SAS SPECTRUM eNEWS

Editor's Note

As quickly as it approached, Pittcon 2018 in Orlando, Florida, is, as of this writing, three weeks past. SAS proudly sponsored two technical sessions: "Frontiers in LIBS Imaging" and "Leading Edge Women in the Field of Applied Spectroscopy". These two sessions were specially planned in celebration of the 60th anniversary of SAS. Further technical details on these two sessions will be presented in an upcoming supplemental issue of Applied Spectroscopy.

While Pittcon had much science to offer, I felt somewhat guilty going to the Universal Pittcon Party at Universal Orlando resort while my kids were still back at home. One thing that I am proud to report is the presentation of my work at a poster session. It has been a long while since I gave a poster presentation and I found it a rewarding experience because I got a chance to chat with quite a few young researchers. One chemical engineer who just started an industrial job and was asked to quantify water and SO_2 using IR and was struggling a bit due to interference. Another graduate student was trying to combine multiple photonic probes based on various technologies into one universal probe. I shared my experience, told them where to find the SAS booth on the floor, and urged them to join SAS. It is my hope they have done that and then they may even receive and read through this Newsletter. If you are one of them, I would appreciate hearing back from you by email.

Speakers from the Frontiers in LIBS Imaging technical session: (left to right) Matthieu Baudelet, Francois Doucet, Vassilia Zorba, Mauro Martinez, and Vincent Motto-Ros

Speakers from the Leading Edge Women in the Field of Applied Spectroscopy technical session: (left to right) Bhavya Sharma, Karen Faulds, Kathleen Gough, Rina Dukor, and LeAnn McGowan

Interview with Jim Rydzak

SAS always strives to serve its members by creating networking opportunities and bridging spectroscopists with different backgrounds and experiences. One way we do this is to share members' personal stories and opinions in the form of member profiles or interviews. In this issue, we bring you an interview with Jim Rydzak. Please let us know if you are interested in sharing your experience/opinion with the rest of SAS community, or if you would like to see an interview with a specific spectroscopist.

(1) Please tell us about yourself and your career path.

I got my BS in Chemistry degree with a minor in computer science at Mount Union University in Alliance, Ohio. During the summer between my junior and senior year there, I was awarded a National Science Foundation summer grant to work at Ohio University. I ended up doing a project with Dr. Peter Griffiths. That grant really set the path of my career. I went on to graduate school at Ohio University, worked for Dr. Peter Griffiths, and developed a strong foundation in instrumentation, FT-IR, and Raman spectroscopy. I owe a very large debt of gratitude to Peter for all that I learned from him.

I have worked in the fields of electroplating, polyolefin manufacturing, consumer product development and manufacturing, and pharmaceutical development and manufacturing. I feel like I have worked in a golden age of spectroscopy with so many developments with the implementation of FT-IR, laser Raman, and NIR spectroscopy. These fields opened up the areas of microspectroscopy, and later imaging, using each of those techniques. The development of the diamond attenuated total reflectance accessory and later the probe changed the way infrared is done away from KBr pellets, Nujol mulls, and sealed cells. Raman and NIR provided techniques to look at samples through glass and even some packaging material.

The biggest benefit of applying these techniques was taking them out of the lab and into the process. I was fortunate to have started the process analytical groups at Colgate-Palmolive and GlaxoSmithKline. I was able to help develop process understanding of the making of many products and the development of many active pharmaceutical ingredients (APIs). Process analytical enables real time monitoring and control of the making process of many products and pharmaceuticals. It is also enabling continuous manufacturing, thereby lower manufacturing infrastructure costs as well as reducing environmental impact by shortening processes, saving electricity, raw materials, and improving quality in the process. Now I am consulting and able to share what I have learned and apply spectroscopy to solve many industrial problems. What a ride it has become!

(2) You have been very active in both SAS and the Coblentz society. Can you talk about your roles in these organizations, the time commitment, and the benefit of your involvement?

I have been an SAS member for over 38 years and I was recently honored to be selected into the rolls of their Distinguished Fellow program. In the Coblentz Society, I first became involved as a Coblentz representative to the FACSS governing board in 1986. This started my involvement in the FACSS (now SciX) conference. I served in many roles for the conference starting with workshops chair and later co-chair with the SAS workshop coordinator Christian Hassell. My interest in setting up opportunities for young chemists to learn spectroscopy began there. I also took on the role of Employment Chair for the conference. In 2003, I was selected to be the program chair for the conference in Ft. Lauderdale. In 2007, I became the governing board chair and several other functions after that included Long Range Planning Chair, Site Selection Committee just to name a few. I participated in the refocusing of the conference mission, led by past SAS president Diane Parry. Ultimately this effort led to naming the conference SciX and the sponsoring of additional conferences, for example, Spring SciX in Scotland in April of this year. Back to the Coblentz roles, during this time I served on the Coblentz Board and was elected president from 2013–2015. During that time working with SAS, we were able to generate fundraising activities to fully endow the Ellis Lippincott award and get a good start at funding the William G. Fateley award. The time commitment involved many meetings at conferences and intermittent organization phone meetings outside of the conferences. The experience of working with so many great spectroscopists and helping to organize awards, conferences, workshops, and sessions was the truest/greatest benefit of my involvement. It resulted in being part of the greater spectroscopic community and developing the lasting relationships with people in SAS, Coblentz, and FACSS/SciX.

(3) Can you give a brief summary of the field of PAT, and some historical perspective on its past, present and where it is going?

Process analytical chemistry was the original terminology for the field we now refer to at process analytical technology or PAT. It had its origins, at least in the US, in the 80s and was spearheaded by the chemical and petrochemical industries, and later the food and pharmaceutical industries. Process analytical groups at that time were largely responsible for taking the interferometers and building their own hardened, process ready instrument to deploy in their chemical and petrochemical plants to enable online control of the processes. A large step came with the development of the Center for Process Analytical Chemistry (CPAC) at the University of Washington. CPAC is a consortium of industrial, national laboratory, and government agency sponsors addressing multidisciplinary challenges in PAT and process control through fundamental and directed academic research. They helped develop the field of chemometrics and instrumentation, such as a process NIR spectrometer that was developed to replace the knock engine to determine gasoline octane. Another development, that is enjoying a reapplication in the area of pharmaceutical flow chemical synthesis, is the New Sampling Sensor Initiative (NeSSI^{TM}). NeSSI^{TM} is a miniature, modular sample systems that integrates "smart" analytical systems by closely integrating flow, pressure, and temperature with analytical sensors such as FT-IR, Raman and NIR spectrometers. NeSSI^{TM} has evolved into a very useful tool for process optimization studies in development, as well as for process control applications in manufacturing.

(4) What is your advice for young spectroscopists still in universities or just graduating?

My best advice for young chemists is to network. This is best done by attending conferences, joining chemistry societies, and talking to people working in the field of spectroscopy. One of my fondest memories was approaching Dr. Tomas Hirschfeld at a conference and asking his opinion of the then new FT-IRs that were on the market. He took some time and we spoke about identifying what my measurement needs were, and to let those dictate what company's instrument was best suited to fill those needs. Next, is to try to get an internship, even just a summer internship in industry that you may wish to work in. I found working for companies that have products that you could see in the marketplace and helped people was very rewarding for me.

(5) When you were working in the industry, can you share some of your thoughts on how to be successful, and the typical challenges you have to overcome when interacting with non-spectroscopists?

The best advice to being successful in industry, as in many fields, is to develop your active listening skills. Really ask questions to fully understand the real problem as it sometimes is different than the problem being posed to you. A simple example comes from developing a set of calibration standards for a product in the consumer products industry. A key ingredient was added to the batch (note all batches are the same size) by dumping a 20-pound bag of the ingredient into the batch. So, the failure modes for that ingredient would be, forgetting to add the bag (a zero concentration), target concentration, and a second bag added by mistake. Understanding this enabled a simplification of the variation of that component in the standards that were made.

Non-spectroscopists also need to better understand what can be accomplished with spectroscopy. Once you understand their problem, an analyst needs to reflect back the understanding that you have gained and then explain how spectroscopy can solve the problem. A classic example of this is analysis, either online or offline, of multicomponent products such as a dish detergent. A spectroscopist can develop a multicomponent calibration set and in a 2 min analysis, which can give the results for each of the eight to ten ingredients in the product using only one instrument. This can be a powerful justification, as you can often replace many types of instruments that were being used to analyze each individual component. In addition, the 2 min (or faster) analysis allows for process control of the production of the dish detergent and is orders of magnitude faster than traditional analyses. The key is in the understanding of the problem, conveying your understanding of the problem and then explaining the possible solutions and limitation of those solution to see if the spectroscopic solution meets the need.

(6) Can you talk about the Coblentz Speed Mentoring session you have been organizing?

The Coblentz Society, in partnership with the Society of Applied Spectroscopy, will for the fifth time hold its Speed Mentoring session at SciX 2018. Speed Mentoring is a fun, fast-pass session that enables a structured interaction with a dozen or more spectroscopists from various industries, academia, and government labs, enabling the mentees to get an understanding of what it is like to work in those areas. These interactions can be the basis of an ongoing mentoring relationship session if that is of interest and is a wonderful networking opportunity for job hunting or just getting a better understanding of life as a spectroscopist. The session has settled into a Monday lunchtime slot and will continue again at the SciX 2018 conference in Atlanta. Please check the signup check box on the SciX 2018 registration form so we have an accurate number for ordering lunches that are provided. You can also register online for the Speed Mentoring session at the Coblentz website at members.coblentz.org. Those who register will get a free boxed lunch!

(7) What do you think is the next big thing in the field of applied spectroscopy?

For some time, I have been waiting for improvements in the mid-IR ranges of the quantum cascade lasers (QCL). I believe that the same kind of miniaturization and mass production of these lasers will have a huge impact on spectroscopy. The QCL instruments have the capability of high intensity resulting in throughput advantages that allow them to be applied to many low-energy sampling techniques. The one that would be most advantageous to PAT would be a QCL coupled to a diamond ATR probe. It would improve sensitivity, thus lowering detection limits for reaction monitoring of all types of chemical compounds especially active pharmaceutical ingredients (API). This would enable better control of impurities in the synthesis of APIs. It would also enable faster detection of flow chemistry synthesis and enhanced control of that technology. The speed advantage would also be applicable to monitoring unit operations in continuous manufacturing of pharmaceutical drug products and also be applicable to many other industries.

Contributed by Shawn (Xiaoyun) Chen (xchen4@dow.com)
and Jim Rydzak (Jim.Rydzak@gmail.com)

Do you have something spectroscopy-related you want to discuss in the newsletter?
Or something that will help our membership such as career tips or application tips?
Please let us know by emailing xchen4@dow.com.

Telephone: 301-694-8122
FAX: 301-694-6860