

On August 21 we go to Space!

ACS President recommends PMSE - CME Joint Symposium

PMSE Advances in Human Space Exploration

Chemistry for Humanity's Next Big Leap

Registration: cmeacs.org

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ACS NY Section
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CME Lectures August 21, 4-6 pm

Dr. Robert Langer, MIT
Dr. Emily Carter, Princeton
Dr. James Green, NASA

Limited free ACS Journal T-shirts

The Westin Boston Waterfront

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CELL NUCL
CHAL ORGN
CHAS PHYS
CHED POLY
CINF PMSE
COLL PROF
COMP SCHB

IMAGE: JAMES VAUGHAN

PMSE Advances in Human Space Exploration

Tuesday, August 21, 2018 • The Westin Boston Waterfront



In association with
NASA



Bringing together Industry, Academia, Government and the Public

Cutting-edge developments in the chemical sciences to advance human space travel to Mars and translate them into new knowledge for the benefit of Earth and its people.

One Day packed with Research, Industry, Jobs

8:30 am – 11:35 am

Advanced Materials & Manufacturing, Organic Solar Cells, Wearable Electrochemical Sensors, Nano-Scale Sensing

1:00 pm – 3:45 pm

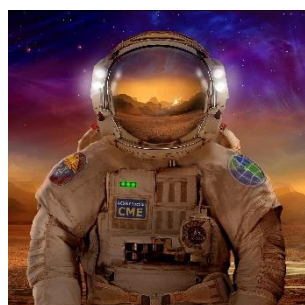
Robust Polymer Brushes Grafted from Gold Surfaces, Nanomaterials for Aerospace, Panel: Industry Quest for more Capability in Smaller Systems, Jobs. Aerojet Rocketdyne, JPL

4:00 pm – 6:00 pm

CME Lectures and Leadership Awards: featuring MIT Professor Dr. Robert Langer, Princeton Dean of Engineering Dr. Emily Carter, NASA's Chief Scientist Dr. James Green

6:30 pm – 8:30 pm

CME Reception



ACS Primary Sponsoring Division: Polymeric Materials Science and Engineering (PMSE)

Organizers: Qinghuang Lin, George Rodriguez, Charles Brumlik

Endorsements: 2018 ACS President Peter Dorhout, 2019 ACS President Bonnie Charpentier, 2017 ACS President Allison Campbell, NASA, the Chemical Marketing & Economics (CME) Group of the ACS New York Local Section

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The CME Lectures includes limited complimentary ACS Journal T-shirts.

Symposium Registration: This Symposium is Free for ACS National Meeting Registrants. So ACS can send you program updates and assure right-sized rooms, register for the Symposium and Reception at cmeacs.org.

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December 4, 2018

PMSE Advances in Human Space Exploration

Tuesday, August 21, 2018 • Full-Day Program • The Westin Boston Waterfront



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Morning Research Session (8:30 - 11:50) - Grand Ballroom D - Concourse Level			
8:30	Qinghuang Lin	IBM Master Inventor, PMSE Past Chair	Opening Remarks
8:35	Michael Meador	NASA Glenn Research Center, POLY Vice Chair	Needs and opportunities in the development of advanced materials and manufacturing methods for future long-duration human space exploration
9:05	Jillian Buriak	U of Alberta, Chemistry of Materials Editor-in-Chief	Optimization of organic solar cells through experimental design and machine learning
9:35	Joseph Wang	UCSD, ACS Nano Editorial Advisory Board	Wearable electrochemical sensors
10:05	Paul Weiss	UCLA, ACS Nano Editor-in-Chief	Opportunities for and advantages of atomically precise structures
10:35	Michael Sailor	UCSD, ACS Sensors Associate Editor	Harnessing the chemistry and physics of silicon nanomaterials for micro and nano sensing devices
11:05	Rigoberto Advincula	Case Western, Reactive and Functional Polymers Editor	Polymers and manufacturing: a space flow chemistry perspective
11:35	End		
Afternoon Research & Industry Session (1:00 - 3:40) - Grand Ballroom D - Concourse Level			
1:00	Peter Dorhout	ACS President	Opening Remarks
1:05	Charles Brumlik	Nano-Biz Principal, ACS NY CME Vice Chair	Introduction
1:10	Randall Lee	U of Houston, Applied Nano Materials Deputy Editor	Robust and thick polymer brushes grafted from gold surfaces using bidentate thiol-based initiators
1:40	Younan Xia	Georgia Tech, ACS Applied Nano Materials Editorial Adv.	Advanced nanomaterials for aerospace and related applications
2:10	Intermission		
2:25	Bibi Campos-Seijo	C&EN Editor-in-Chief	Industry panel moderator remarks
2:30	Torrey Radcliffe	Aerospace Corporation Principal Director of Technology	Panelist, Aerospace Corp. overview and the quest for more capability in smaller systems
2:50	Joe Cassidy	Aerojet Rocketdyne, Space Executive Director	Panelist, Paving the pathway to space
3:10	Panel discussion		
3:40	End		
Afternoon CME Lectures & Awards (4:00 - 6:00) - Grand Ballroom A - Concourse Level			
4:00	Thomas Connelly	ACS CEO	Opening Remarks
4:05	George Rodriguez	Lectures & Awards Presentation	Introduction
4:15	Robert Langer	MIT Koch Institute Professor	Exploring biomaterials, delivery systems, and tissue engineering
4:50	Emily Carter	Princeton Dean of Engineering and Applied Science	Sustainable production of fuels and chemicals
5:25	James Green	NASA Chief Scientist	Future in space supported by chemistry and nano technology
6:00	End		
Evening CME Reception (6:30 - 8:30) - Harbor Ballroom I (Westin Boston Waterfront) - Conference Level			

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CME Leadership Awards

Tuesday, August 21, 2018 • 4 - 6 pm • The Westin Boston Waterfront

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NASA**Award for Historic Scientific Achievement**

Robert Langer, PhD, is the David H. Koch Institute Professor at MIT. (There are 13 Institute Professors at MIT; being an Institute Professor is the highest honor that can be awarded to a faculty member.) His h-index of 233 is the highest of any engineer in history and he has over 1,260 issued and pending patents worldwide. His patents have licensed or sublicensed to over 300 companies.

Professor Langer has written more than 1,400 articles. His many awards include the US National Medal of Science, the US National Medal of Technology and Innovation, the Charles Stark Draper Prize (considered the engineering Nobel Prize), Albany Medical Center Prize (largest US medical prize), the Wolf Prize for Chemistry, the 2014 Kyoto Prize, and the Lemelson-MIT prize, for being “one of history’s most prolific inventors in medicine.” Langer is one of the very few individuals ever elected to the National Academy of Medicine, the National Academy of Engineering, and the National Academy of Sciences.

**Award for Interdisciplinary Innovation**

Emily Carter, PhD, has an outstanding record engaging scientists in many disciplines as well as applying accurate, efficient quantum mechanics methods that enable discovery and design of materials for sustainable energy. Dr. Carter is the Dean of the School of Engineering and Applied Science, Gerhard R. Andlinger Professor in Energy and the Environment, and Professor of Mechanical and Aerospace Engineering, and Applied and Computational Mathematics at

Princeton University. Professor Carter received her BS in Chemistry from UC Berkeley in 1982 and her PhD in Chemistry from Caltech in 1987. She spent 16 years at UCLA as a Professor of Chemistry and Materials Science. At Princeton University she was the Founding Director of the Andlinger Center for Energy and the Environment (2010—2016). The author of over 380 publications, she has delivered over 500 invited and plenary lectures and serves on numerous advisory boards, including for *JACS*, *JCTC* and *ACS Central Science*. Among other honors, she has received awards and fellowships from the American Chemical Society, the American Physical Society, the Institute of Physics, the American Association for the Advancement of Science, the Italian Chemical Society, and the German Chemical Society. Professor Carter was elected in 2008 to both the American Academy of Arts and Sciences and the National Academy of Sciences, and in 2016 to the National Academy of Engineering.

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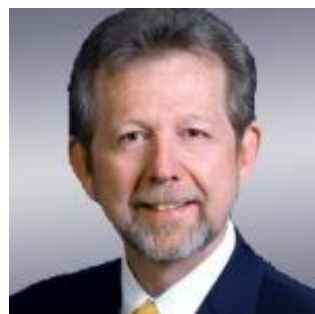
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CME Leadership Awards

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Award for Propelling Space Science

James Green, PhD, has a brilliant record of expanding globally the access to scientific research about space and planetary exploration. He developed and managed the Space Physics Analysis Network that provided scientists worldwide with rapid access to data, to other scientists, and to NASA computer and information resources. Dr. Green is NASA's Chief Scientist who focuses on strategic science objectives and contributions to the science communities worldwide.

Dr. Green was previously the director of the Planetary Science Division at NASA Headquarters since 2006. During his 12 years in this role, he managed numerous successful missions from Mercury to Pluto that have ushered in a golden age of planetary exploration. These missions include: the Lunar Reconnaissance Orbiter; Mars rovers Spirit, Opportunity and Curiosity; and the New Horizons mission to Pluto and beyond just to mention a few.

Dr. Green received his PhD in Space Physics from the University of Iowa in 1979 and began working at NASA's Marshall Space Flight Center in 1980. Over the years he became head of the National Space Science Data Center at Goddard Space Flight Center, Chief of the Space Science Data Operations Office, and Chief of the Science Proposal Support Office. He has written over 115 peer reviewed scientific papers involving the Earth's and Jupiter's magnetospheres and over 50 technical articles on data systems and networks. Dr. Green's numerous awards include NASA Exceptional Achievement Medal, Arthur S. Flemming Award, and Japan's Kotani Prize in recognition of his international science data management activities.

CME Reception

Tuesday, August 21, 2018 • 6:30 -8:30 pm • The Westin Boston Waterfront

Harbor Ballroom I

ACS NASA Space Symposium Reception

Buy Tickets during ACS national meeting registration or at www.cmeacs.org

6:30 pm - Doors Open, Bars open, Passed items begin, International Cheese Table Set

6:40 pm - Remarks

6:45 pm - Sushi Tale, Carving Station, Dessert Station Open

8:30 pm - Adjournment

30-sec ACS Video: [It All Begins with Chemistry](#)

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Morning Session: Research

Tuesday, August 21, 2018 • 8:30 - 10:05 am • The Westin Boston Waterfront

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**8:30 am - Session chair introduction**

Qinghuang Lin – Research senior manager at IBM Watson Research Center. IBM Master Inventor with over 80 granted US patents and more than 70 US patents pending. Editor/co-editor of 6 books and author/co-author of 60 technical papers. Associate Editor of *Journal of Micro/Nanolithography, MEMS, and MOEMS*. Guest Editor of *Journal of Materials Research*. Past Chair of ACS Polymeric Materials Science & Engineering (PMSE) division.

**8:35 am - Needs and opportunities in the development of advanced materials and manufacturing methods for future long-duration human space exploration**

Michael Meador – NASA Glenn Research Center Program Element Manager, Lightweight Materials and Manufacturing, Game Changing Development Program. Former Director of the National Nanotechnology Coordination Office and was the Chief of the NASA Glenn Polymers Branch. ACS Fellow. NASA Exceptional Service Medal for nanotechnology R&D.

**9:05 am - Optimization of organic solar cells through experimental design and machine learning**

Jillian M. Buriak – Chemistry Professor, Canada Research Chair of Nanomaterials, and Senior Research Officer of the National Institute for Nanotechnology at the University of Alberta. Editor-in-Chief *Chemistry of Materials*. Works on nanoparticle synthesis for applications in energy, block copolymer self-assembly on surfaces. Fellow, Royal Society of Canada, Rutherford Medal, ACS Pure Chemistry Award.

**9:35 am - Wearable electrochemical sensors**

Joseph Wang – SAIC Endowed Chair, Distinguished Professor, Chair of Nanengineering, UCSD. Director, Center Wearable Sensors (UCSD), C-Director, Center for Mobile-health Systems (UCSD). 'Citation Laureate' Award-ISI Institute- World Most Cited Scientist in Engineering during the 1991-2001 and 1995-2005 periods. Chief-Editor - *Electroanalysis* (international journal; Wiley-VCH Publishers); 1988-present. Associate Editor- Wiley *Encyclopedia of Analytical Chemistry*; 2007-present.

Tuesday, August 21, 2018 • 10:05 - 11:35 am • The Westin Boston Waterfront

**10:05 am – Opportunities for and advantages of atomically precise structures**

Paul Weiss – ACS *Nano* Editor-in-Chief. UCLA Professor, Director at the California NanoSystems Institute. Chemistry, MIT BS and MS, UC Berkeley PhD. Post Doc at Bell Labs. Began career at Penn State in 1989. His research group includes scientists and engineers from multiple disciplines. They advance nanofabrication to small scales and greater chemical specificity in order to connect, to operate, and to test molecular devices. Over 200 papers and patents.



10:35 am - Harnessing the chemistry and physics of silicon nanomaterials for micro and nano-scale sensing devices. **Michael Sailor** – Distinguished Professor of Chemistry and Biochemistry at UCSD. Chemistry MS PhD Northwestern U. Duward Shriver. Post Doc at Stanford and Caltech. Holds 37 patents that have been licensed to 7 companies. Founder of Spinnaker Biosciences and Common Sensor Technologies. Has published 226 peer-reviewed papers, 1 book. Editorial boards of *Nanoscale Horizons*, *ACS Sensors*, *ACS Nano*, *Molecular Cancer Therapeutics*...

**11:05 am - Polymers and manufacturing: a space flow chemistry perspective.**

Rigoberto Advincula – Macromolecular Science and Engineering Professor Case Western Reserve U. Post-Doc Stanford. Chemistry PhD U. Florida, Gainesville, BS U. Philippines. Visiting Researcher HP and IBM Almaden. His group investigates supramolecular synthesis and structure of polymers and nanomaterials capable of controlled-assembly to form ultrathin films and dispersions and to provide amphiphilicity, ligand functionality, and electrochemical activity in the preparation of pi-electron conjugated oligomers and polymers.

Tuesday, August 21, 2018 • 1:00 – 2:10 pm • The Westin Boston Waterfront

**1:00 pm – Opening remarks**

Peter Dorhout – Kansas State University, Vice President for Research. He worked at Colorado State University-Pueblo, DuPont and Los Alamos. Fellow at ACS and Alfred P. Sloan. ACS member since 1985. Member of Divisions: I&EC, INOR and NUCL. Holds a PhD in Chemistry.

**1:05 pm - Industry session introduction**

Charles Brumlik – CME Vice Chair. Managing Director at Nano-Biz LLC in Branchburg, New Jersey. Advises multinational corporations, investors, startups, and governments on technology assessment and commercialization. Has 20+ nanotechnology publications and patents on materials. Holds a PhD in Chemistry and a JD.

**1:10 pm - Robust and thick polymer brushes grafted from gold surfaces using bidentate thiol-based initiators**

Randall Lee – Deputy Editor, *ACS Applied Nano Materials*, U. of Houston Distinguished University Chair and NSM Associate Dean for Research. NIH Postdoctoral Fellow, Caltech. PhD Harvard, BA Rice. Research in fluorinated organic thin films using SAMs, complex organic interfaces, biologically active interfaces, nanoparticle, biopolymers and catalysts used in electronic devices and as coatings for biomaterials, sensors, artificial enzymes, tissue engineering.

**1:40 pm - Advanced nanomaterials for aerospace and related applications.**

Younan Xia – Brock Family Chair and Eminent Scholar in Nanomedicine, Biomedical Engineering at Georgia Institute of Technology. PhD in physical chemistry from Harvard (with G. Whitesides), MS in inorganic chemistry UPenn, BS chemical physics University of Science and Technology of China (USTC). Focus on synthesis of novel nanomaterials for use in nanomedicine, regenerative medicine, cancer theranostics, tissue engineering, controlled release, catalysis, and fuel cell technology

Tuesday, August 21, 2018 • 2:25 – 3:40 pm • The Westin Boston Waterfront

**2:25 pm – Industry panel moderator remarks**

Bibiana Campos-Seijo – Editor-in-Chief and VP of C&EN Media Group at ACS Publications. Previously worked as Magazines Publisher and Editor at Royal Society of Chemistry, Author - What's Inside? Column at *Wired Magazine* and Editor-in-Chief of Advanstar Communications. BS and PhD in Chemistry.

**2:30 pm – The Aerospace Corporation overview and the quest for more capability in smaller systems.**

Torrey Radcliffe – Principal Director of Technology at The Aerospace Corporation. Dr. Radcliffe has developed humans spaceflight systems for over 15 years. Involved in the cost and affordability analysis of Mars Design Reference Architecture 5.0, the Constellation Program, the 2009 Review of US Humans Spaceflight Plans Committee and The National Academies report "Pathways to Exploration."

**2:50 pm – Paving the pathway to space**

Joseph Cassady - Executive Director, Space Programs, Washington DC Operations, Aerojet Rocketdyne. Helps oversee strategy and architectures for future space and launch systems. BS MS Aeronautics-Astronautics Purdue, Systems Engineering GWU. 3 decades in propulsion and mission and systems analysis, 50 technical papers dealing with electric propulsion, power and attitude control systems and mission analysis. Flight projects for Air Force and NASA. Led teams for highest power electric propulsion system flown and the EO-1 Pulsed Plasma Thruster system. VP Electric Rocket Propulsion Society and Director for ExploreMars.

Tuesday, August 21, 2018 • 4 - 6 pm • The Westin Boston Waterfront

**4:00 pm – Lectures Opening Remarks**

Thomas Connelly – Executive Director and CEO of the ACS since February 2015. Former DuPont Executive VP, Chief Innovation Officer. Joined DuPont in 1977 and played key roles in Delrin®, Kevlar®, Sorona® and Teflon®. He led a 10,000-person science and technology team into new areas, including new materials, energy and biotechnology. BS and PhD in Chemical Engineering.

**4:05 pm – Lectures & Awards Presentation**

George Rodriguez – CME Past Chair. Advisor on business strategy and technology partnering. Served as Vice President of Biotechnology and Nanotechnology at Nagase America. He served as head of two Pfizer businesses. He created original programs, such as the Leadership Awards and the ACS NASA symposiums, and helped establish the first ACS international chapter in South America. First in class in BS Chemical Engineering and MS Industrial Management.

**4:15 pm - Exploring biomaterials, delivery systems, and tissue engineering**

Robert Langer – MIT Koch Institute Professor.

Abstract: The advancement of civilization and the exploration of space will depend on cutting-edge developments in life science monitoring and healing systems, devices, and other technologies that allow humans not only to survive but to be highly productive in the harshest conditions imaginable for an extended period of time. This talk will explore cutting-edge

cutting-edge developments in the following areas:

- Developing controlled release systems
- Creating new approaches for delivering drugs, such as proteins and genes, across complex barriers in the body, such as the intestines, the lung, and the skin
- Researching new ways to create tissue and organs, including creating new polymer systems for tissue engineering

CME Lectures & Awards

Tuesday, August 21, 2018 • 4 - 6 pm • The Westin Boston Waterfront



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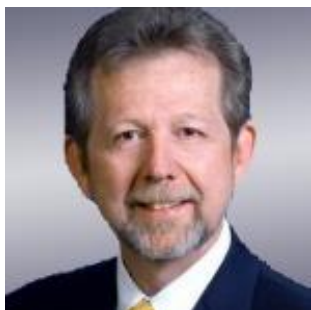


4:50 pm – Sustainable Production of Fuels & Chemicals

Emily Carter – Princeton Dean of Engineering.

Abstract: I wrote this abstract the day after a scientific giant of our day, the great cosmologist Stephen Hawking, died. To honor his memory, I will speak about potential technological advances in materials science, nanoscale optics, and electrochemistry that could allow us to respond to Dr. Hawking's clarion call: "It is time to explore other solar systems ... humans need to leave Earth."

To do so probably represents—next to rendering fusion power commonplace—the greatest set of technological challenges humankind has ever faced. Among them are ones from the domain of chemistry: We will need to create a virtuous chemical cycle, exploiting energy from sunlight and molecules in air, water, and carbon dioxide to synthesize fuels and chemicals needed to sustain life off planet Earth. I will give examples from my own research—developing and applying quantum mechanics techniques to sustainable energy technologies—aimed at understanding and designing new materials and processes that will create that virtuous cycle needed by future generations.



5:25 pm – Future in Space Supported by Chemistry and Nano Technology

James Green – NASA's Chief Scientist

Abstract: Developed by James L. Green, Louis Barbier, Tara Ruttley, Xaivian Raymond. NASA's Office of Chief Scientist.

NASA's ambitious future plans are to create a sustainable program of human and robotic exploration with commercial and international partners to enable human expansion across the solar system. This program supports the return of

humans to the Moon for long-term exploration and utilization, followed by human missions to Mars in our lifetimes. In order to accomplish these objectives, NASA invests about \$800M in 15 distinct technology areas (TAs) including space power and energy storage, nanotechnology, materials and structures, and thermal protection systems. Nanotechnologies and chemistry play a large role in many of these investments, including (for example): structural engineered nanomaterials (lightweight metal-matrix composites), high-efficiency radiation hard solar cells, high-performance energy storage devices (such as supercapacitors), and nanotube arrays for biochemical sensing. The latter can be used for both health monitoring and biomarker detection. Rapid, low-cost bio-detection devices will be increasingly important as we move to detect life on other planets, icy moons, and myriad solar system bodies. Technologies like these are also evaluated for their capabilities in enabling future exploration beyond low-Earth orbit (LEO) through testing on the International Space Station (ISS). Within the sustained microgravity environment of ISS, investigations










256th ACS National Meeting & Exposition

CME Lectures & Awards



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Continued abstract of James Green's lecture

performed in chemistry, materials, and nanotechnology contribute to the development and on-orbit demonstration of new tools for future exploration, such as air and water recycling systems, propellant management systems, new space vehicle and spacesuit materials, and volatile organic trace gas management systems.

As we embark on humans exploring the Moon and Mars, the more important it will be to convert extraterrestrial resources to generate required products, an approach called in-situ resource utilization (ISRU) for which chemistry is essential science. Sunlight for power is, of course, one the common form of ISRU, but now critical space-based resources that are essential for the success of long-duration missions includes accessing water, oxygen, and methane resources, which can be derived from carbon dioxide on Mars atmosphere and water deposits from lunar and Mars regolith. The development and testing of ISRU technologies for searching and processing space-based resources is a critical component in NASA's exploration plans and will eventually get humans to the Moon and Mars. Finally, it is important to also realize that chemistry will always play an essential role in robotic instruments that tease out the chemical composition of the Moon and Mars that give us the knowledge of how these bodies are created and evolved.

5:55 pm - Final remarks and adjournment of Lectures Session

CME Reception

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Harbor Ballroom I

ACS NASA Space Symposium Reception

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8:30 pm - Adjournment

30-sec ACS Video: [It All Begins with Chemistry](#)

5-min C&EN Video: [Chemistry and Mars Exploration](#)



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ACS President recommends this 2nd ACS NASA Symposium

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PMSE Advances in Human Space Exploration



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3. Biochemical Technology (BIOT)
4. Biological Chemistry (BIOL)
5. Business Development & Management (BMGT)
6. Cellulose and Renewable Materials (CELL)
7. Chemical Education (CHED)
8. Chemical Health & Safety (CHAS)
9. Chemical Information (CINF)
10. Chemistry & the Law (CHAL)
11. Colloid & Surface Chemistry (COLL)
12. Computers in Chemistry (COMP)
13. Energy & Fuels (ENFL)
14. Environmental Chemistry (ENVR)
15. Fluorine Chemistry (FLUO)
16. Geochemistry (GEOC)
17. Inorganic Chemistry (INOR)
18. Medicinal Chemistry (MEDI)
19. Nuclear Chemistry & Technology (NUCL)
20. Organic Chemistry (ORGN)
21. Physical Chemistry (PHYS)
22. Polymer Chemistry (POLY)
23. Polymeric Materials: Science & Engineering (PMSE)
24. Professional Relations (PROF)
25. Small Chemical Businesses (SCHB)

About ACS

A nonprofit organization established in 1876 and chartered by the U. S. Congress, the American Chemical Society (ACS) is the world's largest scientific society with 150,000 members. ACS publishes the weekly magazine *C&EN* and 50+ scientific journals, including *ACS Applied Nano Materials*, *ACS Sensors* and *ACS Nano*.

About PMSE

The Polymeric Materials: Science and Engineering Division (PMSE) was founded in 1924. Areas of interest include coatings, plastics, adhesives, biomedical polymers, composites, electronic applications.

About CME

Established in 1954, and winner of four ChemLuminary awards since 2012 the Chemical Marketing and Economics (CME) group of the ACS' New York Section, organizes trailblazing programming including the ACS NASA Space Symposia, the Leadership Awards, and monthly luncheon/webcasts where business, investment and technology leaders share their insights on energy, materials and life science.

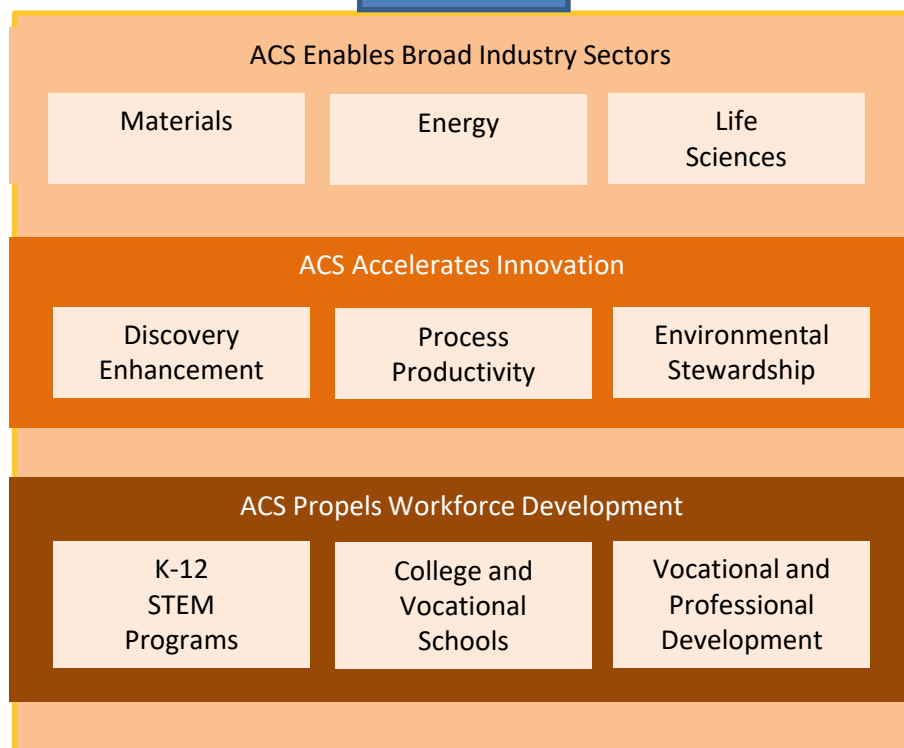
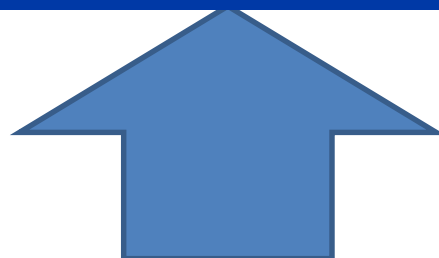


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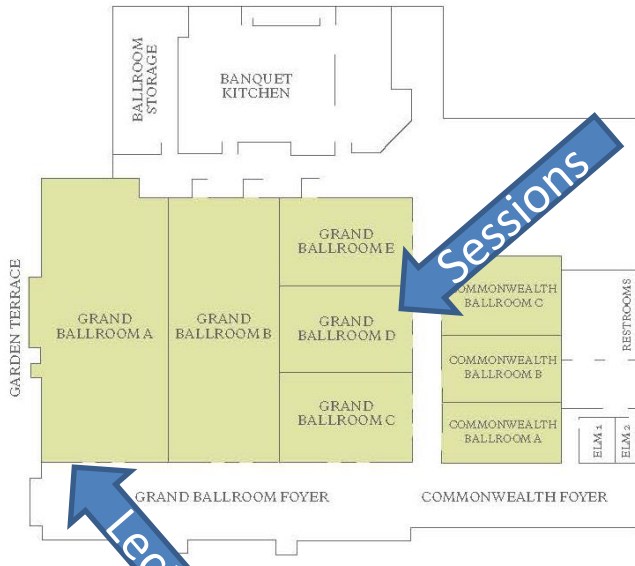


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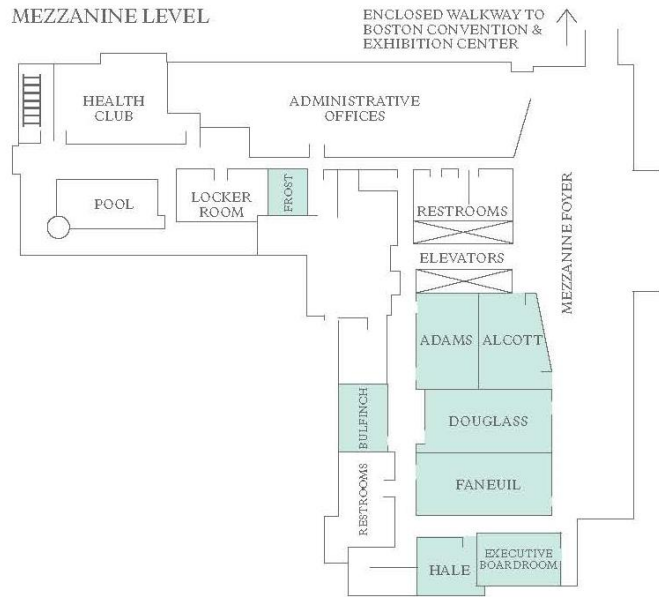


Floor Plan Westin Boston Waterfront

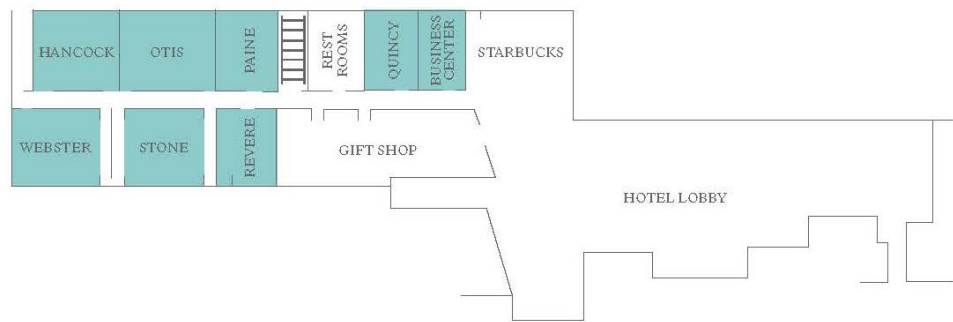
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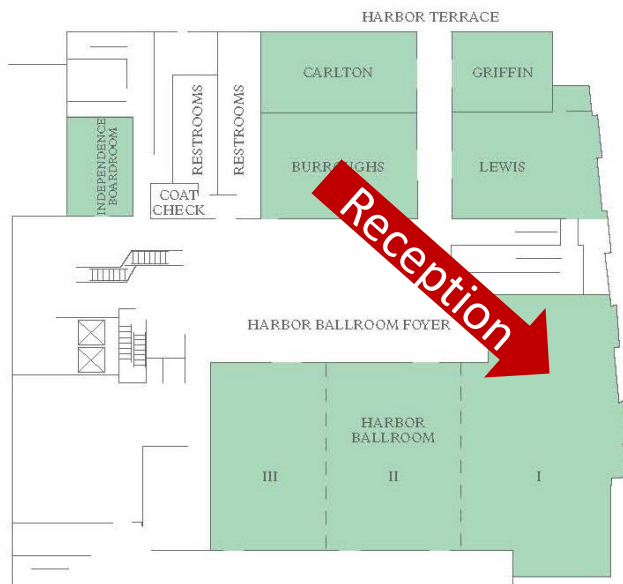


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