New Newsletter Editor

With the transition of the Newsletter Editor from Fred Haibach to Xiaoyun (Shawn) Chen, the Newsletter Committee felt an introduction would be helpful for SAS members, as a means of understanding the Committee's goals and hopes for the SAS Newsletter in the coming year.

Shawn Chen and Luisa Profeta

Taking over the role of Newsletter Editor as of January 2017, and reflecting over his efforts in the last three years has led me to the conclusion that Fred has certainly left big shoes for me to fill! You can find his perspectives on being SAS Newsletter Editor in the previous issue. Below, I would like to give the SAS community and *Applied Spectroscopy* readership a brief introduction of myself and then describe my perspectives and goals for the SAS Newsletter.

I am currently a research scientist at the Dow Chemical Company. My expertise is in optical spectroscopy, with a focus on vibrational spectroscopy techniques including IR, Raman and NIR. Prior to my 9.5-year experience with Dow, I got my Ph.D. in chemistry from University of Michigan and my B.S. in Chemical Engineering from Tsinghua University. You can find more details about me if you Google my name or find me on LinkedIn. I became a SAS member in 2012, and started to volunteer my time first as an Award Committee member and then moved onto the Newsletter Committee. I honestly believe that I will spend my whole career as a spectroscopist and my focus is always going to be on application-driven results. Subsequently, I would love to see SAS prosper and our profession appreciated and recognized by the rest of the science community.

To me, the SAS Newsletter plays two important roles. First, on the official side it documents important events for SAS. Second, on the more personal side it provides a forum and venue for SAS and its members to share their stories and passion. For example, my 8-year-old daughter, who is in third grade, recently told me that her class was learning about light. Since I just showed her a portable Raman instrument at home, she was wondering whether I could bring it to her class. Concerned about potential laser safety, I told her that I needed to think about it. I wish I knew some tried and tested demonstration that I can readily use to pique kids' curiosity in applied spectroscopy. I found another potentially effective way to promote spectroscopy to the general public recently when I read a sci-fi novel *The Three Body Problem* by Cixin Liu. If you have not read it, I highly recommend it. I mention it here because the author touches upon the use of spectroscopy a few times in a scientifically accurate manner in this novel (a rarity these days!). However, spectroscopy is far from being at the center of the plot and so I suspect only spectroscopist geeks like me would even notice such thing. However, if there can be more such interesting use of spectroscopy in the popular culture, it would be beneficial for SAS in promoting applied spectroscopy. I hope all SAS members interested in making SAS a more impactful society can use this Newsletter as a venue to share experience and thoughts.

Last but not least, I am truly curious how many people actually read this Newsletter. Please do take a minute and send me an email at xchen4@dow.com to let me know if you see this. Just type "I read it" in the subject line if you are busy. If you prefer using a phone, give me a call at 989-636-9042. I look forward to interacting with all SAS members and in serving SAS in the coming years. Our Newsletter Committee is comprised of volunteer members, we always welcome new members to join us to give more perspectives and enrich their own experiences. Feel free to email me for further details.

Contributed by Xiaoyun (Shawn) Chen
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Pittcon 2017

Pittcon 2017 Conference and Expo will be held at McCormick Place, Chicago, Illinois, from March 5–9. SAS is proudly sponsoring two sessions:

> **Metallomics** is scheduled for Thursday morning, March 9, beginning at 8:30 am, Room W181c. This session will showcase development and application of technical such as ICP-MS, LIBS at cellular level with a focus on metallomics.
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> **Molecular Spectroscopy for Disease Detection** is scheduled for Thursday afternoon, March 9, beginning at 1:30 PM, Room W181c. This session will focus on the biomedical and clinical applications of IR imaging and SERS.

Weird Science® on Fuels and Energy

On Tuesday November 15–16, 2016 the Spectroscopy Society of Pittsburgh along with its sister Society the Society for Analytical Chemists of Pittsburgh, held their 29th Annual Faraday Lecture at Soldiers and Sailors Memorial Hall in Oakland, Pennsylvania. Lee Marek, a chemistry teacher at the University of Illinois Chicago presented, "*Weird Science® on Fuels and Energy*". This interactive series of live chemistry based experiments was not only highly entertaining, but featured science in a new and interesting light for students that appealed to most of the senses: sight, sound, smell, and touch. There was also an evening presentation given on Tuesday that was free and open to the public.

A View on Startups from a Hardware Engineer

Starting a business in spectroscopy is a challenge. In an earlier installment, we focused on two recent startups who have are actively financing their growth. Both Friedrich Menges, Spectroscopy Ninja, and Alex Scheeline, Spectroclick Inc., related their struggles and successes with obtaining financial support for their startups. Reginald Tobias, "Reggie" to his friends, has worked on spectrometers and other precision instrumentation since 1960. He has contributed business, engineering and manufacturing expertise to the largest and smallest of spectroscopy companies. The list of companies he has worked for and with includes McPherson Instruments, Minuteman Laboratories, and Beckman instruments. The instrumentation has spanned from the X-ray to the far infrared. Lately, he has been running his own business as a contract instrument designer and small-scale manufacturer as Hitek hardware. His love of the instrumentation business has kept him involved and excited. I asked him to relate his experiences with startups and what makes them successful.

Fred Haibach

I have been asked to discuss what characteristics a small business needs to successfully take a concept from a brainchild, born to meet a market-needed application, to a product in production. What characteristics are needed can be observed by following the organic growth of the concept to a strong market contender.

Usually the first encounter with a client is a discussion of the science involved with the application. The client, usually educated in the required science, has a general idea of the measurement technique he wants to pursue. The successful, new prospective client is usually expert in the technique, so he comes equipped with detection limits, sample sizes, perhaps suggestions for detectors etc. What he needs to know is; can we design and build for him a simple working device that he can show to investors (or his wife), and how much will it cost for the first phase. This becomes a negotiation, since what he really wants is a finished working instrument he can take to Pittcon in five weeks.

There are generally four to six phases to get a product to first shipment. Caution! What shows up first time at Pittcon is not ready to ship! This can be for many reasons—not least is, "Does anyone want it?"

The first phase is to build a simple working model of the concept. We try to use as much metal and glass as possible without any cardboard and tape. Sometimes we do the optics designs if required, sometimes not. The electronics are usually first cut PC boards or purchased complete working modules if possible for the application. Often off-the-shelf mechanical mechanisms are used as quick and inexpensive short cuts. National Instruments interface boards and LabView may be operating perhaps operating the system. This process can take a few weeks or a few months. Costs can be greatly elevated if special expensive components are required. For example, Quantum Cascade Lasers require special, non-standard components.

Generally, this phase is bench top or optical bench, and iterative and reentrant, since nothing works the first time. The problems almost without exception are either mechanical design/fabrication errors or detection limits, i.e., signal to noise, drift, thermal issues, etc.

So where does the bench prototype phase end and the first integrated design begin? This is a foggy area. We try to be conservative in our estimates so that it is called "phase one", even though product goes through several iterations. However, the end is usually decided when it works or does not work. We do not call this a prototype build, but simply proof of principle. The first integrated design is low volume and appeals to early adopters.

So assuming that it works and potential investors have done their due diligence with marketing research into possible price and volume, we now can establish the instrument design goals.

From marketing research: how many can be sold versus time versus cost? How much can it sell for in these quantities? What margins are required for ROI in the required amount of investor time? These things may not seem relevant, but how one designs a product is predicated by these items. Needless to say, that if these items are not reasonable then there is no phase two.

We begin phase two, which is often called the prototype phase, then, knowing some of the constraints of the design package. We know fundamental things like how do the users interface with the instrument, what manufacturing methods can be considered based on the volume/cost constraints, etc. This phase of the project is to compress all the required components into a housing as small as possible. At the end of this design phase, we know if it really can be a hand held device (or whatever the configuration desired was). This is an engineering design, and as much as engineers think they are industrial designers, it is generally sharp edged, rugged and very digital in appearance. This is the prototype that can become a beta model for selected users to test and provide feedback with.

Using the feedback from the prototype, from all inputs, including marketing, financial, and beta user suggestions the third phase begins, the product design. In a really slick program, the industrial designers have been involved with the prototype phase, but more often, they are the last to influence the design. One of the most wonderful experiences for a product development team is to watch an industrial graphic designer hand sketch a final product vision, or perhaps many versions of the product appearance and function. Usually the marketing people and the "Boss" get to choose the final design. A rule I have learned to follow is, always let the "Boss" pick the color, and stick to the really important issues.

So to recap, "What are the characteristics needed of a small business to take a product from concept to market?" Mostly the ability to attract the right people at the right time in the product cycle and to know who they are and when they should be on board, be they employees or consultants. The quality required is really the reputation of the person or persons who are promoting this company and its new product. The reputation is what attracts money and expertise. A great concept and engineering team are necessary steps, but marketing and salesman ship are also essential.

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