and North Jersey Local Sections of the American Chemical Society unless so stated.

March Calendar

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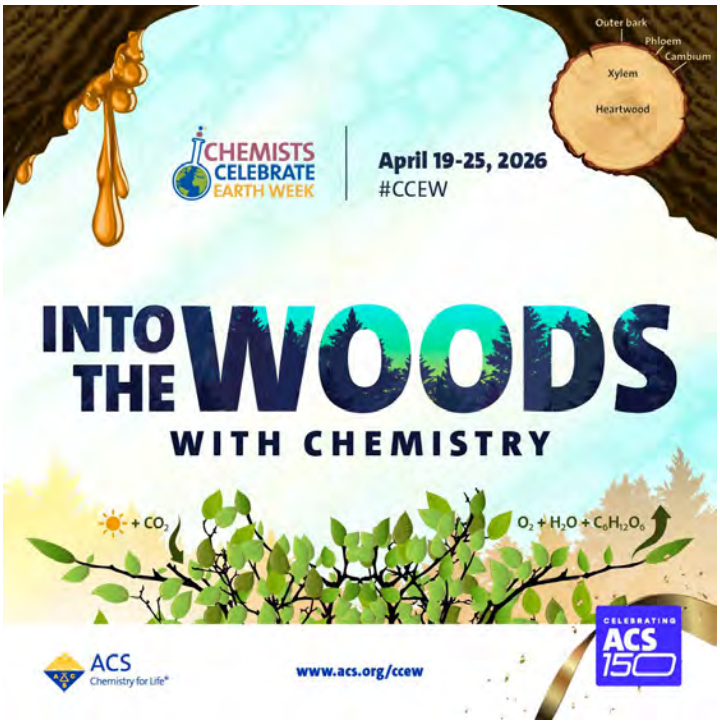

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NEW YORK SECTION MEETINGS

http://www.newyorkacs.online

BOARD MEETING DATES FOR 2026

The dates for the Board Meetings of the ACS New York Section for 2026 have been selected and approved. Please note, the meeting date has changed to Wednesday and all meetings may be joined virtually except for the Nichols Symposium.

The meetings are open to all – everybody is welcome, but an RSVP for in-person attendance is required 5 days before the meeting, the Friday before the Wednesday meeting. All members who would like to attend any of the meetings should inform the New York Section office by emailing Ms. Bernadette Taylor.

All 2026 Board Meetings will be held as hybrid meetings from the CUNY Graduate Center (directions). New York ACS Chair Mr. Joseph Wiener will Chair all meetings. The meetings will start at exactly 6:30 PM.

The board meetings dates are, as follows:

Wednesday, April 1, 2026 (hybrid)

Friday, April 10, 2026 (in person only)
William H. Nichols Symposium and Medal Award Presentation at St. John's University.

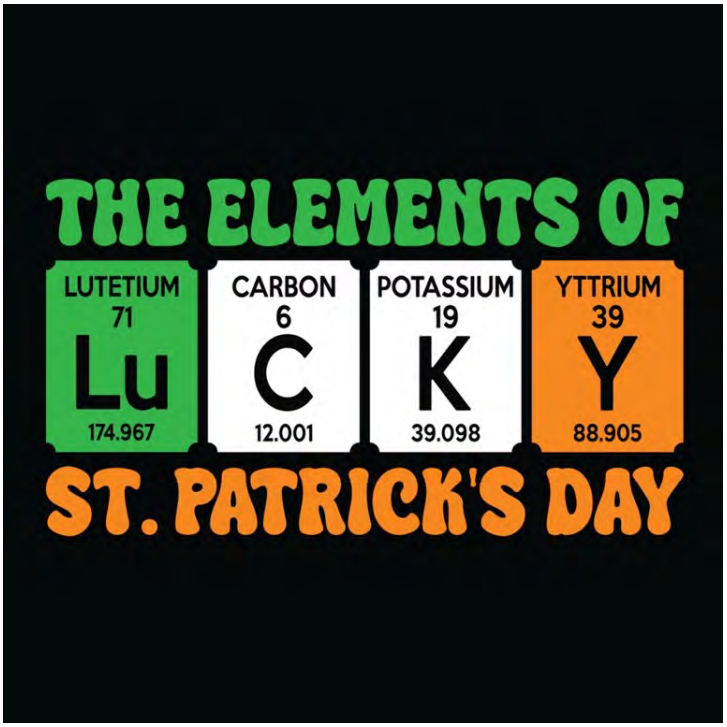
Wednesday, June 10, 2026 (hybrid)

Wednesday, September 9, 2026 (hybrid)

Wednesday, November 4, 2026 (hybrid)

More information will be posted in future monthly issues of *The Indicator* and on the New York ACS website.

5th ANNUAL CHEMISTRY OF LOVE



HUDSON–BERGEN CHEMICAL SOCIETY

27th Annual Student Research Symposium and Award Night

Speaker:	**Junyong Choi, Ph.D.** Queens College – City University of New York
Date:	**Friday, May 1, 2026**
Place:	Dickinson Hall, Room 4468 Fairleigh Dickinson University
Time:	**4:30 PM Student Presentations** **6:00 PM Dinner and Awards** **6:45 PM Plenary Lecture**

Reservations required, Email Dr. Mihaela Leonida by **April 12th**

This is a forum for students and their faculty mentors from colleges and universities that participate in the Hudson-Bergen Chemical Society activities to present the results of their research. Outstanding students, chemistry/biochemistry majors from the participating colleges, are also being recognized (they receive the HBCS Award consisting of a certificate and a gift certificate). All the presenters will receive certificates of participation. Students who wish to make presentations (~10 min each) must send an abstract via e-mail to mleonida@fdu.edu, by **April 12, 2026**. The abstract should be in MS Word (font Times New Roman 12) and must include the names and email addresses of the student(s) and their faculty adviser(s) in addition to the title of the abstract. The abstract should not exceed 200 words. The name of the student presenting the poster should be underlined. There is no registration fee.

This year's symposium also features the lecture:

Computer-Aided Design and Optimization of Novel Inhibitors as Therapeutic Candidates

Junyong Choi, Ph.D.
Department of Chemistry and Biochemistry, Queens College - City University of New York

Abstract: Computer-aided molecular modeling is an efficient and cost-effective strategy for the discovery and development of small-molecule inhibitors in academic settings. This seminar highlights efforts to develop small-molecule inhibitors targeting *Trypanosoma brucei* Replication Protein A1 (TbRPA1) and Casein Kinase (CK1) for the treatment of infectious diseases and cancer, respectively. Specifically, this talk will cover the structure-based design and development of anti-*T. brucei* agent, which exhibits low nanomolar inhibition potency against *T. brucei* and over 2,000-fold selectivity versus human HeLa cells. In addition, a novel small-molecule inhibitor of CK1e was identified through in silico screenings of chemical libraries. This hit was subsequently optimized using molecular modeling, organic synthesis, and biochemical assays, leading to the development of highly potent and selective CK1e inhibitors. Our in-house inhibitors represent promising candidates for further investigation in *in vivo* models of parasitic infection and human cancers. Overall, computer-aided molecular modeling is a powerful technique for the development of therapeutic candidates in medicinal chemistry research.

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- Protein as N2

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- ISE
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LONG ISLAND SUBSECTION

A PCSK9 Vignette: From mRNA Display to Passively Permeable Macrocycles

Speaker: **Dr. Yuhua Huang**
Principal Scientist, Merck & Com. Inc.
Date: **Tuesday, March 17, 2026**
Place: Zoom (registration)
Time: **6:30 PM**

Download flyer here

Abstract:
PCSK9 inhibition is a validated strategy for lowering LDL-cholesterol, yet current antibody therapies require injections, underscoring the need for oral alternatives. Using mRNA display, we identified macrocyclic peptide binders to the PCSK9:LDL-R interface and applied structure-guided optimization to enhance potency, stability, and physicochemical properties, ultimately enabling advancement of the formulation-enabled candidate MK-0616. In parallel, iterative design—incorporating strategies such as cross-linking and targeted reduction of hydrogen-bond donors to promote passive permeability—yielded the first PCSK9 macrocycles with measurable MDCKII/PAMPA permeability and low but quantifiable oral bioavailability.

Biography:
Dr. Yuhua Huang received a Master's degree from the University of Minnesota and a Ph.D. from Rutgers University. As a co-inventor of Victrelis (boceprevir), the first-in-class HCV NS3 protease inhibitor, and narlaprevir, a second-generation protease inhibitor developed by R-Pharm, her contributions were recognized with the Schering-Plough President's Award (2002) and the Thomas Alva Edison Patent Award (2006). Her recent work on delivering high-quality molecules to advance drug discovery across stages and modalities was presented at the 27th American Peptide Symposium in 2022..

LONG ISLAND SUBSECTION

Experimental Approaches to Quantifying Noncovalent Interactions in Solution

Speaker: **Dr. Bright Emenike**
Assistant Professor
Chemistry Department
United States Naval Academy
Date: **Tuesday, April 14, 2026**
Place: Zoom (registration)
Time: **6:30 – 7:30 PM**

Download flyer here

UNDERGRADUATE RESEARCH SYMPOSIUM – CALL FOR ABSTRACTS

The Student Activities Committee of the New York ACS invites all undergraduates to present their research at the 73rd Annual Undergraduate Research Symposium. This year's URS will be held at Queensborough Community College – CUNY on May 2, 2026 from 8:00AM – 2:00PM and will feature a keynote address by Tao Hong, Ph.D, a proud alumnus of Queensborough Community College - CUNY. Registration is FREE.

Abstracts are due April 3, 2026

Metasurface-On-Chip Flow Cytometry for Fluorescence Quantification

Speaker: **Tao Hong, Ph.D**.
Date: **Saturday, May 2, 2026**
Place: Queensborough Community College – City University of New York
Time: **8:00 AM – 2:00 PM**
Registration: Student Presenters
Faculty Mentors
Exhibitors
Guests

Abstract: Fluorescence flow cytometry (FFC) is a fundamental technique in cellular and molecular analysis, yet conventional instruments rely on bulky free-space optics and expert-driven workflows for channel calibration and compensation. We introduce a compact and calibration-free, metasurface-on-chip FC (MOCFC) that replaces filter assemblies or spectrometers with an inverse-designed metasurface array that encodes fluorescence spectra into spatially multiplexed intensity barcodes. We demonstrate statistical profiling of immunolabeled cell populations based on regressed per-fluorophore quantity and extend the approach to multi-cytokine quantification by using a commercial Cytometric Bead Assay (CBA), without the need for channel calibration. By encoding spectral information by a compact on-chip optical metasurface front end and decoding it with end-to-end spectral regression, this metasurface architecture enables quantitative, multi-fluorophore FC in a compact format, opening a promising path toward portable, point-of-care cellular and molecular analysis.

Download Abstract submission instructions and Abstract template file here

WESTCHESTER CHEMICAL SOCIETY

From Sand to Solar Cells: How Glass Changed the World

Speaker: **Mary Virginia Orna, Ph.D.**
Professor of Chemistry, Emerita
College of New Rochelle
Date: **Tuesday, March 3, 2026**
Place: Westchester Community College
75 Grasslands Road
Valhalla, NY 10595
& Zoom
Time: **5:30 PM Coffee Hour**
6:00 PM Speaker

Please contact Peter Corfield at pcorfield@fordham.edu to RSVP for the meeting or if you have any questions.

Download flyer here

Abstract:
This talk will take us on a journey from the legendary discovery of glass on the shores of the Mediterranean to this peculiar substance's impact on our society. Made up of Earth's most abundant elements, it is nevertheless a puzzling oddity. We will look at natural and synthetic glasses, its composition and processing, glass production in Roman and Venetian times, medieval stained glass, the advent of laboratory glassware that enabled the growth of the chemical industry, and finally, how our society depends on glass for so many essential functions.

Biography:
Mary Virginia Orna is Professor of Chemistry, Emerita, College of New Rochelle. She received her Ph.D. in analytical chemistry from Fordham University and has lectured and published widely on the history of chemistry and chemical education. She is an active ACS member, a Past-Chair of the New York Local Section and Alternate Councilor for the ACS Division of the History of Chemistry. She is the author or editor of 22 books and the recipient of numerous awards for her work in chemical education, including the George C. Pimentel National Award and the CASE New York State Professor of the Year and National Gold Medalist in 1989.

WESTCHESTER CHEMICAL SOCIETY DISTINGUISHED SCIENTIST AWARD AND 2026 STUDENT ACHIEVEMENT AWARDS

Speaker: **Columba de la Parra, Ph.D.**
2026 Westchester Chemical Society Distinguished Scientist
Assistant Professor, Lehman College, The Graduate Center, CUNY
Date: **Tuesday, April 28, 2026**
Place: Pace University, Stephen Friedman Room, Wilcox Hall
861 Bedford Road, Pleasantville, NY
Cost: $40 / $ 20 students
Time: **5:15 PM**

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ResMed: Residential School on Medicinal Chemistry and Biology in Drug Discovery

June 8-12, 2026

Sheraton Parsippany Hotel, Parsippany, NJ

ResMed is a week-long graduate level course organized to provide an accelerated program for medicinal chemists, biologists and other industrial and academic scientists who wish to broaden their knowledge of drug discovery and development. The School's aim is to concentrate on the fundamentals that are useful in drug discovery spanning initial target validation through development.

ResMed features lectures and case studies presented by an impressive faculty from a wide range of related disciplines. Attendees are able to network throughout the week with lecturers who are experts in their field.

DREW UNIVERSITY 2026 ResMed

TOPICS INCLUDE

Principles of Med Chem
Drug-like Properties
Hit-to-Lead in Drug Discovery
Lead Optimization
Molecular Modeling
Kinases
Drug Metabolism
Designing Around Problematic Functionalities
Bioisosteres
Covalent Inhibitors
Pharmacokinetics
Enzymology, Receptors & Ion Channels
Molecular Glues
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Co-sponsored by Division of Medicinal Chemistry

2026 WILLIAM H. NICHOLS DISTINGUISHED SYMPOSIUM & AWARD PRESENTATION

HOW HALIDE PEROVSKITES EXPANDED THE FRONTIERS OF PHOTOVOLTAIC SOLAR ENERGY

A distinguished symposium honoring

Professor Mercouri G. Kanatzidis
Northwestern University

for transformative work in halide-perovskite solar cells

Date: Friday, April 10, 2026
St. John's University
Directions

Time: 1:00 PM – 7:30 PM
Register here

Supported in part by the William H. Nichols Fund For Chemistry at the Boston Foundation

Symposium Program (PDF)

1:00 PM **Welcome**
Mr. Joseph Wiener, 2026 New York ACS Chair, PepsiCo

1:05 PM **Greetings from St. John's University**
Professor Teresa Delgado, Dean of St. John's College of Liberal Arts and Sciences

1:10 PM **Opening of the Distinguished Symposium**
Mr. Joseph Ulichny, 2026 New York ACS Chair-Elect, Columbia University

1:15 PM **Electrochemical Approaches for Sustainable Phosphate and Lithium Cycles**
Professor Kyoung-Shin Choi, University of Wisconsin-Madison

Phosphorus is one of the main components of fertilizers and is also essential for various industrial manufacturing processes. While the continued increase in the human population will require greater fertilizer production, global phosphate rock reserves are limited. Furthermore, the mining of phosphate rock, its conversion to phosphoric acid, and the disposal of phosphate-containing waste create multiple environmental concerns. Thus, it is highly desirable to develop cost-effective methods to recycle wasted phosphate into useful chemicals such as H_3PO_4, both to safeguard the supply of phosphorus and to protect the environment. Another element of critical interest is lithium. The growing number of electric vehicles (EVs) powered by lithium-ion batteries (LIBs) will generate a massive amount of spent LIBs in the near future. $LiFePO_4$ has recently become the most preferred cathode material for LIBs in EVs because it is significantly cheaper and safer than other cathodes. Recovering lithium from spent $LiFePO_4$ batteries using conventional methods, however, may not be economically viable

2026 WILLIAM H. NICHOLS DISTINGUISHED SYMPOSIUM & AWARD PRESENTATION (continued)

1:15 PM **Electrochemical Approaches for Sustainable Phosphate and Lithium Cycles**
Professor Kyoung-Shin Choi, University of Wisconsin-Madison (continued)

because, unlike Ni-, Mn-, and Co-based LIB electrodes, $LiFePO_4$ contains no valuable metals other than lithium. In this presentation, we will report new electrochemical approaches that we have been developing to selectively extract phosphate or lithium ions from waste and recover them as high-purity, useful chemicals (e.g., H_3PO_4 for phosphate and Li_3PO_4, Li_2CO_3, and LiOH for lithium). We will present the design and operating principles of electrochemical cells for phosphate and lithium recycling. Finally, we will highlight the sustainable nature of our electrochemical approaches, which minimize the use of chemicals and the generation of waste throughout the process.

1:45 p.m. **Nature's Blueprint: Powering the Planet with Sunlight, Water & Carbon Dioxide**
Professor Aditya Mohite, Rice University

This presentation covers state-of-the-art research in solution-processed perovkite solar cells, where we have demonstrated commercially validated durability through the synergistic combination of 3D and 2D perovskites. We demonstrate state-of-the-art photoelectrochemical reactors for water splitting, which utilize perovskite photovoltaics where we have demonstrated >22% solar-to-hydrogen efficiencies with thousands of hours of on-sun operation. Finally, we make the case for CO2 as an asset and a valuable feedstock for the production of value added products and materials. Non-thermal or cold plasma processes present a the unique capability to perform chemical transformations in a non-equilibrium state, achieving efficiencies beyond those predicted by thermodynamics. One of the most attractive features is the opportunity to linearly scale this technology at flow rates of 100-200 liters per minutes per reactor in-house. These results have inspired the development of the "Plasma Foundry" for scalable decarbonization of industries.

2:15 p.m. **Discovering Compounds and Designing Materials**
Professor Ram Seshadri, University of California - Santa Barbara

In the literature, extended crystalline compounds are sometimes inaccurately labeled materials, but materials are usually compounds that display some useful functionality. Moreover, real materials, when employed in real-world applications, are rarely pure compounds. It is also of historical interest to note that the synthesis of chemical compounds often predates the discovery of the key functionality that would allow the compound to be declared a material, sometimes by decades. It is more often the case therefore, that compounds that have been previously synthesized are screened for their function. I will discuss approaches to the synthesis of new compounds (using examples of halide perovskites and double perovskites), and how computational tools aid in screening these compounds for useful functionality (using magnetocalorics and low-k dielectrics as examples). It turns out to be rarely the case that functional materials are made by design.

2:45 p.m. *Coffee Break*

2026 WILLIAM H. NICHOLS DISTINGUISHED SYMPOSIUM & AWARD PRESENTATION (continued)

3:15 p.m. **Application of Ductile Electronics Strategies to Soft Matter Solar Cells**
Professor Tobin Marks, 2010 William H. Nichols Medalist, Northwestern University

This lecture focuses on the challenging, understanding-based design, creation, and realization of new materials combinations for high-efficiency, environmentally stable, ductile (flexible and stretchable) polymeric organic solar cells (OSCs) which are also manufacturable at low cost and according to green chemical principles. While OSC power conversion efficiencies (PCEs) have now exceeded 20% and environmental stabilities have increased greatly, major materials design issues for next-generation polymer photovoltaic challenges remain and are the focus of this lecture. And it is clear that fabrication methodologies should include high-throughput, large-area, high-resolution printing techniques. Topics to be discussed are: 1. Targeting high-efficiency donor and acceptor materials classes that, among other properties, can be produced economically using established evaluation metrics of the pharmaceutical industry; 2) Developing synthetic methodologies that are environmentally benign (green) and produce materials with minimum structural/electronic defects and good opto-electronic performance; 3) Developing new non-fullerene acceptors that enhance molecular packing, hence PCE and OSC stability; 4) Creating exceptionally ductile OSCs with good PCEs by incorporating functional elastomers or plasticizing non-fullerene acceptors.

3:45 p.m. **Introduction of the Medalist**
Professor Tobin Marks, 2010 William H. Nichols Medalist, Northwestern University

4:00 **How Halide Perovskites Expanded the Frontiers of Photovoltaic Solar Energy**
Professor Mercouri G. Kanatzidis, 2026 William H. Nichols Medalist, Northwestern University

The discovery of halide perovskite materials as exceptional solar-absorbing semiconductors stemmed from the drive to develop more stable, all-solid-state dye-sensitized solar cells. What began as a modest goal led to far more than anticipated, resulting in the emergence of a remarkable new class of photovoltaic devices. Three-dimensional (3D) and two-dimensional (2D) halide perovskites have become standout semiconductors in recent years, known for their excellent carrier lifetimes and structural adaptability. Yet, the roles of Pb^{2+} and Sn^{2+} ions, along with the impact of organic spacer cations on structure and performance, remain areas that demand deeper investigation. Meanwhile, perovskitoids, a related but structurally distinct class of materials, offer expanded design flexibility through even richer structural and compositional diversity. Recent studies have shown that certain organic cations can stabilize these frameworks effectively. This presentation will explore the latest findings on structure–property relationships in halide perovskites and perovskitoids, providing practical insights into the rational design and integration of organic spacers in crystalline semiconductors and optoelectronic devices.

Supported in part by the William H. Nichols Fund For Chemistry at the Boston Foundation

2026 WILLIAM H. NICHOLS DISTINGUISHED SYMPOSIUM & AWARD BANQUET (continued)

4:45 PM **William H. Nichols Medal Award Ceremony**

Presiding;	**Mr. Joseph Wiener** 2026 Chair, ACS New York Section
ACS Greetings:	**To be announced**
Medal Presentation:	**Mr. Joseph Wiener**
Acceptance Address:	**Dr. Mercouri G. Kanatzidis** Nichols Medalist

5:30-7:30PM **Complimentary Reception for all Attendees and Speakers**

REGISTRATION

Online registration using PAYPAL for payment is available at www.newyorkacs.online/nichols_medal

Or use the Tear Off reservation form at this line **RESERVATIONS DEADLINE – APRIL 1, 2026**

MAIL RESERVATIONS TO:
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Student, unemployed, retired	**$20**	_____	$_____
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Tickets will be available for pick up onsite at the registration table.

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Supported in part by the William H. Nichols Fund For Chemistry at the Boston Foundation

NORTH JERSEY SECTION MEETINGS

2026 NORTH JERSEY ACS EXECUTIVE COMMITTEE MEETINGS

2026 North Jersey ACS Chair Mohammed R. Elshaer and the Executive Council welcome you to our monthly NJACS meetings. The meetings are normally held on the second **Wednesday from 6:30 pm to 8:30 pm.** All members are welcome to attend and become more involved in section activities. The initial dates for 2026 are, as follows:

Wednesday, March 18, 2026 (virtual)
Wednesday, April 22, 2026 (hybrid)
Wednesday, May 20, 2026 (hybrid)
Wednesday, June 17, 2026 (hybrid)

For links to the virtual meetings and RSVP for in-person attendance at hybrid meetings, please see our Section Calendar.

NORTH JERSEY ACS MASS SPECTROMETRY DISCUSSSION GROUP

SPRING ACS 2026

NEWS FROM OUR PARTNERS

INTERESTED IN A CAREER IN THE PHARMA INDUSTRY?

The ACS Future Pharma Innovators Program recognizes individuals who are interested in the pharmaceutical industry as a career path. This program provides an industry mentor and a $1500 stipend for travel to the Fall ACS Meeting to present their research and network with other program members and industrial chemists

[Application due March 6]

Submissions for the April 2026 issue of The Indicator are due on March 16, 2026.
http://www.theindicator.org/

INTERESTED IN AN ACADEMIC CAREER?

If you are a postdoctoral fellow interested in a faculty position in the chemical sciences at a college or university, the ACS is offering their Postdoc to Faculty Workshop (P2F) on **July 17-19, 2026** in Washington, D.C. The (P2F) provides postdoctoral scholars interested in pursuing faculty positions at institutions of higher education with guidance and resources to support their job search. The workshop consists of several panel discussions and presentations on topics ranging from finding positions, to the application and interview process, to navigating the first year. Key features include: individual consultations with current faculty, mock interviewing and networking opportunities.

Applications are due April 5, 2026.

[Apply here]

NEWS FROM OUR PARTNERS (continued)

EASTERN ANALYTICAL SYMPOSIUM

NEWS FROM OUR PARTNERS (continued)

CHEMICAL CONSULTANTS NETWORK MEETING

MARCH 11, 2026

BEING A SCIENCE ADVISOR OR BOARD MEMBER

Keith D. Wing, PhD.

DATE & TIME: Wednesday March 11, 2026, 6:30 PM

Click here to register (available in early January)

Location: Online via Zoom! (Registration required)

Abstract: This talk will cover some expected roles and responsibilities for those wishing to act as science advisors or board members. Although my industrial and commercialization experience has mostly involved discovery of agrochemicals, I have had significant exposure to development, registration, launch and product support activities for these and other chemicals and have also been a board member and chair for science-related non-profits and a consultant for various companies. There is no one size fits all, and CCN expertise covers a wide technological range, but we'll review a few fundamentals, followed by open discussion.

Biography: Keith received his BA at UCLA, PhD at UC Riverside/Davis, and post-doc'd at UC Berkeley, finishing 1983. He was a senior research associate and team leader at Rohm and Haas Ag (1983-1990), DuPont Crop Protection (1990-2004) and DuPont Central Research and Development (2004-2012). He then consulted independently in industrial biochemistry and strategic planning (2012-2024). He has served on several nonprofit boards including the Chemical Consultants Network (former chair), the Science History Institute's Joseph Priestley Society, and the Charter School of Wilmington. He is active in ACS and has given many talks and arranged symposia in AGRO.

Click here to register to attend the event. This session is **FREE.**

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NEWS FROM OUR PARTNERS (continued)

SOCIÉTÉ DE CHIMIE INDUSTRIELLE

Webinar
Energy: What Has Happened And Its Impact On Chemicals
Date: Wednesday, March 25, 2026
Time: 1:00 PM

This panel brings a group of senior chemical and energy leaders together to examine how the ongoing volatility in global energy markets is reshaping the economics of chemical manufacturing. With rapid swings in natural gas, power, and feedstock costs, producers are re-evaluating their asset footprints, operating models, and long-term investment priorities. This virtual panel will explore what has structurally changed, how manufacturers are responding to global energy price volatility and macro uncertainty and what executives should prioritize through 2026 to manage risk, protect margins, and remain competitive.

Register here

The Indicator is published online on the 1st of each month (Sept-Jun).
http://www.theindicator.org/

NEWS FROM OUR PARTNERS (continued)

PROTEIN-BASED MEAT ALTERNATIVES FOR A HEALTHY DIET

Contributed by Krishna Kallury, Alternate Councilor, Southern California Local Section
In-reach Subcommittee Chair, National Senior Chemists Committee, ACS

Sustainability and Environmental Concerns of Meat based products

The environmental impacts of industrial-scale meat production include a strain on freshwater reserves, creation of greenhouse gas emissions (20% of total global emissions) that exacerbate climate change, an inefficient use of land, pollution from animal waste, deforestation, and significant loss of biodiversity. The frequency and severity of flooding, droughts, and other extreme weather events are attributed to the effects of climate change.

John Hopkins Center for a Livable Future (CLF) advocates eating less meat and recommend starting with Meatless Monday, a simple and effective first step toward protecting our planet and reducing the demand for meat globally. The following actions are suggested:

- Learn more about the connection between high meat consumption and climate change
- Explore how shifting to healthy lower meat diets would affect climate measures
- Learn about how a worldwide shift from current diets to the EAT-Lancet planetary health diet would have direct but very different implications for agricultural greenhouse gas emissions by country.
- Check out how a meatless day has differential impacts by country
- Read a review of the scientific literature on the roles of reducing animal product consumption and wasted food in meeting climate change mitigation targets, prepared in advance of the United Nations Conference of the Parties 21 (COP21), in this report. The Importance of Reducing Animal Product Consumption & Wasted Food in Mitigating Catastrophic Climate Change (2015)
- Learn from CLF's expertise and insights regarding how best to implement and enhance climate solutions from a food systems and public health perspective
- Explore how diet plans to support weight-loss influence the nation's food-related environmental footprin

Sustainability and Solutions:

- Dietary Shifts: Reducing meat consumption and shifting towards plant-based protein sources (beans, nuts, tofu) significantly lowers carbon footprints.
- Meat Alternatives: Opting for poultry or pork over beef, as well as plant-based alternatives, reduces environmental impact.
- Sustainable Practices: Supporting local, regenerative, or better-managed farming practices can reduce the negative impact of animal agriculture

Choosing between plant-based, vegan, meat-heavy, or hybrid diets depends on health, ethical, and environmental goals

NEWS FROM OUR PARTNERS (continued)

Here is the breakdown to help with your choice:

Plant-Based/Vegan: Focuses on whole grains, fruits, vegetables, and legumes (vegan excludes all animal products). This approach is strongly linked to reducing chronic diseases like cancer and heart disease, and is generally more sustainable.
Meat-Based/Standard: Often higher in saturated fat and calories, requiring more resources (land, water) for production.

Hybrid Diet (Flexitarian/Mixed): Aims to reduce, not eliminate, meat consumption by mixing lentils, nuts, or mushrooms with meat, or choosing "less but better" meat.

Benefits: Offers better sustainability and health benefits than a pure meat diet while retaining the taste and texture of animal products.

Nutritional Impact: Hybrid foods often have more fiber, antioxidants, and lower saturated fat.
Plant-Based Meat Alternatives (PBMAs): Engineered to mimic meat (e.g., Beyond**,** Impossible), providing similar protein but sometimes high in sodium or processed ingredients.

Which to choose?

For maximum health & planet impact: Choose whole-food plant-based.
For flexibility/gradual change: Choose a hybrid/flexitarian diet.
For convenience/meat-lover transition: Choose plant-based meat alternatives (PBMA) or, if you want "best of both," look for products using cultured fat for taste with plant protein.

Sources of protein-based meat alternatives (PBMAs): benefits and drawbacks (cited from Kaplan and McClements, Frontiers in Science 2025, September 30; DOI 10.3389/fsci.2025.1599300)

Alternative proteins derived from various non-animal sources such as plants, mycelium, cultured cells, microbes, and insects are gaining increasing attention due to their potential to address global food challenges. The search for these alternative proteins began in response to the need to establish sustainable food systems to feed the growing global population, as well as rising concerns about the adverse environmental impacts of traditional animal agriculture. Early innovations focused on plant-based solutions, but recent technological advances have led to the possibility of using cultured cells and microbial fermentation as other viable sources of alternative proteins. Details of these newer alternative protein sources and the products derived from each are given below.

NEWS FROM OUR PARTNERS (continued)

Plant based Products

Plant-based meat analogs are generated by blending a variety of plant-derived ingredients, including proteins, polysaccharides, lipids, flavors, pigments, and preservatives. These ingredients may be isolated from a variety of botanical sources, including cereals (such as corn, rice, wheat, barley, and oats), legumes (such as soybeans, peas, chickpeas, lentils, peanuts, and beans), pseudocereals (such as amaranth, quinoa, chia, and buckwheat), nuts (such as almonds, cashews, and hazelnuts), leaves (such as kale, spinach, lettuce, or duckweed), and seeds (such as flax, sunflower, or sesame). In addition, functional ingredients may be isolated from marine "plants" (actually algae) like seaweed (such as carrageenan or alginate) or obtained through microbial fermentation (such as with gellan gum and xanthan gum). Plant-derived ingredients can also be isolated from agricultural or food industry waste streams, which may increase the sustainability of the food supply. It is extremely challenging to create meat analogs entirely from plant-derived ingredients because of the unique composition and structure of animal meat. Whole meat has a complex structural architecture consisting of muscle, adipose, and connective tissues, which is difficult to replicate using only plant-derived ingredients. Indeed, one of the major factors holding back the more widespread adoption of plant-based meat analogs is that they do not accurately simulate the desirable structure, flavor, texture, and mouthfeel of animal meat products.

Mycelium-based Products

Commercially successful meat analogs have been generated using mycoproteins obtained using industrial fermentation processes. These products are mainly created from mycelium (Fusarium venenatum fungus, also used in bread, beer, and yogurt) grown in large bioreactors under appropriate conditions, including temperature, oxygen level, pH, and nutrient composition. A small quantity of mycelia is placed into a bioreactor, where it multiplies over time, leading to a large amount of biomass that can be collected, centrifuged, and then converted into a suitable food product. An RNA removal step is required during the production process, as there are concerns that high levels of nucleic acids in mycelium products could lead to health concerns, such as gout. A major advantage of using mycelium for creating meat analogs is that it naturally has a fibrous structure that is somewhat similar to that found in meat, thereby improving its sensorial attributes. Moreover, mycelium is a good source of proteins, dietary fibers, vitamins, and minerals, and therefore naturally has a good nutritional profile. Nevertheless, there are still challenges in converting mycelium into food products with sensory properties that accurately mimic those of animal meat. Consequently, mycelia are usually combined with other ingredients, including binders, flavors, colors, and preservatives, to better simulate the desirable attributes of meat products. Other meat analogs can be produced from different kinds of mycelia, as they can also provide similar beneficial features as described above. For instance, Neurospora crassa has been used as an ingredient to formulate chicken nuggets.

NEWS FROM OUR PARTNERS (continued)

Cultivated Meat Products (CM)

CM analogs are also created by growing cells within bioreactors under controlled conditions and then harvesting, purifying, and converting them into meat-like products. The difference here is that the cells are the key ingredient in the food product and are used for the nutritional and sensory benefits mentioned earlier. The cells are usually isolated from animals, such as cows, pigs, chickens, or fish, or sometimes from insects. There are several stages involved in the production of meat analogs using this technology: (i) isolate appropriate cells from animal tissues; (ii) proliferate precursor cells in a bioreactor using an appropriate growth medium, which contains nutrients and signaling factors; (iii) control bioreactor conditions so the precursor cells differentiate into the desired animal cell type, such as muscle or adipose tissue; (iv) harvest and wash the cells; and (v) combine the cells with other ingredients (such as plant and microbial fillers, binders, nutrients, flavors, or colors) to generate meat analogs. The bioreactor conditions require tight process control, including of temperature, oxygen levels, pH, osmolality, agitation conditions, and cell densities, to ensure efficient and safe production of the cells. This high level of process control, as well as the requirement for expensive recombinant growth factors to optimize cell doubling times and high cell densities in bioreactors, leads to high production costs. CM products based on immortalized chicken fibroblasts have received regulatory approval in the United States and Singapore, while other companies have pursued bovine and fish sources with regulatory approval still pending. Some products have also been approved in Israel and the United Kingdom for either human or animal consumption.

Microbial-based Products

Rather than eating the whole cells, as is the case for CM analogs, it is possible to utilize precision fermentation methods to produce the proteins and other functional ingredients needed to formulate meat analogs. These methods employ different kinds of microorganisms, including bacteria, yeast, or fungi, to produce these ingredients. Typically, the microbes are grown in bioreactors under optimized nutrient and environmental conditions. As they grow, the microbes produce proteins or other useful functional ingredients, such as lipids, polysaccharides, vitamins, pigments, or flavors, that can be used to formulate meat analogs once they are purified from the complex media and cells. These molecules may be secreted from the microbial cells or remain intracellular. The target molecules can be isolated from the microbial broth, either by simply separating them from the microbes or by breaking the microbial cell walls and then separating them. A series of downstream processing methods may be required to isolate and purify the target molecules, including selective precipitation, absorption, filtration, or centrifugation methods. In some cases, the microorganisms used may naturally produce the desired target molecule. In other cases, they may be genetically engineered to produce the target molecule of interest. In the case of proteins, the approach usually involves creating a DNA sequence that corresponds to the target protein, then inserting it into a plasmid, which is then introduced into the microbial cells. As a result, the target protein is produced by the molecular machinery inside

the microorganisms during the fermentation process. At present, the biggest hurdle facing this precision fermentation technology is the difficulty in economically producing large quantities of the target molecules, due to the yields of target molecule per unit volume as well as downstream purification steps required. For this reason, this approach is mainly used to produce high-value functional ingredients that can be utilized at relatively low levels in foods, such as the leghemoglobin that is used as a pigment in some plant-based burgers or transglutaminase that is used as an enzymatic crosslinking agent in protein-based gels and foods. However, precision fermentation has also been used to produce meat, egg, and milk proteins, which have then been used to formulate food products.

Insect based Products

Despite being uncommon foods in many developed countries, insects are widely consumed in some countries, with over 2 billion people estimated to include them as part of their diets on a regular basis. Insects have many potential advantages as an alternative protein source in the human diet.
Insects used for creating these products include crickets, yellow mealworms, black soldier fly larvas, locusts/grasshoppers and lesser mealworms. These insects are primarily used for their sustainability, offering high protein yields with significantly lower water consumption, feed and space compared to traditional livestock.

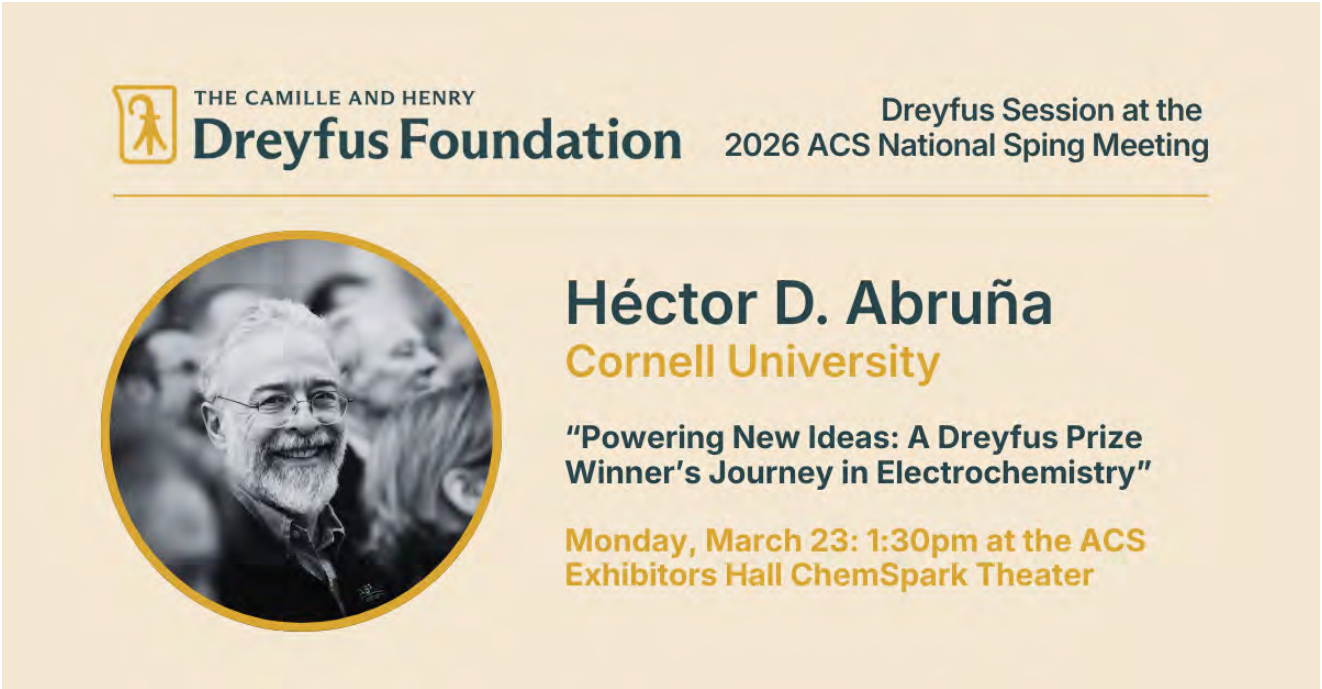
In general, the nutrient profile of insects depends on the species, development stage, and food processing operations used to generate the final food product. Certain insect species have been reported to have high levels of proteins, unsaturated fats, dietary fibers, vitamins (especially vitamin C), and minerals (especially iron and calcium), which means they can be utilized as nutritious alternatives to animal meat. Further, insects can be utilized as whole animal additions to foods, most often as insect flour, while insect cells can be isolated and utilized for CM goals, as described earlier. Of note is that, for CM, insect cells, due to their adaptability to a wide range of environmental variables (e.g., oxygen, nutrients, pH, and temperature), require lower process control than mammalian cells, thus, production costs are significantly reduced. In addition, insect cells have been scaled in the pharmaceutical industry to produce therapeutics, thus, there is precedence for advanced manufacturing. A major hurdle to incorporating insects into the food supply is that consumers in many countries find the idea of eating them highly undesirable. This is partly due to food neophobia (the fear of trying new foods), as well as disgust at the idea of eating insects. To partly overcome this problem, the food industry is developing products that contain insect ingredients but that do not look like the insects themselves. For instance, the insects may be converted into flours or pastes that are then incorporated into foods like protein bars, baked snacks, burgers, nuggets, or sausages. The use of insect cells instead of whole insects can also help to reduce consumer-related insect phobia for food.

NEWS FROM OUR PARTNERS (continued)

A Comparative Evaluation (reference: Trends in Food Science & Technology 2025, 160, 105013)

While plant-based meat alternatives made from a single protein source often provide sustainability benefits, they may lack certain essential nutrients—such as B-group vitamins, Omega-3 PUFAs, and key amino acids (e.g., methionine, lysine, tryptophan, and threonine). Although their overall nutritional impact has not properly been thoroughly assessed within the context of a balanced diet, various strategies are targeted to design plant-based meat analogues with optimized macro- and micronutrient profiles. Hybrid foods present a logical step towards more nutritious and health-conscious food production. They offer an enriched and balanced nutritional profile, combining the positive dietary aspects of animal-based proteins and other alternatives e.g. algae and microbial sources with the well-balanced characteristics of plant proteins, creating a synergy that optimizes the biological value of the final product. For instance, grains and legumes are often rich in amino acids like lysine, while meats provide other essential amino acids, creating products with complete, easily digestible protein These additional nutrients play a crucial role in fighting chronic diseases, such as cardiovascular disease and diabetes, which are common in diets rich in processed red meat.

Hybrid foods can offer greater health benefits than pure plant- or animal-based foods. Notably, fiber content can be increased by incorporating high-fiber plants, addressing a standard limitation in animal-based foods. Additionally, animal-derived ingredients can boost protein levels, amino acids, and vitamins more effectively than plant sources alone. Consequently, a hybrid diet that combines the nutritional advantages of both plants and meat may support a balanced diet with higher fiber intake and enhanced levels of protein, vitamins, and other essential nutrients. This approach may promote improved gut health, support muscle growth, and help prevent nutritional deficiencies.



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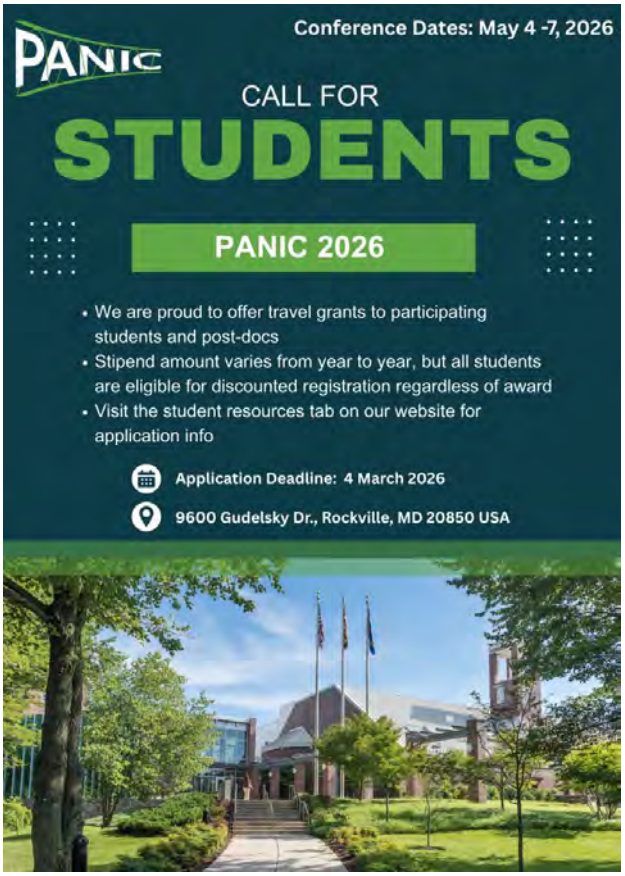

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Call for 2027 Nominations

Dr. Marie Maynard Daly Award

Presented by the New York ACS Local section

To honor excellence in the profession and in supporting and encouraging individuals from underrepresented groups to pursue careers in the chemical sciences.

ACS Local Section New York

This award honors **outstanding active professionals** in the fields of **chemistry and chemical engineering** who are high achievers in research careers in academic, industrial or government settings, and who have a demonstrated record of successfully mentoring and supporting individuals from underrepresented groups to pursue careers in the chemical sciences The awardee's career path to excellence should serve as an inspirational model for K-12 students, college students and early to mid-career scientists

Nominees need to be active professionals in the United States or United States Territories as well as members of the American Chemical Society in good standing.

Nomination package (nominator's form, nominee CV, and two recommendation letters) should be sent as a single PDF to: Daly-award@newyorkacs.org

Deadline: June 2nd, 2026

About Dr. Marie M. Daly

In 1947 Dr. Marie M. Daly became the first Black woman to receive a PhD in chemistry in the United States (Columbia University). In addition to her outstanding research in Biochemistry (proteins, sugars, and cholesterol) she helped support programs to promote the inclusion of underrepresented groups in the chemistry profession. Learn more by watching this NYACS produced video

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