

## **Dr. Ping Furlan** **2020 New York Section Outstanding Service Awardee**



*See article on page 5.*

## **THIS MONTH IN CHEMICAL HISTORY**

Harold Goldwhite, California State University, Los Angeles • [hgoldwh@calstatela.edu](mailto:hgoldwh@calstatela.edu)

The eighteenth century saw great advances in chemistry, sparked by the rapid growth in studies of gases, or “airs” as they were called at the time. The initial spark came from seventeenth century observations by Van Helmont, who coined the term gas from a Greek root meaning chaos, and who realized that there were gases different from common air, which was still regarded by many natural philosophers as one of the four elements. The following century saw great advances in pneumatick chemistry, as the study of gases was called. The great book in chemistry that I will consider in this column incorporates much of the research undertaken by a seminal figure of pneumatick chemistry. The researcher is Joseph Priestley (1733 – 1804); the book is “Experiments and Observations on Different Kinds of Air” (3 volumes, 1774 – 1777).

Priestley was an impressively talented man, by profession a dissenting minister, i.e. a Christian but not an adherent to the established Anglican Church; and by enthusiasm a natural philosopher. He wrote and published prodigiously: charts of history and biography; a history of electricity; a history of vision, light, and colors; several versions of the work on airs already mentioned; two books attempting to establish the doctrine of phlogiston; a book on oratory (he had a stammer!); and around “50 works on theology, thirteen on education and history; eighteen on political, social, and metaphysical subjects; and twelve books and about fifty papers on scientific subjects” (Partington, “History of Chemistry”, Vol.3).

Given such productivity it is not surprising to learn that the Editor of “Philosophical Transactions”, the journal of The Royal Society, after receiving a number of voluminous papers on airs from Priestley, intimated to him that there was no room in Phil. Trans. for any more papers by Priestley, and that he should consider publishing elsewhere. Thus the “Experimental Observations...”.

Several columns could be devoted to the career of Joseph Priestley, but those are for another time. For now I will focus on Priestley’s numerous discoveries and observations in pneumatick chemistry. The pneumatick trough, invented by Stephen Hales, separated the generator and the collector of airs, and was an advance in technique. Priestley used two types of pneumatick troughs, collecting airs over water or over mercury. In this way he was able to isolate airs soluble in water.

Early in his work, when he lived in Leeds next to a brewery, he began studying mephitic air (carbon dioxide) produced in the fermentation of grains to beer. He found that impregnating water with mephitic air gave a refreshing sparkling beverage similar to natural mineral waters. His pamphlet on this discovery was his most popular publication, and led to an industry that flourishes to this day – the carbonated beverage industry.

The airs Priestley discusses in his book include nitrous air (nitric oxide); phlogisticated air (nitrogen); nitrous vapor (nitrogen dioxide); nitrous air diminished (nitrous oxide); acid air (hydrogen chloride); inflammable air (hydrogen); vitriolic acid air (sulfur dioxide); fluor acid air (silicon tetrafluoride); alkaline air (ammonia); carbon monoxide; and dephlogisticated air (oxygen). Priestley was not always the earliest discoverer of some of these airs, but he excelled in the wide scope of his work and in his extensive examination of their properties, particularly those of oxygen. Priestley’s work on oxygen was the key to Lavoisier’s revolution in chemistry and the improved understanding of combustion and respiration. With Priestley’s great book on airs we are on the threshold of a new era of chemistry which is encapsulated in the next great book I plan to discuss.

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Indicator** 

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Address advertising correspondence to Advertising Manager. Other correspondence to the Editor.

## February Calendar

### NEW YORK SECTION

**Thursday, February 4, 2021**

Long Island Subsection

See page 6.

**Tuesday, February 9, 2021**

Westchester Chemical Society

See pages 7-8.

**Friday, February 12, 2021**

Computers in Chemistry Topical Group

See page 9.

**Thursday, February 18, 2021**

New York Section for Applied Spectroscopy

See pages 10-11.

**Friday, February 19, 2021**

New York Section Board of Directors

Meeting

See page 6.

*also*

**Wednesday, March 17, 2020**

Organic Topical Group

See page 12.

**Fridays, March 19, June 4, September 10, November 19, 2021**

New York Section Board of Directors

Meeting

See page 6.

**Fridays, March 19, April 9, May 7, 2021**

Computers in Chemistry Topical Group

See page 9.

**Friday, April 16, 2021**

William H. Nichols Distinguished Symposium (Virtual)

See pages 13-15.



### NORTH JERSEY SECTION

**Monday, February 21, 2021**

North Jersey Executive Meeting

See page 16.

*also*

**Mondays, March 22, April 19, May 17,**

**June 14, September 27, October 18,**

**November 15, December 13, 2021**

North Jersey Executive Meeting

See page 16.

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**The Indicator is posted to the web around the 15th of the previous month at**

**[www.TheIndicator.org](http://www.TheIndicator.org)**

**Deadline for items to be included in the MARCH 2021 issue of The Indicator is JANUARY 28, 2021**

**To Comply With the Federal Regulations Regarding Social Distancing Necessitated by the COVID-19 Virus, it became imperative to cancel, postpone or “go viral” all Section Meetings for the past year.**

**Details of any relevant meetings will appear in the appropriate future issues of The Indicator.**

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## 2020 NY Section Outstanding Service Awardee

# Dr. Ping Furlan

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Dr. Ping Furlan is currently a Full Professor in Chemistry at the United States Merchant Marine Academy, a Fellow of American Chemical Society, and a Guest Researcher at the Brookhaven National Laboratory – Center for Functional Nanomaterials. Her education background includes a two-year postdoctoral appointment with Bell Communication Research, a Ph.D. and a M.S. in Chemistry from University of Connecticut and a B.S. in Applied Chemistry from University of Science and Technology of China. Since 1997, she has directed numerous Chemistry and STEM outreach events, organized international nanomaterials conferences, and served as STEM journal editor and reviewer.

Dr. Furlan's most noteworthy service efforts to New York ACS include her chairing of the New York Section's National Chemistry Week Committee since 2013, the International Year of the Periodic Table in 2019, the Let's Do Chemistry – NISE Project since 2018, and the Sponsorship and Exhibition Committee at the 48th (2020) and 44th (2016) ACS Middle Atlantic Regional Meetings. She was also the 2019 Chair of Long Island Subsection and is an alternate councilor for 2019-2021.

The New York Section's NCW – New York Hall of Science Hands-on Program, directly impacting 1200 area youth each year, has won numerous national and regional recognitions including the recent 2017 ACS National Chemluminary Award, the 2017 Middle Atlantic Regional Partners for Progress and Prosperity Award, and the 2016 ACS National Chemluminary Award Finalist. In 2020, despite of pandemic challenges, Dr. Furlan and her Committee successfully organized a virtual chemistry demo show for public, and multiple chemistry knowledge Kahoot Contests for area students.

To commemorate 150th anniversary of Mendeleev's Periodic Table, the New York Section designed, constructed and displayed a giant 3D Periodic Table (12'x12'x11') at New York Hall of Science during the 2019 National Chemistry Week that involved volunteers from 62 organizations and impacted 12,000 people via exhibition. The Project was honored as 2019 ACS National Chemluminary Award Finalist for the Most Innovative New Program Category.

In 2018, the New York Section was awarded a "Let's Do Chemistry" physical kit. The Kit was funded by NSF and developed by NISE (National Informal STEM Education Network). The Kit effectively supported the New York ACS' NCW Program and the STEM Family Night Project which won the Section a 2018, and a 2019 ACS National Chemluminary Award Finalist for the Chemattitude Partnership Category, respectfully.

Dr. Furlan is the Lead Organizer of many Long Island Chemistry and STEM Hands-on Outreach Events since 2011 and has impacted more than 5500 local students through STEM Family Night at Great Neck Baker School, Green Earth Day Boy Scout Camporee, STEM for Girls, Great Neck Library Hands-on; Earth Day at Sadle Rock and NYSCI Teen STEM Night Program.

Dr. Furlan is also a member of History of New York Section Committee since 2014.

## New York Meetings

<https://www.newyorkacs.org>

### ACS, NEW YORK SECTION BOARD OF DIRECTORS

#### MEETING DATES FOR 2021

The dates for the Board of Directors Meetings of the ACS New York Section for 2021 were selected and approved. The meetings are open to all – everybody is welcome. All non-board members who would like to attend any of the meetings should inform the New York Section office by emailing Bernadette Taylor at [btaylor@NewYorkACS.org](mailto:btaylor@NewYorkACS.org) or by calling the Section office at (732) 770-7324.

Dates of the meetings for 2021 are posted on the New York Section website at <https://www.NewYorkACS.org>, below, and monthly in *The Indicator*. Dr. Rita K. Upmacis will chair all meetings. The board meetings will start at exactly 6:30 PM. Until further notice, meetings will be held on-line. and will start at exactly 6:30 PM.

The Board Meeting dates for 2021 are:

#### Friday, February 19, 2021 Board Meeting

Friday, March 19, 2021 Board Meeting

Friday, April 16, 2021 Nichols Symposium (Virtual)

Friday, June 4, 2021 Board Meeting

Friday, September 10, 2021 Board Meeting

Friday, November 19, 2021 Board Meeting

We hope to provide further details concerning the NY ACS Sectionwide Conference and the virtual Nichols Symposium soon.

## LONG ISLAND SUBSECTION

\*\*\*\*\* February LIACS Seminar \*\*\*\*\*

“Investigation of Siderophores and Their Structural Derivatives as Potential Chemotherapeutic Agents”

*Speaker:* Dr. Sabesan Yoganathan, PhD  
Department of Pharmaceutical Sciences  
College of Pharmacy and Health Sciences  
St. John's University

#### Abstract:

Siderophores are a diverse class of secondary metabolites secreted by microorganisms under iron-deficient conditions for iron acquisition. Microorganisms utilize dedicated enzymes for siderophore biosynthesis and membrane proteins for transport. Siderophores play an important role in microbial pathogenesis. Siderophore biosynthetic machinery and transport proteins are potential target to develop a new class of antibiotics. Moreover, due to their metal binding properties, and ability to interfere with iron-dependent biological processes, siderophores have emerged as potential anticancer natural products. Our research lab focuses on the synthesis and evaluation of siderophores and their analogs as potential antimicrobial agents and anticancer agents. Azotochelin is one of the catechol-based siderophores that we are currently investigating. This seminar will discuss our efforts towards the development of azotochelin-derivatives as potential chemotherapeutic agents. We have taken a medicinal chemistry approach to understand the structure activity relationship of azotochelin scaffold, and discovered a series of azotochelin analogs with promising anticancer activities. Current efforts are focused on investigating the mechanism of cytotoxicity of these new lead compounds.

**Date:** Thursday, February 4, 2021

**Time:** 6:00 PM.

**Place:** Zoom

**Link:** <https://youtu.be/AiwPOMwPx0A>

**Meeting ID:** 878 6151 9540

**Passcode:** 563026

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## WESTCHESTER CHEMICAL SOCIETY

### SPECIAL SEMINAR

*Because of COVID-19, this meeting will be a remote meeting. Details are at the end of this announcement. You will need to have the Zoom software on your computer to access the link.*

#### Clinical Decision Support Tool and Rapid Point-of-Care Platform for Determining Disease Severity in Patients with COVID-19

Invited Speaker: John T McDevitt  
Professor of Biomaterials,  
School of Dentistry

Professor of Chemical  
and Biomolecular  
Engineer  
Tandon School of  
Engineering  
New York University  
NY and Brooklyn, NY

#### Abstract

SARS-CoV-2 is the virus that causes coronavirus disease (COVID-19) which has reached pandemic levels resulting in significant morbidity and mortality affecting every inhabited continent. The large number of patients requiring intensive care threatens to overwhelm healthcare systems globally. Likewise, there is a compelling need for a COVID-19 disease severity test to prioritize care and resources for patients at elevated risk of mortality. In this talk, an integrated point-of-care COVID-19 Severity Score and clinical decision support system is presented using biomarker measurements of C-reactive protein (CRP), N-terminus pro B type natriuretic peptide (NT-pro-BNP), myoglobin (MYO), D-dimer, procalcitonin (PCT), creatine kinase-myocardial band (CK-MB), and cardiac troponin I (cTnI). This COVID-19 Severity Score combines multiplex biomarker measurements and risk factors in a statistical learning algorithm to predict mortality. The COVID-19 Severity Score is trained and evaluated using data from 160 hospitalized COVID-19 patients from Wuhan, China. Our analysis finds that COVID-19 Severity Scores are significantly higher for the group that died versus the group that is discharged with median (interquartile range) scores of 59 (40–83) and 9 (6–17), respectively, and an Area Under the Receiver Operating Curve (AUROC) of 0.94 (95% CI 0.89–0.99). In more recent studies, these efforts have been expanded to include 701 patients with

COVID-19 are collected across practices within the Family Health Centers network at New York University Langone Health. A two-tiered model is developed with Tier 1 using easily available, nonlaboratory data to help determine whether biomarker-based testing and/or hospitalization is necessary. Likewise, Tier 2 predicts probability of mortality using biomarker measurements) and age. Both Tier 1 and Tier 2 models are validated using two external datasets from hospitals in Wuhan, China comprising 160 and 375 patients, respectively. The Tier 1 and Tier 2 internal validation had AUROC (95% confidence interval) of 0.79 (0.74–0.84) and 0.95 (0.92–0.98), respectively. The Tier 1 and Tier 2 external validation had AUROCs of 0.79 (0.74–0.84) and 0.97 (0.95–0.99), respectively. Collectively these promising initial models pave the way for a point-of-care COVID-19 Severity Score system to impact patient care. Clinical decision support tools for COVID-19 have potential to empower healthcare providers to save lives by prioritizing critical care in patients at high risk for adverse outcomes.

#### Biography



John T. McDevitt now serves as a Full Professor within the Department of Biomaterials at New York University, is a member of NYU's Bioengineering Institute and participates as a faculty member in the NYU Department of

Chemical and Biomolecular Engineering within the Tandon School of Engineering. Prior to this time, he served for 5 years as the Brown-Weiss Professor of Bioengineering and Chemistry at Rice University and rose through the academic ranks at University of Texas at Austin where he was positioned for 20 years. McDevitt completed his Ph.D. degree in Chemistry from Stanford University.

Professor McDevitt is a pioneer in the development of 'programmable bio-nano-chip' technologies. He has a strong track record of translating essential bioscience, artificial intelligence and medical microdevice discoveries into real-world clinical practice. In this capacity, he has served as the Scientific Founder for a number of diagnostic and clinical services companies. One of his most

*(continued on page 8)*

## WESTCHESTER CHEMICAL SOCIETY

(continued from page 7)

recent companies, OraLiva, Inc. features clinical services and diagnostic apps with potential to impact patient treatment and management. McDevitt and his team have raised over \$45M in Federal and Foundation support. His recent research has been sponsored by major programs funded by the National Institute of Dental and Craniofacial Research (NIDCR) division of the National Institutes of Health (NIH), National Institute on Drug Abuse (NIDA) at NIH, the Bill and Melinda Gates Foundation, Cancer Prevention Research Institute of Texas (CPRIT), the National Aeronautics and Space Administration (NASA), the Army and the United Kingdom's Home Office Scientific Development Branch.

McDevitt and his team have written more than 200 peer-reviewed scientific manuscripts and have contributed to more than 100 patents and patent applications. This work was recognized with the "2016 AACC

Wallace H. Coulter Lectureship Award," "Best of What's New Award" in the Medical Device Category by Popular Science as well as for the "Best Scientific Advances Award" by the Science Coalition. Dr. McDevitt's individual honors include the Presidential Young Investigator Award, the California Polytechnic Distinguished Alumni Award and the Exxon Education Award. Over the past years, Dr. McDevitt has served as the Principal Investigator for 6 major clinical trials and 2 clinical pilot studies, all involving the programmable bio-nano-chip. Through these clinical efforts, mini-sensor ensembles are being developed for major diseases in the areas of COVID-19 disease severity, oral cancer, cardiac heart disease, trauma, drugs of abuse, ovarian cancer and prostate cancer.

**Date:** Tuesday, February 9, 2021

Time: Zoom Meeting 7:00PM

Zoom link available from 6:45 PM  
(US and Canada)

Place: Zoom

Cost: Free and Open to the Public

<https://sunywcc-edu.zoom.us/j/87192908761?pwd=VGdINFE0bFhoZWZh2dEs5UUtJOUVLUt09>

Meeting ID: 871 9290 8761

Passcode: 61697e

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Find your local number: <https://sunywcc-edu.zoom.us/j/87192908761?pwd=VGdINFE0bFhoZWZh2dEs5UUtJOUVLUt09>

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## NEW YORK SECTION FOR APPLIED SPECTROSCOPY

### February Monthly Meeting — “Multiplexed and Sensitive Bioanalysis using SERS and SESORS”

We invite all interested persons to attend the on-line meeting of the NY Section of SAS.

**Date: Thursday, February 18, 2021**

Time: 12:00 noon EST.

The meeting includes a talk by Prof. Karen Faulds of the University of Strathclyde

#### Information to join the meeting:

##### Microsoft Teams meeting

Please go to the NYSAS website [www.nysas.org](http://www.nysas.org) for further information, and for a live active link to join the meeting.

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.....

*Speakers:* K. Faulds\*, S. Mabbott,

H. Kearns, L.E. Jamieson,  
F. Nicolson, A. Kapara, and  
D. Graham

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#### Abstract

Surface enhanced Raman scattering (SERS) is an analytical technique with several advan-

tages over competitive techniques in terms of improved sensitivity and multiplexing. We have made great progress in the development of SERS as a quantitative analytical method, in particular for the detection of DNA. However, the lack of quantitative data relating to real examples has prevented more widespread adoption of the technique. Detection of specific DNA sequences is central to modern molecular biology and also to molecular diagnostics where identification of a particular disease is based on nucleic acid identification. Many methods exist and fluorescence spectroscopy dominates the detection technologies employed with different assay formats. Another advantage of SERS over existing detection techniques is that of the ability to multiplex which is limited when using techniques such as fluorescence. We have clearly demonstrated the ability to identify and quantify the presence of a mixture of 3 pathogenic DNA sequences in solution using data analysis techniques.

Here we demonstrate the development of new bioanalytical assays based upon SERS which have been used successfully for the detection of bacterial pathogens using modified SERS active probes. Biomolecule functionalised nanoparticles have been designed to give a specific SERS response resulting in discernible differences in the SERS which can be correlated to the presence of specific pathogens. In this presentation the simultaneous detection and quantitation of 3 pathogens within a multiplex sample will be demonstrated. We have also recently published the use of nanoparticles functionalised with resonant Raman reporter molecule for the visualization of a 3D breast cancer tumour models using Spatially Offset Raman combined with SERRS (SESORRS).

#### Biography

Karen Faulds is a Professor in the Department of Pure and Applied Chemistry at the University of Strathclyde and an expert in the development of surface enhanced Raman scattering (SERS) and Raman techniques for novel analytical detection strategies and in particular multiplexed bioanalytical applications. She has published over 145 peer reviewed publications and has filed 5 patents. She has been awarded over £20M in funding as principal and co-investigator from EPSRC, BBSRC, charities, industry and governmental bodies. Her Groups research has been recognised through multiple awards including the Nexxus Young Life Scientist of the Year Award (2009), Royal Society of Chemistry

(RSC) Joseph Black Award (2013), Craver Award (2016) and Charles Mann Award (2019). She is a Fellow of the Royal Society of Chemistry (2012), the Society for Applied Spectroscopy (2017) and the Royal Society of Edinburgh (2018). She has been named as one of the Top 50 Women in Analytical Science (2016), Top 10 Spectroscopist (2017) and Top 100 Influential Analytical Scientists (2019) by The Analytical Scientist. She has given over 90 invited talks at national and international conferences.

She was elected as the first female and youngest Chair of the Infrared and Raman Discussion Group (IRDG) in 2014 which is the oldest spectroscopic discussion society

in the UK. She is an appointed member of the Royal Society of Chemistry (RSC) Chemical Biology Interface Division Council and a member of the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) Governing Board and a member of the International Steering Committee of the International Conference on Raman Spectroscopy (ICORS). She is the Strathclyde Director of the EPSRC and MRC Centre for Doctoral Training in Optical Medical Imaging joint between the Universities of Edinburgh and Strathclyde, serves on the editorial board of RSC Advances and Analyst and the editorial advisory board for Chemical Society Reviews and Analytical Chemistry.



## NY/NJ SAS PRELIMINARY SCHEDULE OF SPEAKERS 2020-2021



**Everyone is Welcome to Attend**

Note: All meetings will be on-line. Click on this link to join [Join\\_Microsoft\\_Teams\\_Meeting](#). For more information, go to <https://www.nysas.org/>

**Open Access Virtual Presentations, sponsored by:  
New York/New Jersey Section of The Society for Applied Spectroscopy**

Date	Time	Speaker	Title	Affiliation
18-Feb.	12 noon is EST 5:00 PM is GMT	Karen Faulds	Development of SERS and SESORRS for Multiplexed Bioanalysis	University of Strathclyde
18-Mar.	12 noon is EST 5:00 PM is GMT	<sup>1</sup> Heinz Siesler &  <sup>2</sup> Marina deGea Neves	<sup>1</sup> Food Authentication and Classification Using Vibrational Spectroscopy in Tandem with Chemo- metrics Tools  <sup>2</sup> Handheld Near-Infrared Spectrometers: On-Site Quality Control and Protection against Product Counterfeiting	University of Duisburg-Essen

**All presentations will be held LIVE via Microsoft Teams. For further information:**  
<https://www.nysas.org> or [john.wasylyk@bms.com](mailto:john.wasylyk@bms.com)

## **EMPLOYMENT AND PROFESSIONAL RELATIONS COMMITTEE OF THE NEW YORK SECTION**

To Human Resources Departments in Industry and Academia

The Employment and Professional Relations Committee maintains a roster of candidates who are ACS members seeking a position in the New York metropolitan area. If you have job openings and would like qualified candidates to contact you, please send a brief job description and educational/experience background required to [hessytaft@hotmail.com](mailto:hessytaft@hotmail.com).

Candidates from our roster who meet the requirements you describe will be asked to contact you.



## **ORGANIC TOPICAL GROUP – JOINT MEETING WITH THE NEW YORK ACADEMY OF SCIENCES CHEMICAL BIOLOGY DISCUSSION GROUP**

### **AI in Chemical Biology: New Frontiers**

**Organizers:** Nozomi Ando, PhD  
Cornell University  
César de la Fuente, PhD  
University of Pennsylvania  
Sara Donnelly, PhD  
The New York Academy of Sciences  
Sonya Dougal, PhD  
The New York Academy of Sciences

**Keynote:** James Collins, PhD  
Massachusetts Institute of Technology

**Speakers:** Tim Cernak, PhD  
University of Michigan  
Joey Davis, PhD  
Massachusetts Institute of Technology  
Alán Aspuru-Guzik, PhD  
University of Toronto  
Anne Fischer, PhD  
DARPA  
Debora Marks, PhD  
Harvard Medical School

This one day symposium will showcase recent advances in chemical biology that were enabled by Artificial Intelligence (AI) and highlight best practices for employing AI techniques in this field.

**Date:** **Wednesday, March 17, 2021**

**Time:** 11:00 AM – 5:00 PM

**Place:** Virtual Symposium

**Cost:** ACS and NYAS members save \$30 or more on this event. Please select the appropriate non-member Registration Category and use the Priority Code “ACS”.

For more information and to register for the event, go to [www.nyas.org/AIChemBio](http://www.nyas.org/AIChemBio)

To become a Member of the Academy, visit [www.nyas.org/benefits](http://www.nyas.org/benefits)



## **NEW YORK SECTION**

### **2019 ChemLuminary Awards**

The New York Section is very proud to have been nominated as a finalist in four different ChemLuminary categories. On Wednesday December 9, we were fortunate enough to be have been chosen as the recipient of the **2019 ChemLuminary Award for Outstanding Performance by a Very Large Section**. Congratulations to all of our members that worked so hard to make this happen!



## **AMERICAN CHEMICAL SOCIETY'S NEW YORK SECTION, INC. – WILLIAM H. NICHOLS DISTINGUISHED SYMPOSIUM**

### **“Nanostructured Polymers by Molecular Engineering Using ATRP”**

*Honoring:* Professor Krzysztof Matyjaszewski

**Date:** Friday, April 16, 2021

**Time:** 1:00PM – 5:30 PM

**Place:** Virtual Symposium



### **Welcome**

Professor Ruben M. Savitzky, 2020 Chair, ACS New York Section, The Cooper Union

### **Opening of the Distinguished Symposium**

Professor Rita K. Upmacis, 2020 Chair-elect, ACS New York Section, Pace University

### **Polymer-Enhanced Biology**

Professor Alan J. Russell, Department of Chemical Engineering, Carnegie Mellon University

The growth of polymers from the surface of proteins has opened the door to tuning and supplementing protein function by rational design. Protein-polymer conjugates are synthesized from pure starting materials and the struggle to separate conjugates from polymer, native protein, and from isomers has vexed scientists for decades. We have discovered that covalent polymer attachment has a transformational effect on protein solubility in salt solutions. Charged polymers increase conjugate solubility in ammonium sulfate and completely prevent precipitation even at 100% saturation. This transformational impact on protein solubility can be used to simply purify mixtures of conjugates and native proteins into single species. Increasing protein solubility in salt solutions through polymer conjugation could lead to many new applications of protein-polymer conjugates.

### **Responsive Materials from Dynamic Bonds**

Professor Brent S. Sumerlin, Department of Chemistry, University of Florida

By relying on a variety of reversible covalent reactions that lead to readily cleaved bonds, we have prepared materials that combine the physical integrity of covalent materials and the structural dynamics of supramolecular complexes. Enaminone, boronic esters, boronate esters, and Diels-Alder linkages have all been employed to prepare these responsive and dynamic materials, with particular attention having been dedicated to the preparation of hydrogels, elastomers, and nanoparticles. We seek to exploit the reversible nature of these bonds to prepare responsive and self-healing materials.

### **Dancing in the Dark with CHIPs:**

#### **Polymers for Next Generation Photonics and Imaging**

Professor Jeffrey Pyun, Department of Chemistry and Biochemistry, University of Arizona

The ability to manipulate light with materials is critical for a wide range of optical applications for devices, imaging and sensing applications. We will discuss our recent efforts to make new functional polymers and materials that are designed to transmit, reflect, rotate or guide light across a wide optical spectrum to enable creation of new imaging and sensing platforms. We will discuss how these systems will improve human-machine interfaces and next generation sensors for transportation.

### **Polymers, Cells and Spores: Macromolecular Engineering of Living Thin Films**

Professor David A. Tirrell, Department of Chemistry, California Institute of Technology

This lecture will describe our ongoing effort to engineer the physical and biological properties of thin bacterial films by display of adhesive proteins on the cell surface, by release of matrix proteins into the extracellular space, and by the inclusion of stable bacterial spores. Studies of film fabrication, cell viability, film growth, film structure, indentation behavior, and regeneration following injury will be discussed.

*(continued on page 14)*

## WILLIAM H. NICHOLS DISTINGUISHED SYMPOSIUM

(continued from page 13)

### Macromolecular Engineering by Taming Free Radicals Using Atom Transfer Radical Polymerization

**Professor Krzysztof Matyjaszewski, Nichols Medalist,**  
Center for Macromolecular Engineering Carnegie Mellon University

Macromolecular Engineering (ME) is a process comprising rational design of (co)polymers with specific architecture and functionality, followed by precise and efficient polymer synthesis and processing in order to prepare advanced materials with target properties. We employed radical polymerization for ME due to its tolerance to many functionalities although radicals are difficult to be controlled, since they have very short life times ( $<1$  s) and are involved in side reactions. Taming free radicals was accomplished via dynamic equilibria between minute amounts of radicals and large pool of dormant species using copper-based ATRP (atom transfer radical polymerization) catalytic systems. By applying new initiating/catalytic systems, Cu level in ATRP was reduced to a few ppm and ME provided polymers with precisely controlled molecular weights, low dispersities, designed shape, composition and functionality as well as block, graft, star, hyperbranched, gradient and periodic copolymers, molecular brushes and organic-inorganic hybrid materials and bioconjugates. These polymers can be used as components of various advanced materials such as health and beauty products, biomedical and electronic materials, coatings, surfactants, lubricants, additives, sealants as well as nano-structured multifunctional hybrid materials for application related to environment, energy and catalysis.

### Biography



Krzysztof (Kris) Matyjaszewski was born in Poland, in 1950. He obtained his PhD degree in 1976 at the Polish Academy of Sciences in Lodz, Poland, working with Prof. S. Penczek. Since 1985, he has been at Carnegie Mellon University (CMU) where he is currently J. C. Warner Professor of Natural Sciences and a director of Center for Macromolecular Engineering. He served as Head of Chemistry Department during 1994-1998. He also holds appointments of Adjunct Professor at the University of Pittsburgh, the Polish Academy of Sciences in Lodz and Technical University in Lodz, as well as Departments of Chemical Engineering and Materials Science at CMU.

Matyjaszewski's main research interests include controlled/living radical and ionic polymerization, catalysis and synthesis of advanced materials for optoelectronic, energy-related, environmentally-related as well as for biomedical applications. In 1994, he discovered

Cu-mediated atom transfer radical polymerization (ATRP). In order to tame the uncontrolled free radical polymerization behavior, Matyjaszewski introduced a new concept to insert periods of ca. 1 min dormancy after each ca. 1 millisecond of radical activity. This way, the overall life of propagating chains was extended from about 1 second to several hours with hundreds of intermediate dormancy periods. This would be like extending person's life from 100 years to 3000 years, if after each 1 day of activity a person could be dormant for 1 month. The concept of equilibria between active and dormant species applies not only to polymer systems but also operates in biological systems, such as Vitamin B-12, and also redox equilibria in the respiratory chain and lipid isomerization or redox recycling of the antioxidant systems. ATRP has its roots in atom transfer radical addition/cyclization, a highly selective and efficient organic reaction. Organic chemists originally used very high concentration (ca. 10 mol %) of copper catalysts. Matyjaszewski invented new catalysts for ATRP which are million times more powerful. This year he reported new ATRP catalysts which are billion times more reactive than original catalysts used in seminal 1995 paper. Thus, they can be used at very low concentrations, parts per million (ppm) relative to monomer. The catalysts used in so

small amounts can be continuously regenerated using mild reducing agents such as ascorbic acid, iron or copper wire, electrical current, mechanical forces or light under excellent spatio-temporal control. Now, organic chemists adopted these catalytic systems also to organic reactions.

ATRP has enabled preparation of well-defined, essentially tailor-made polymers via macromolecular engineering. In these systems, all polymer chains grow concurrently and steadily. This allows synthetic chemists to prepare a myriad of well-defined polymers, including block and gradient copolymers, stars, molecular brushes, also various bioconjugates by linking synthetic polymers with nucleic acids, proteins and enzymes, as well as inorganic-organic hybrids by anchoring polymers to nanoparticles, flat wafers and other inorganic materials. In 1996 and 2000, Matyjaszewski founded two industrial Consortia with over sixty participating international chemical companies to facilitate technology transfer to industry. So far, ATRP has been licensed 17 times and commercial production of advanced polymers by ATRP started in 2004 in US, Japan and Europe. ATRP has been used to prepare well-defined polymers with precisely designed and controlled macromolecular architecture, including various hybrids and bioconjugates, as well as smart, stimuli responsive systems. ATRP has been successfully used to commercially produce better pigment dispersants for inkjet printing, automotive and appliances coatings, cosmetics, chromatographic packings, adhesives, sealants for self-cleaning windows, flat panel display and automotive gaskets. Other applications, being evaluated, include drug and nucleic acid delivery, coatings for cardiovascular stents, scaffoldings for bone regeneration, biocidal surfaces, degradable plastics, and others in biomedical, optoelectronic, and automotive industry.

Matyjaszewski's group at CMU has comprised over 100 graduate students, 100 undergraduate students and over 140 postdoctoral fellows. He has co-authored over 1,100 publications (cited 100,000 times, h-index 154, ISI), co-edited 20 books, 99 book chapter and holds 62 US and over 150 international patents.

Matyjaszewski received 2017 Benjamin Franklin Medal in Chemistry, 2015 International Dreyfus Prize in Chemistry, 2014 National Institute of Materials Science (Japan) Award, 2013 Madison Marshall Award, 2012 Prize of Société Chimique de France, 2012 Maria Curie Medal, 2012 Dannie-Heineman Prize, Goettingen Academy of Science, 2011 Wolf Prize in Chemistry, 2009 Presidential Green Chemistry Challenge Award, and from the American Chemical Society: 2019 Award in Chemistry of Materials, 2013 AkzoNobel North America Science Award, 2011 Hermann Mark Award, 2011 Award in Applied Polymer Science, 2002 Polymer Chemistry Award, 1995 Creative Polymer Chemistry Award. He received eleven honorary degrees (Ghent, Lodz, Athens, Moscow, Toulouse, Pusan, Paris, Technion, Poznan, Padova, Coimbra) and is a member of National Academy of Engineering, National Academy of Sciences, Polish Academy of Sciences, Russian Academy of Sciences, Australian Academy of Sciences, honorary member of Israel and Chinese Chemical Society and a fellow of National Academy of Inventors, International Union of Pure and Applied Chemistry, and American Chemical Society.



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## North Jersey Meetings

<https://www.njacs.org>

### 2021 NORTH JERSEY EXECUTIVE COMMITTEE MEETINGS

Section officers, councilors, committee chairs, topical group chairs, and section event organizers meet regularly at the Executive Committee Meetings to discuss topics of importance to running the section and representing the membership. The team is scheduling monthly virtual meetings on Monday evenings at 7 – 9 PM (EST). See below table for the 2021 meeting dates. All ACS members are welcome to attend these meetings and become more involved in section activities. For any additional information, please contact Mirlinda Biba (NJACS 2021 Chair) at [mbiba@njacs.org](mailto:mbiba@njacs.org).

There are no other Subsection meetings scheduled for February.

### 2021 ACS North Jersey Local Section Executive Committee Meetings (virtual) Schedule

Month	Meeting Date Time: 7-9 PM EST (virtual)
February	Monday, February 22, 2021
March	Monday, March 22, 2021
April	Monday, April 19, 2021
May	Monday, May 17, 2021
June	Monday, June 14, 2021
September	Monday, September 27, 2021
October	Monday, October 18, 2021
November	Monday, November 15, 2021
December	Monday, December 13, 2021

**Deadline for items to be included in the MARCH 2021 issue of *The Indicator* is **JANUARY 28, 2021****

## Call for Applications

### FREDDIE AND ADA BROWN AWARD

This Award recognizes and encourages high achieving middle- and high-school students, of African American and Native American heritage, to further develop their academic skills, with views on careers in the chemical sciences.

#### Award Amounts

Middle School \$100.00 Check and \$50.00 gift certificate : High School \$200.00 Check and \$100.00 gift certificate.

#### Who is Eligible

Middle School students enrolled in a science class : High School students who have completed a chemistry course

#### Grades

Middle School B Average or better in Science, B Average overall : High School B Average in Chemistry, B Average overall

#### Letter of Recommendation

Math or Science/Chemistry Teachers or Guidance Counselor

#### Statement

Middle School “Why I Like Science” : High School “Why I Like Chemistry”

#### Selection Criteria

Applicants must be African American (Black) or Native American (including Pacific Islander) or of mixed race.

#### Transcript

Official transcript required.

#### Financial Need

Not Required.

Applications available on the web: [www.njacs.org/freddieadabrown](http://www.njacs.org/freddieadabrown) or from your school guidance office.

#### Return Application To

Freddie and Ada Brown Award, NJACS Section Office, 49 Pippens Way, Morristown, NJ 07960

#### Due Date

Completed Applications must be postmarked no later than **March 31 Annually**

Questions: Contact Jeannette Brown [Jebrown@infionline.net](mailto:Jebrown@infionline.net) or (908) 239-1515

## Call for Volunteers

### OPPORTUNITY FOR ACS MEMBERS TO AID STUDENTS 2 SCIENCE IN A HYBRID VIRTUAL LAB PROGRAM

Can you spare a few hours of your time? Do you like working with students and would you like the opportunity to share your science knowledge in a classroom? Students 2Science (S2S) is seeking volunteers to support its V-Lab program. S2S has a series of elementary, middle, and high school experiments that run in various schools across New Jersey. Members are especially needed to mentor students in participating schools to help with experiments. It's great fun, a wonderful way to give back, and only requires

1-2 hours of your time. Experiments include CO<sub>2</sub> to the Rescue, Curious Crystals, Mystery of M&Ms, Thermochemistry: *Exothermic and Endothermic Chemical Reactions*, and *Glow it Up: The Chemistry of Luminol*. All are age-appropriate and volunteers are provided with instructions on how to support in the classroom prior to your scheduled volunteer day.

For more information, contact Cyndi Roberson, Director of Corporate Relations, at (973) 947-4880 ext. 516 or visit the website to register for the upcoming school year: <https://www.students2science.org>.



### SEMINAR SPEAKERS WANTED

The New York Section of the ACS is in search of speakers that we can add to our Speakers Bureau database of interested local area speakers who are available for Section-wide seminars and symposia. If you have an area of research or interest that would provide an interesting talk appropriate for our Section members, and would like to be included in our Speakers Bureau, please contact the New York Section Office at (732) 770-7324 or send an email to Bernadette Taylor [btaylor@NewYorkACS.org](mailto:btaylor@NewYorkACS.org) with the following information that will be posted on the Section's website: your name, affiliation, a title, and 5-6 words briefly summarizing your area of specialty. We look forward to hearing from you about topics that you wish to share with our other members!

## Call for Nominations

### COMMITTEE ON THE HISTORY OF THE NEW YORK SECTION

Over the past twenty-three years the New York Section has participated in the designation of seven National Historic Chemical Landmarks and four New York Section Historic Chemical Landmarks. A brief description of these National and local section landmarks may be found on the NY Section Home Page at <https://www.newyorkacs.org> under the Committee on the History of the NY Section. These landmark programs recognize achievements in the chemical sciences and related areas, in order to enhance public appreciation for the contributions of the chemical sciences to modern life.



### HAPPY PRESIDENTS' DAY TO TWO OF THE BEST!

