



The Crucible

Volume CIV, No. 1

September 2018



National Chemistry Week is Coming!!!

Join the Pittsburgh Section of the American Chemical Society as we celebrate 20 years of National Chemistry Week/ChemFest at the Carnegie Science Center with the theme

"Chemistry is Out of This World"

Where: Carnegie Science Center

When: Friday, October 26th (9 AM to 3 PM) Saturday, October 27th (10 AM to 4 PM)

What's Happening: Over 20 tables of hands-on experiments, activities, demonstrations, and special programming.

The Pittsburgh Section ACS could use your help to make this year's NCW celebration a success.

Do you have an organization that would like to conduct hands-on activity at the event?

Are you interested as an individual in volunteering to help during the event?

If you, or your organization, are interested in participating in this year's NCW event, please contact Michael Mautino at michael.mautino@covestro.com Or 412-413-4792

For more information about the NCW celebration in Pittsburgh, visit the Pittsburgh Section's website at http://www.pittsburghacs.org/outreach/national-chemistry-week/or look us up Facebook at Pittsburgh ACS NCW. You can also find additional information about NCW on the ACS's website at https://www.acs.org/content/acs/en/education/outreach/ncw.html The Pittsburgh Section's 2018 NCW activities are sponsored in part by The Society for Analytical Chemists of Pittsburgh, The Spectroscopy Society of Pittsburgh, PPG Science Education Council, and the PPG Foundation.

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for the Executive Committee of the ACS Pittsburgh Local Section!

Nominations are now open for the Executive Committee of the Pittsburgh ACS section. The Section will hold an election this coming fall. Please volunteer your time and consider running for the following positions.

- o Chair-Elect (2 Year Term 2019-2020)
- o Secretary-Elect (2-Year Term, 2019-2020)
- o Treasurer-Elect (2-Year Term, 2019-2020)
- o 2 Directors (3-year term)
- o 1 Councilor (3-year term)

Want to learn more about the duties of the positions? They can be found in our <u>online Operations Manual.</u>

Please send nominations and self -nominations (with the appropriate contact information) to Dave Waldeck, dave@pitt.edu.

Announcing the Re-formation of the

ACS Pittsburgh Section

Education Group!

ANTICIPATED FIRST MEETING
IN EARLY NOVEMBER

More information coming to the Crucible, Website, and Section App soon.

Questions? Want to get involved now?

Contact Dave Gallaher or Evonne Baldauff

dlgallaher@carlow.edu

ebaldauf@waynesburg.edu



Society for Analytical Chemists of Pittsburgh Spectroscopy Society of Pittsburgh



September Meeting

Wednesday, September 12, 2018





5:30 PM Social Hour — Power Center Ballroom 5:30 PM SSP Technology Forum – Power Center Ballroom 6:30 PM Dinner - Power Center Ballroom Student Affiliate Meeting – Shepperson Suite 7:45 PM Business Meeting – Power Center Ballroom 8:00 PM Technical Program – Power Center Ballroom



SSP TECHNOLOGY FORUM

Dr. Daniel T. Wagner School of Pharmacy at Duquesne University

"Alternative Medicine Meets Clinical Pharmacy"

His lecture entitled "Alternative Medicine Meets Clinical Pharmacy" will define what Integrative Pharmacy is. He will discuss the effects and side-effects of the most common supplements in America and recognize the benefits versus the risks of combining dietary supplements with common prescription medicines. He will also touch upon a new way to look at a 'homeostasis' of drugs, supplements, and diet on organs and organ systems utilizing 'frequency medicine.'

BIOGRAPHY: Dr. Daniel T. Wagner is a 1975 graduate of the School of Pharmacy at Duquesne University in Pittsburgh. He received an international M.B.A. in 1993, and attained a Doctorate of Pharmacy degree from Ohio Northern University in 2000.

He is the recipient of numerous awards and recognition's. Most Notably he was honored as "Pennsylvania Pharmacist of the Year" in 1996 by The Pennsylvania Pharmacists Association. In 1999 he was recognized by American Druggist Magazine as one of "The Fifty Most Influential Pharmacists in America." In August, 2000 Drug Topics, a nationally Distributed news magazine for pharmacists named Dan among their "Pharmacists of the Year 2000."

Dan has done extensive traveling and research on medicinal plants in the rain forests of Belize, Peru, Costa Rica, Ecuador, Cuba and Western Africa, and has incorporated his knowledge and experience into his natural medicine practice. In 1995, he first traveled to Nigeria to participate in medical mission work with the World Health Mission.

In 2006, he took over leadership of this NGO and altered the name to The World Health Vision. Dr. Dan has been to Nigeria 14 times since 1995 leading a health team to treat diabetes, cataracts/blindness and hypertension. He has published over 80 articles in leading pharmacy journals and alternative media.

Continued on Page 4



Society for Analytical Chemists of Pittsburgh Spectroscopy Society of Pittsburgh



September Meeting



SACP TECHNICAL PROGRAM

Dr. Parastoo Hashemi, University of South Carolina 2018 SACP Pittcon Achievement Award Recipient

"Harnessing the Power of Electroanalytical Chemistry to Better Diagnose and Treat Psychiatric Disease"

BIOGRAPHY: Parastoo (Parry) Hashemi is an Associate Professor in the Department of Chemistry and Biochemistry at the University of South Carolina. She performed her undergraduate studies in King's College, London and her PhD with Martyn Boutelle in the Department of Bioengineering in Imperial College, London. Her postdoctoral work was at UNC Chapel Hill with Mark Wightman. Parry has pioneered an interdisciplinary and translational research program that centers on the development and optimization of *in situ* electrochemical methods for analyzing biologically and environmentally impactful molecules with applications in point of care diagnostics. Parry has been awarded the Masao Horiba Award for Analytical Chemistry (2013), the Eli Lilly Young Investigator Award in Analytical Chemistry (2015), an NSF CAREER Award (2017), the University of South Carolina Breakthrough Stars Award (2018), the Society of Pittsburgh Chemists Pittcon Achievement Award (2018) and the Society of Electroanalytical Chemistry Royce Murray Young Investigator Award in Analytical Chemistry (2018).

<u>DINNER RESERVATIONS</u>: Please complete the <u>Online Dinner Reservation Form</u> NO LATER THAN Tuesday, September 4, 2018. The form is also located under the Meeting Notice on website <u>www.sacp.org</u>. Should you not be able to access the form, please call 412-825-3220, ext 212 the SACP & SSP Administrative Assistant to make your dinner reservation. The entrée choices for September are **Beef Brisket** or **BBQ Vegetable Kabob**. Please let us know if you have any dietary restrictions. Dinner will cost \$10 (\$5 for undergraduate students). Checks can be made payable to the SACP or the SSP, depending on membership.

<u>PARKING</u>: Duquesne University Parking Garage entrance is on Forbes Avenue. Upon entering the garage, you will need to get a parking ticket and drive to upper floors. Bring your parking ticket to the dinner or meeting for a validation sticker. Should any difficulties arise, please contact Duquesne University.

ACS-Energy Technology Group Meeting



Thursday, September 20, 2018

"Design and Evaluation of an Acid Leaching Solvent Extraction Process to Extract Rare Earth Elements from Acid Mine Drainage Precipitates"

Paul Ziemkiewicz

Abstract

With the support of the USDOE's National Energy Technology Laboratory, researchers at West Virginia University and Virginia Tech have identified acid mine drainage (AMD) and the associated treatment precipitates (AMDp) as attractive sources of Rare Earth Elements (REEs), particularly heavy and critical REEs. Acid forming coal spoils, tailings, and underground mines act as heap leach reactors, where the sulfuric acid produced through pyrite oxidation leaches REEs from the surrounding shales. Conventional AMD treatment then captures nearly 100% of REEs and concentrates them by a factor of 2,600x.

Extensive sampling efforts have shown that AMDp samples contain an average of 635 g/t REE, with a 95% confidence interval of 549 to 724. This sampling effort has identified 395 tons of REEs in 79 existing AMDp storage ponds sampled thus far. Ongoing AMD production in Appalachia generates about 800 tons of REE per year. Following up on these promising findings, a 3 g/hr pilot plant using acid leaching/solvent extraction (ALSX) has been installed at WVU to test AMD based feedstocks for REE production. The facility was commissioned on 18 July 2018. The presentation will focus on field sampling of the AMD/REE resource and early results from our ALSX process.

Biography

Paul Ziemkiewicz, PhD, is the Director of the Water Research Institute at West Virginia University. Dr. Ziemkiewicz, a native of Pittsburgh has a PhD from the University of British Columbia and an MS and BS from Utah State University in the biological sciences. After graduation he worked for ten years with the Alberta Department of Energy before coming to West Virginia University in 1988 to serve as director of the Water Research Institute. The Institute develops and carries out environmental research projects in the region and nationally. Research focus areas include management and treatment of waste streams from coal mining and oil and gas development. Major programs include acid mine drainage, coal ash, rare earth recovery, coal mine reclamation, water treatment and watershed restoration.

Cost is \$26, walk-ins are welcome but reservations with dinner selection are preferred.

Dinner Menu: Soup, salad and choice of: Lasagna, Chicken Romano, Spaghetti w/meatball, Manicotti. Also, included are coffee, tea, or soft drinks.

Please RSVP by Monday September 13, with names of those planning to attend, and, *your dinner choice*, to: ACS.ETG@gmail.com

Check In: 6:00-6:30 PM, Dinner: 6:30-7:30 PM, Technical Presentation 7:30-8:30 PM Location: <u>Lombardozzi's</u> *Restaurant* - Bloomfield, 4786 Liberty Ave, Pittsburgh, PA 15224



2018 NCW Illustrated Poem Contest Chemistry is Out of This World

The Pittsburgh Section of the American Chemical Society (ACS) is sponsoring an illustrated poem contest for students in Kindergarten - 12th grade. This regional contest is open only to students who live in the following Ohio, Pennsylvania, and West Virginia counties:

Ohio: Jefferson. **Pennsylvania:** Allegheny, Armstrong, Beaver, Butler, Cambria, Clarion, Fayette, Greene, Indiana, Jefferson, Somerset, Venango, Washington, and Westmorland. **West Virginia:** Brooke, Hancock, and Ohio.

Contest Deadline: Friday, November 2, 2018

Prizes: \$50 1st Place and \$25 2nd Place in each of 4 grade categories: K-2nd, 3rd-5th, 6th-8th and 9th-12th grades.

Contact: Mail illustrated poem and entry form to Michael Mautino, 3485 Frye Ave, Finleyville, PA 15332. It is highly encouraged to e-mail entries to NCW@pittsburghacs.org

Winners of this regional contest will advance to the National Illustrated Poem Contest for a chance to be featured on the ACS website and to win prizes!

Write and illustrate a poem using the NCW theme, "Chemistry is Out of This World." Your poem must be **no more** than 40 words and in the following styles to be considered:

HAIKU - LIMERICK - ODE - ABC POEM - FREE VERSE - END RHYME - BLANK VERSE

Possible topics related to space chemistry include:

LightStarsAtmosphereSpectrumPlanetsGasesSupernovaUltraviolet

Entries will be judged based upon

Artistic Merit - use of color, quality of drawing, design, and layout Poem Message - fun, motivational, inspiring about yearly theme Originality Creativity - unique, clever and/or creative design



Contest Rules:

All poems must be no more than 40 words, and in one of the following styles to be considered: Haiku, Limerick, Ode, ABC poem, Free verse, End rhyme, and Blank verse.

Entries are judged based upon relevance to and incorporation of the NCW theme, word choice and imagery, colorful artwork, adherence to poem style, originality and creativity, and overall presentation.

All entries must be original works without aid from others. Poems may be submitted by hand on an unlined sheet of paper not larger than 11" by 14" or scanned and sent via email. Illustrations may be created using crayons, watercolors, other types of paint, colored pencils, or markers. The illustration may also be electronically created by using a digital painting and drawing app on a computer, tablet, or mobile device.

The text of the poem should be easy to read and may be typed before the hand-drawn or digital illustration is added, or the poem may be written on lined paper, which is cut out and pasted onto the unlined paper with the illustration.

No clipart or unoriginal images can be used.

Only one entry per student will be accepted; all entries must include an entry form. If the illustration is created using a digital painting or drawing app, the name of the program must be included on the entry form.

All illustrated poems and/or digital representations of the poems become the property of the American Chemical Society.

Acceptance of prizes constitutes consent to use winners' names, likenesses, and entries for editorial, advertising, and publicity purposes.



2018 NCW Illustrated Poem Contest Chemistry is Out of This World ENTRY FORM

Please fill out this form and attach it after the poem. All fields are required. Incomplete forms will invalidate the entry.

The deadline for the Pittsburgh Section Contest is Friday, November 2, 2018.

Parent/Guardian information may be left blank if Teacher contact information is provided.

Student and Organization Information							
Student Name:							
Student Grade:							
Parent/Guardian Name:							
Parent/Guardian Email:							
Parent/Guardian Address:							
Parent/Guardian City:				State:		Zip:	
School or Sponsoring G	roup (e.	g. Boys and Girls					
Teacher Name:							
Teacher Email:							
School Address:	chool Address:						
School Address 2:							
School City: State:		State:		Zip:			
Please send any follow up for the student to t		e student to the p	arent or	school	addr	ess. Check one.	
Illustration Type (Chec	k one)						
Hand-drawn art		Digitally created art					
If the poem was digitally created, please name the software used in the box below:							
Judging Category by 0	Grade (C	heck one)					
K-2	3	3-5	6-8			9-12	
		FOR LOCAL	SECTION US	E ONLY			
Local Section Name: Pittsburgh							
NCW Coordinator Name: Mid		Michael Mautin	Michael Mautino				
NCW Coordinator Email/		NCW@pittsburghacs.org					

University of Pittsburgh Chemistry Department

2018 Fall Seminar Listing

August 24, 2018

2:30pm, Eberly 307
Dr. Qiaowei Li
Fundan University
"Chemistry of Metal-Organic
Frameworks with Multicomponents in Order"

September 6, 2018

2:30pm, 150 Chevron
Dr. Galia Maayan
Technion – Israel Institute of
Technology
"Bio-Inspired Cooperative
Catalysis"

September 6, 2018

4:00pm, 150 Chevron
Dr. Xinyu Liu
University of Pittsburgh
"TBA"

September 13, 2018

2:30pm, 150 Chevron
Dr. Neal Mankad
University of Illinois at Chicago
"Reduction & C-C Coupling Reactions of Alkynes Enabled by Bimetallic & Tandem Copper Catalysis"

September 13, 2018

4:00pm, 150 Chevron
Dr. Daniel Lambrecht
University of Pittsburgh
"What Do Macroscopic Observables Teach Us About the Molecular
World?"

September 18, 2018

2:30pm, 307 Eberly
Dr. Amanda Garner
University of Michigan
"Chemical Probing of Translational
Control and microRNA Biology"

September 20, 2018

2:30pm, 150 Chevron
Dr. Peng Liu
University of Pittsburgh
"Predictive Models for Transition
Metal Catalyzed Organic Reactions
Capture, Chemical Reactions, and
Energy Storage"

September 20, 2018

4:00pm, 307 Eberly Dr. Mary Kay Wayne State University "TBA"

September 25, 2018

2:30pm, 150 Chevron
Dr. Chunlong Chen
PNNL – Pacific Northwest National
Laboratory
"Designing Sequence-Defined
Peptoids for Bio-Inspired Synthesis
of Functional Nanomaterials"

October 3, 2018

Covestro Distinguished Lecture
4:00pm
O'Hara Student Center
Dr. Jillian Buriak
University of Alberta
"TBA"

October 4, 2018

Covestro Distinguished Lecture 2:30pm, 150 Chevron Dr. Jillian Buriak University of Alberta "TBA"

October 9, 2018

4:00pm, 150 Chevron
Dr. Amish Patel
University of Pennsylvania
"Characterizing Protein Hydration to
Inform its Interactions"

October 11, 2018

32nd Annual
Frederick Kaufman Memorial Lecture
Series
4:00pm, 150 Chevron
Dr. Louis Brus
Columbia University
"Electronic Structure in Nanoscience"

October 12, 2018

32nd Annual

Frederick Kaufman Memorial Lecture
Series
2:30pm
O'Hara Student Center
Dr. Louis Brus
Columbia University
"Ag Nanocrystal Plasmons: Field
Enhancement & Photochemical
Growth"

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University of Pittsburgh

Chemistry 2018 Fall

Seminar Listing

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October 17, 2018

37th Annual
Pittsburgh Conference Lectures
(PITTCON)
4:00pm, O'Hara Student Center
Dr. David R. Walt
Harvard University
"Measuring Scientific Impact"

October 18, 2018

37th Annual
Pittsburgh Conference Lectures
(PITTCON)
4:00pm, 150 Chevron
Dr. David R. Walt
Harvard University
"Biomarker Discovery: From
Technology Development to Clinical
Applications"

October 23, 2018

2:30pm, 150 Chevron Dr. Dipankar Koley Oregan State "TBA"

October 25, 2018

2:30pm, 150 Chevron
Dr. Brandi Cossairt
University of Washington
"The Chemistry of Nanoscale Phosphides: Building & Manipulating
Complex Inorganic Molecules with
Atom-Level Precision"

November 1, 2018

8th Annual
Henry Frank Lecture
4:00pm, Chevron 150
Dr. David Case
Rutgers University
"Molecular Dynamics Simulations of
Proteins & Nucleic Acids: Challenges
& Opportunities"

November 2, 2018

8th Annual
Henry Frank Lecture
2:30pm, 307 Eberly
Dr. David Case
Rutgers University
"Molecular Dynamics Simulations of
Biomolecular Crystals"

November 5, 2018

2:30pm, 150 Chevron
Dr. Dustin Maly
University of Washington
"Engineered Protein Switches for
Studying Intracellular Signaling
Dynamics"

November 8, 2018

2:30pm, 150 Chevron
Dr. Songi Han
University of California – Santa Barbara
"TBA"

November 8, 2018

4:00pm, 150 Chevron
Dr. Corinna Schindler
University of Michigan
"Catalytic Carbonyl-Olefin
Methathesis & Oxygen Atom
Transfer"

November 13, 2018

2:30pm 150 Chevron Dr. Michael Hilinski University of Virginia "Selective Oxidation Strong & Weak Bonds: New Catalytic & Synthetic Methods"

November 15, 2018

2:30pm 150 Chevron Dr. Ting Xu University of California - Berkeley "TBA"

Get Connected!

Stay up-to-date on all the happenings of the Pittsburgh Section ACS

Section's Website:

www.pittsburghacs.org

Facebook Page: Pittsburgh

Section of the American

Chemical Society

Linked In: Pittsburgh Section

of the American Chemical

Society

Snapchat: Pittsburgh_acs

Twitter: Pittsburgh ACS



Dear Academic ACS Pittsburgh Section Members,

The Pittsburgh Section of the American Chemical Society has budgeted funds to help encourage undergraduate/ graduate student participation in national and regional ACS meetings. The awards are intended to help defray meeting registration and travel-related expenses (lodging, transportation, per diem) for eligible students. Awards will be made based on the scientific merit of the paper/poster to

be presented, financial need, and preference will be given to ACS members.

To apply for the funds, applicants should complete the attached application and return it by the relevant deadline. The deadlines for receipt of applications are as follows:

- 06/01 (for travel to be completed by 12/31)
- 12/01 (for travel to be completed by 06/30)

As noted on the application, students should include an abstract and confirmation (if received) of the paper/poster being accepted for the Meeting. In addition to the application form, applicants should include a recommendation letter from the PI of the project being presented and/or a recommendation letter from another and a personal statement as to the anticipated benefits of meeting attendance.

Applications can be made electronically (preferred) by emailing the application to Heather Juzwa

(<u>hljuzwa@shimadzu.com</u> or <u>heather sapko@hotmail.com</u>) or by mailing a hard-copy application (Pittsburgh Section ACS Travel Grants / Heather Juzwa / Center / 321 Winners Circle / Canonsburg, PA 15317).

Since 2013, the Pittsburgh Section of the ACS has awarded up to four \$500 grants each year to aid our undergraduate/graduate student members in presenting papers or posters at ACS Meetings.

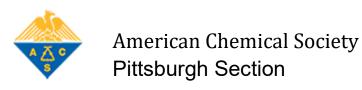
This is an ongoing program in our Section, and details will be updated on our website, (<u>www.pittsburghACS.org</u>, as necessary.

Applicants will be notified via email that their application was received. All efforts will be made to announce awards within two weeks of the application deadline, and all applicants will be notified of the final committee decisions. Our Section is looking forward to helping increase the participation of local students in ACS conferences. If you have any questions, please do not hesitate to contact me.

Sincerely,

 $\label{thm:continuous} \mbox{Heather Juzwa, ACS Pittsburgh Section Student Travel Grants, Chair}$

Senior Field Sales Engineer, Shimadzu Scientific Instruments, Inc.



www.pittsburghacs.org

Application Deadline	Travel Completion Date	
December 1st	June 30 th (subsequent year)	
June 1 st	December 31st (same year)	

Name of Applicant:
Name of Institution:
Undergraduate Student / Year
Graduate Student / Year
Mailing Address to Receive Payment if Awarded
Email: Phone:
PI:
ACS Membership No.*:
*If you do not know your ACS number, please email htjuzwa@shimadzu.com to receive it by email.
Meeting Location: Meeting Date:
Project Title:
Paper Presentation Poster Presentation
*Please attach a copy of your project abstract to the application.
Has your project been accepted? Yes No
*Attach documentation regarding acceptance if received at point of application.
Will this be your first presentation at an ACS national or regional meeting? Yes No
If no, please list conferences at which you have presented:

Purpose	of grant:
0416.	
Otner It	nding sources (if any):
Persona	Statement of anticipated benefits of meeting attendance
Has the	applicant received a travel grant from the ACS Pittsburgh Section in the past? Yes No
page) de	application was selected, the Pittsburgh Section of the ACS would like you to write a short (one escription of your activity upon completion of the conference for publication in our monthly news-he Crucible, and on our website. The description is due within 30 days of the meeting attended.
.11.	
am Willir	ng to complete this report: Yes No
gnature:	
4	
ite:	
end com	pleted hard-copy applications and supporting documentation to:
	Pittsburgh Section ACS Travel Grants
	Heather Juzwa
	321 Winners Circle
	Canonsburg, PA 15317

Business Directory

Services

Services

Services

Pittsburgh Section Officers

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bdavis@waynesburg.edu

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5020 Bedeon Street

Pittsburgh, PA 15217

mbaker1@andrew.cmu.edu

Treasurer

Amy Rupert

350 Sunset Rd.

Pittsburgh, PA 15237

treasurer@pittsburghacs.org

Crucible Deadline

The deadline for items submitted to The Crucible is the 15th of the month prior to publication. For example, all items for the October 2018 issue must be to the editor by September 15, 2018.

Volunteers Needed!

There are a number of volunteer opportunities in the Pittsburgh ACS section! If you are interested in volunteering, please contact Heather Juzwa at hljuzwa@shimadzu.com!



Society for Analytical

Chemists of Pittsburgh

CALLING NEW MEMBERS

Dues Only \$20.00, Call the SACP

Administrative Assistant at

412-825-3220 Ext. 212 Right Now!

The Crucible

The Crucible is published monthly, August through May. Circulation, 2,500 copies per month. Subscription price, six dollars per year. All statements and opinions expressed herein are those of the editors or contributors and do not necessarily reflect the position of the Pittsburgh Section.

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Get Connected!

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Section's Website:

www.pittsburghacs.org

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Pittsburgh Section of the American Chemical Society

Spectroscopy Society of Pittsburgh

- Professional Networking within the Spectroscopy Community
- Monthly Symposia by

Prominent Researchers

• Promoting Science Education

To Join Call Amy: 412-825-3220 ext 212

The Crucible

A newsletter of the Pittsburgh Section of the American Chemical Society

124 Moffett Run Rd. Aliquippa, PA 15001

Change of Address

If you move, notify the American Chemical Society, 1155
Sixteenth Street, N.W., Washington, D.C. 20036.
To avoid interruption in delivery of your CRUCIBLE, please send your new address to Traci Johnsen, 124 Moffett Run Rd., Aliquippa, PA 15001. Allow two months for the change to become effective.

Pittsburgh Area Calendar

Wednesday, September 12

Society for Analytical Chemists of Pittsburgh and the Spectroscopy Society of Pittsburgh

SSP Technology Forum

"Alternative Medicine Meets Clinical Pharmacy"

Dr. Daniel T Wagner, School of Pharmacy at Duquesne University

SACP Technical Meeting

"Harnessing the Power of Electroanalytical Chemistry to Better Diagnose and Treat Psychiatric Disease"

Dr. Parastoo Hashemi, University of South Carolina

Duquesne University, Pittsburgh, PA

Lombardozzi's Restaurant - Bloomfield, 4786 Liberty Ave, Pittsburgh, PA 15224

Thursday, September 20

Pittsburgh ACS Energy Technology Group

"Design and Evaluation of an Acid Leaching Solvent Extraction Process to Extract Rare Earth Elements from Acid Mine Drainage Precipitates"

Paul Ziemkiewicz

Lombardozzi's Restaurant - Bloomfield, 4786 Liberty Ave, Pittsburgh, PA 15224

October 26-27

National Chemistry Week 2018

Carnegie Science Center, Pittsburgh, PA