



# Spectroscopy Society of Pittsburgh

## January Meeting

Wednesday – January 15, 2014  
Duquesne University



<b>5:30 PM</b>	Technology Forum Speaker's Presentation - <b>Wolfe Lecture Hall located in Bayer Hall</b>
<b>5:30 to 6:30PM</b>	Social Hour - <b>City View Café (6th Floor of Union)</b>
<b>6:30PM</b>	Dinner - <b>City View Café (6th Floor of Union)</b>
<b>8:00PM</b>	Business Meeting– <b>Laura Falk Hall located in Mellon Hall</b>
<b>8:15PM</b>	Technical Program Speaker's Presentation– <b>Laura Falk Hall</b>

Deadline for Dinner Reservations **1/9/14**

[On-line Reservations](#)

### TECHNICAL PROGRAM - 8:15 PM

**Dr. Mark Bier, Carnegie Mellon University**

"Heavy Ion Mass Spectrometry -- the Next Frontier"



Heavy ion mass spectrometry (HIMS) is a new frontier. Despite major advancements due to electrospray (ES) and matrix-assisted laser desorption ionization (MALDI) there are still high  $m/z$  limitation of these ionization methods, mass analyzers and detectors. We are developing new mass spectrometry (MS) instrumentation and methods to improve the analysis of ultra-high  $m/z$  macromolecules including complexes such viral particles, a major interest of the group. We were the first lab to weigh synthetic Head II capsid of the T7 bacteriophage HK97 at 13 MegaDa, expanded ProHead I at 17.7MegaDa, a multimeric capsid complex at 26+ MDa and the capsid of the T9 bacteriophage D3 (16.6MDa) by distinguishing between individual charge states. We are also the first lab to determine ion charge states over 50 by MALDI. These unprecedented results were accomplished using a superconducting tunnel junction (STJ) cryodetector mass spectrometer. Other heavy ion complexes that we have weighed include biomolecules such as IgM (1MDa), ferritin (900kDa), von Willebrand factor (220kDa to 1+MDa) and synthetic nanoparticles such as quantum dots (~1MDa), 5nm gold particles and most recently, multiply-charged single-walled carbon nanotubes. These remarkable results will be showcased in this seminar.

**Dr. Mark E. Bier** is a Research Professor of Chemistry in the Department of Chemistry at Carnegie Mellon University and he is the Director of the Center for Molecular Analysis within the Mellon College of Science.

He received his BS degree in Chemistry from Allegheny College in Meadville, PA and his Ph.D. from Purdue University with Professor Robert Graham Cooks. Between his BS and Ph.D. degree he worked as a Biochemist at the Department of Medicine at the V.A. Medical Center in Oakland, PA and a chemist at AMSCO, now Steris Corporation in Erie, PA. where he patented a hydrogen peroxide delivery method that is still used today.

During his Ph.D. studies he developed the first quadrupole surface induced dissociation (SID) quadrupole mass spectrometer and in source membrane probes for MS. Mark joined Finnigan Corporation in San Jose, CA (now ThermoFisher Scientific) and was a lead Scientist developing the first commercial ESI and APCI ion trap mass spectrometer (LCQ). His greatest idea/invention, was the high ion storage capacity

linear ion trap (LIT) and the toroidal ion trap with radial ejection. The LIT is going to Mars in 2020 and will be used to look for life related molecules as a part of a NASA-ESA MOMA mission.

His current research is focused on the mass spectrometry analysis of heavy ions by MS ( $m/z > 100\text{kDa}$ ) by developing special detector, analyzer and source technologies. The work is directed at ultra-high mass macromolecule analysis such as viral particles.

## TECHNOLOGY FORUM - 5:30 PM

**Peter Chapman, Carnegie Mellon University**

"picoCTF: Teaching 10,000 High School Students to Hack"



In the spring of 2013 two student-lead organizations at Carnegie Mellon University, the Plaid Parliament of Pwning and Team Osiris, designed and hosted a computer security competition for high school students called picoCTF. Unlike existing competitions, picoCTF focused primarily on offensive hacking skills presented in the form of a web-based video game to better excite students about computer science and computer security. Over the 10-day competition nearly 10,000 high school students participated across almost 2,000 teams vying for \$25,000 in prizes, making picoCTF the largest hacking competition ever held. As the technical lead with experience running MOOCs, I will share how we organized, built, and ran picoCTF. Additionally, I will also discuss how we plan to build on our success to make an even larger impact on computer science education.

**Peter Chapman** is a Ph.D. candidate in the Computer Science Department at Carnegie Mellon University working with David Brumley in the Software Security Research Group. He graduated from the University of Virginia in May of 2012 with a Bachelor of Arts majoring in Computer Science and Cognitive Science. From 2009 to 2012 he was an active member of the Security Research Group in the UVA Computer Science Department working under his advisor David Evans studying web and mobile security. In the summer of 2011 he participated in a Microsoft Research internship in Redmond, Washington under the mentorship of Jinlin Yang working with the Windows Azure System Monitoring and Diagnostics group. In the February of 2012 he was one of the first employees at Udacity as an assistant instructor for CS 101: Building a Search Engine and CS 262: Building a Web Browser. In 2013 Peter began attending CMU and in the spring of 2013 was the technical lead for a nation-wide high school hacking competition, picoCTF. Nearly 10,000 students competed across 2,000 teams for \$25,000 in prizes.

### Dinner Reservations:

Please register on-line at <http://www.ssp-pgh.org/monthly-meeting-rsvp/> to make dinner reservations NO LATER THAN Thursday, January 9, 2014 at noon. Dinner will cost \$10 (\$5 for students) and checks can be made out to the SSP. This month's entrée will be Salmon. If you have any dietary restrictions, please indicate them when you RSVP.

### Parking Instructions:

The Duquesne University Parking Garage is located on Forbes Avenue. Upon entering the garage, receive parking ticket and drive to upper floors. Pick up a parking chit at the dinner or meeting.