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ACS Division of Analytical Chemistry
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DAC NEWSLETTER
FALL 2009

From the Chair

Dr. Isiah M. Warner
Division Chair

IT TAKES ~~A~~ MANY VILLAGE(S)

It takes a village. We have heard these words expressed succinctly in many contexts, particularly in regard to the formative years of our young people. However, have you ever heard them in regard to the formative years of a scientific discipline? Probably not!! I am modifying these well-known words to say that… it takes many villages… to create a strong sub-discipline of chemistry such as **analytical chemistry**. Of course, we know that analytical chemistry has been practiced for centuries. However, if we go back in history in this country--let's say about eighty years--, we would recognize that analytical chemistry in this country was very much in its infancy. In fact, if we look back that far and look at history, we will recognize that analytical chemistry in the U.S. had a firm foundation through the guiding hands of several influential persons, notably Professor Izaak M. Kolthoff at the University of Minnesota and Professor N. Howell Furman at Princeton University. A number of great analytical chemists from the Kolthoff group come to mind, including Herb Laitinen and Dave Hume; and from Furman's group, Ralph Adams and Charlie Reilley come to mind. From that small beginning sprung many other analytical chemistry villages, e.g., at the University of Illinois under the guiding hands of Professor Howard V. Malmstadt and other strong villages, including analytical chemistry at (in alphabetical order) Arizona, Florida, Indiana, Iowa State, Michigan, North Carolina, Purdue, Texas, and Washington. I am now proud to say that Louisiana State University is back on track and should be included with these other great institutions.

Some of you are likely to say wait a minute. You forgot to include (blank) university, the University of (blank), and also you didn't include the many industrial and governmental laboratory contributions to analytical chemistry over all those years. My response to such comments is that you are absolutely correct. My citations are not intended to be comprehensive. (to be continued on p3)

IN THIS ISSUE:

12 division members selected as

2009 ACS Fellows

Allen Bard
Paul Cremer
Catherine Fenselau
Helen Free
William Heineman
George Heinze
Catherine Hunt
Alan Marshall
Susan Olesik
Jeanne Pemberton
Isiah Warner
Richard Zare

ACS Chemistry for Life™

ASC Awards Honoring Analytical Chemists

Peter Armentrout, Peter Carr, Nobuo Tanaka

Division Awards Honoring

Robert J. Cotter, John R. Engen, Daniel C. Harris, John W. Olesik, James F. Rusling, Edward S. Yeung

Letter from the Past Chair

This is the end of my four years of service to the division as Chair Elect, Chair, and Past Chair. As I leave, I want to encourage you to get involved in the Division of Analytical Chemistry along with many others who are dedicated to providing you with a professional society of which you can be proud. We were able to accomplish a great deal in the past 4 years with the development and implementation of a new strategic plan; reorganization of operations with a new business office; reorganization of the Executive Committee; formation of a new relationship with Pittcon; development of a partnership with Annual Reviews of Analytical Chemistry; development of a new division website, etc.

For me, the most rewarding parts of this journey were the relationships that I was able to develop with scientists that I respect and admire. I want to personally acknowledge just a few of the people who I was fortunate to work with, and who were instrumental in developing a strategic plan to carry forth our new vision: Chris Enke, John Callahan, Isiah Warner, Steve Petrovic, Al Ribes, and Roland Hirsch. Thank you for your dedication and your hard work, but most of all, I thank you for your friendship.

Secretary's Report

Fall 2009

2009 Election Results

For the fifth year the Division conducted elections via electronic balloting through Vote-now.com. On behalf of Division of Analytical Chemistry - ACS, Campus-Vote/Vote-now conducted an election for the positions of Chair-Elect, Secretary, two Councilor and one alternate Councilor positions, from June 1, 2009 to 11:59 PM, July 10, 2009. In addition, also on the ballot was a revision of the current bylaws to make the Chair of the Subdivision of Chromatography and Separations Chemistry a voting member of the executive board.

Of the 1321 total voters participating (13.9 % of the 9514 members), 1299 made a selection for one or more candidates while 22 abstained. There was a slight decline from the previous year participation (in 2008 1371 total voters participated or14.2% of the 9622 members) although still in line with the previous three years. In 2007, 1204 total voters participated (11.9% of the 10092 members); in 2006 1332 members participated (12.9% of the 10292 members), and in 2005 1327 members (12.5% of the 10581 members) participated. Thirty-two election comments were received with very positive feedback (with a couple of exceptions) on the way the elections were conducted.

The bylaws revisions were approved with 91% of yes votes.

The elected candidates are as follows:

Chair-Elect: Dr. David Koppenaal, Pacific Northwest National Labs
Secretary: Dr. Anna Cavinato, Eastern Oregon University
Councilor: Dr. Roland Hirsch, DOE
Dr. Bonner Denton, University of Arizona
Alternate Councilor: Dr. Al Ribes, The Dow Chemical Company

Respectfully submitted,

Anna G. Cavinato,
Secretary, ACS Division of Analytical Chemistry

(**From the Chair**, Continued) There are obviously many other contributions which should be cited. However, my defense is that I am not trying to give a complete history of analytical chemistry. That is best done by referencing Herb Laitinen's book[1] , F. Szabadvary's book[2], or by having a nice long chat with knowledgeable persons in this area such as Peter Carr at Minnesota, Henry Blount at NSF, or Gary Christian at the University of Washington. In this editorial, I am challenging my own recollections and simply stating that analytical chemistry, as we know it today in this country, has a strong foundation as a result of many groups (villages) of people.

Others might wonder why I am giving this history of analytical chemistry, since it seems that everyone already knows it. Let me explain! As Chair of the division, I chaired the analytical division award symposium at the recent ACS national meeting in Washington, D.C. I was truly impressed to see so many outstanding division awardees, including **Robert J. Cotter, John R. Engen, Daniel C. Harris, John W. Olesik, James F. Rusling**, **and Edward S. Yeung.** In addition, the analytical division hosted the ACS Award Symposia of several icons of our community including **Peter Armentrout, Peter Carr, and Nobuo Tanaka.** The idea for this editorial was a result of three unrelated incidents/encounters. One involved someone mentioning the name "Fred Findeis" and my being astounded at how many persons did not know the name. Surely, we should all recognize the impact of Fred Feindeis on analytical chemistry at the national level. It was Fred Findeis who thought that analytical chemistry was important enough to receive funding from the National Science Foundation. It was Fred Findeis who recruited NSF staff persons, e.g., Henry Blount, who have had a profound impact on analytical chemistry at NSF and thus the country. A second incident involved my sitting in on Ed Yeung's award address as he talked about the internationalization of analytical chemistry. It was indeed fascinating to hear Ed talk about his current efforts to help expand the level of analytical chemistry in China, Japan, and other countries. The third incident was a result of my sitting next to Royce Murray, Editor of Analytical Chemistry, at the Analytical Division dinner on Monday evening of the Washington, D.C. ACS National meeting. Discussions with Royce really ignited my focus in this letter as we reminisced about current and past names in analytical chemistry. We talked about many chemists including former colleagues of his such as Charlie Reilley and Thomas Isenhour.

I want us to remember that it has not been so long ago when analytical chemistry was in a serious decline at many of our well known academic institutions. We should remember that George Santayana said that "Those who cannot learn from (or remember) history are doomed to repeat it." Now, we are a strong division, clearly on the rise and crossing into many interdisciplinary areas of science. I believe that much of this rise has to do with the flexibility of our chemistry in this division. Wasn't it Charlie Reilley who said "**Analytical Chemistry is what analytical chemists do.**"? What greater flexibility in definition can we ask for as a sub-discipline of chemistry? It is clear that our young analytical scientists are not afraid to get involved with the tougher problems in science today. For example, analytical chemistry is clearly seen as a strong and vibrant entity in the nanotechnology and life science areas.

Finally, I want to note that every few years I give a cumulative examination on some aspects of our history to encourage our young people to remember the past, as well as to remember our contributors to that past. I want to encourage my fellow analytical scientists to do something similar in order to continue to keep the history of our division and discipline alive and strong. In addition to academic endeavors such as cumulative examinations, we should continue symposia on our history at regional and national meetings. Help me to identify analytical sites (not only in this country, but across the world) to be nominated for inclusion as ACS Historical Landmarks. While this letter has focused on academia, I challenge one of you out there, perhaps our next chair, to send in a similar letter to our newsletter focusing on the contributions of industry and government laboratories. In the meantime, as I leave my position as Chair of the division, I ask that you remember that it takes you and many villages to keep our sub-discipline strong.

[1] H. A. Laitinen, G. Ewing, ***A History of Analytical Chemistry,*** **Division of Analytical Chemistry of the ACS,** The Maple Press Co., York, PA 1977
[2] F. Szabadvary, ***History of Analytical Chemistry,*** Pergamon Press, Oxford, 1966

Call for Newsletter Contributions

News or photos to share? Information to distribute?
Please send your contributions to the DAC Newsletter Editor Xudong Yao by email:
x.yao@uconn.edu

Dr. Dorothy J. Phillips, Division Program Chair, expresses her gratitude and thanks to the members of the Division and the scientific community who made our 2009 Fall ACS program in Washington DC a huge success. The Division program had 31 half-day sessions, covered 18 topics and hosted both a general and an undergraduate poster session.

2009 Fall ACS

Award Addresses at 2009 Fall ACS meeting (Organized by D. J. Phillips; Presided by I. M. Warner)

J. F. Rusling, 1, Electrochemistry, bioelectrochemistry and modern biomedical applications

J. W. Olesik, 2, From the vaporization of single droplets and particles to ion-molecule reactions for accurate elemental analyses in complex samples using inductively coupled plasma mass spectrometry

D. C. Harris, 3, Charles David Keeling and the story of atmospheric CO_2 measurements

J. R. Engen, 4, Hydrogen/deuterium exchange detected by mass spectrometry: A valuable method for analysis of protein conformation

R. J. Cotter, 5, Designing mass spectrometers for earth and mars

E. S. Yeung, 6, Internationalization of analytical chemistry

Photo by Anna G. Cavinato

ASC Awards Honoring Analytical Chemists

ACS Award in Analytical Chemistry

Professor **Peter Carr,** University of Minnesota

ACS Award in Chromatography

Professor **Nobuo Tanaka**, Kyoto Institute of Technology

Frank H. Field and Joe L. Franklin Award for Outstanding Achievement in Mass Spectrometry

Professor **Peter B. Armentrout**, University of Utah.

Kolthoff Awards Invitation

Applications are invited for the 2009 I. M. Kolthoff Award for undergraduate research in analytical chemistry. The Kolthoff awards provide travel funding up to $750 for undergraduate students to present a poster on their undergraduate research this year at either PITTCON 2010 (February 28 – March 5, 2010; Orlando, FL) or the 240th ACS National Meeting & Exposition (August 22-26, 2010; Boston, MA). 2-3 awards will likely be made between the two meetings. Applicants for the I. M. Kolthoff Award must submit an abstract for their poster presentation on-line prior to the published deadline for preliminary abstracts. The deadline for submission of completed applications for the I.M. Kolthoff Award for consideration for the 2009 competition will be October 31, 2009 for presentation at PITTCON 2010 and ca. April 30, 2010 for presentation at the 2010 Fall ACS National Meeting.

Preference will be given to applicants who are in their junior or senior year and for whom this would be their first time attending and presenting at a major national research conference. Evaluation criteria will include the quality of the abstract/research, the applicant's academic record, the advisor's letter of support, the student's interest in and the applicant's potential for advanced study in the analytical sciences, and diversity (ethnicity, gender, institution type, and institution geographic location).

A completed application consists of the completed application form, a copy of the abstract submitted for presentation at either PITTCON 2010 or the fall 2010 ACS National Meeting, and a nomination letter, written by the student's undergraduate research. The nomination letter should be submitted directly by the student's advisor via email to Professor Mabrouk. The subject line of the email should state "Letter of Recommendation on Behalf of [Student's Name] for 2009 I. M. Kolthoff Award." All required information must be submitted in electronic form to Professor Pam Mabrouk, Chair of the DAC Education Committee. Please direct all questions to Pam Mabrouk via E-mail (p.mabrouk@neu.edu).

Analytical Division – Support of Symposia at Regional ACS Meetings

Funds Still Available for 2009

The Analytical Division has a speaker's fund to help support programming at the regional American Chemical Society meetings. Awards will generally be made to support a thematic symposium. Funds can be used to support travel expenses of an expert in the field who would not normally attend that particular regional meeting. It is expected that local speakers will then be included to fill out the symposium. Alternatively, funds can be requested to provide more modest levels of support to several speakers from the region. The Division will help regional planners identify possible speakers for symposia topics, if necessary. Applications for support are considered on a rolling basis until the yearly allocation of funds has been expended. There is no formal application process. Anyone interested in applying for an award should contact Nadja Cech (nadja_cech@uncg.edu) by email to discuss the nature of the symposium and the funds that are needed to help support the program.

Recipients of the Division of Analytical Chemistry Awards 2008

Award in Chemical Instrumentation
Sponsored by the Dow Chemical Company

Robert J. Cotter
Johns Hopkins University

Robert J. Cotter is Professor of Pharmacology and Molecular Sciences and Director of the Middle Atlantic Mass Spectrometry Laboratory in the Johns Hopkins University School of Medicine. He received his PhD in Physical Chemistry at Johns Hopkins in 1972 where he first developed his interest in tandem mass spectrometry, ion molecule reactions and the time-of-flight mass spectrometer. Following his first position at Gettysburg College he joined the Hopkins Medical School faculty in 1978 where his interest in instrumentation led to his early development of laser desorption mass spectrometry for the analysis of non-volatile biological molecules. In 1982 he developed the first LD time-of-flight mass spectrometer incorporating a time delay between ion formation and extraction, demonstrating the effect of delay time on ion focusing and fragmentation. In a 1984 publication in *Analytical Chemistry* he reported the IR laser desorption of series of high mass compounds, primarily peptides, and in a 1986 paper in *Macromolecules* the application of IRLD TOF mass spectrometry to low molecular weight polymers. His interest in the time-of-flight mass spectrometer itself led to a number of significant developments to this analyzer, particularly the curved-field reflectron that enabled the analysis of metastable fragment ions and the subsequent design of tandem time-of-flight instruments that have been successfully commercialized. In addition, his laboratory has contributed a number of instrumental innovations for ion trap mass spectrometers including methods for more efficiently trapping ions, isolating ions by inverse Fourier transform methods, activating ions by collisions with heavy gases and coupling ion traps to time-of-flight mass analyzers. His has also been a pioneering laboratory for the development of miniaturized instruments for homeland security and point-of-care diagnostics, and has also been involved in the design and development of a low power, low weight ion trap mass spectrometer for inclusion on a future Mars mission, as part of the ExoMars program. His instruments have been utilized in his own laboratory to address a wide range of research problems that have included the identification of bioagents, the structures of amyloid proteins, the structures and biosynthesis of bacterial lipopolysaccharides, and currently elucidation of the histone code through the analysis of lysine acetylation, methylation, ubiquitylation and SUMOylation.

Dr. Cotter is the author of a text: *Time-of-Flight Mass Spectrometry, Instrumentation and Applications to Biological Research*. He has been a frequent contributor to the A-pages of *Analytical Chemistry*, with reviews of thermal and direct desorption methods in 1980, lasers and mass spectrometry in 1984, plasma desorption in 1988, and time-of-flight mass spectrometry in 1992 and 1999. Dr. Cotter has trained more than 70 graduate students and post-doctoral fellows. He was Vice-President for Programs of the *American Society for Mass Spectrometry* from 1996-1998, President from 1998-2000, and is currently a member of the Board of Directors and Treasurer of the *US Human Proteome Organization* (USHUPO).

Spring 2010 ACS National Meeting & Exposition

March 21 – 25, 2010
San Francisco, California, USA

Abstract submission is now open until October 19, 2009

2009-2010 Program Chair: Susan Lunte (slunte@ku.edu)

Spring 2010 DAC Newsletter for program details

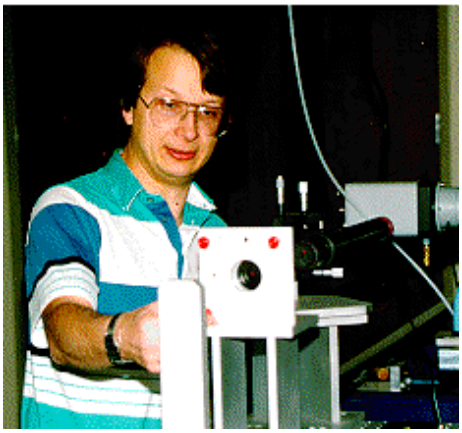
Arthur F. Findeis Award for Achievements by a Young Analytical Scientist
Sponsored by Philip Morris USA

John. R. Engen
North Eastern University

John R. Engen is an Associate Professor of Chemistry & Chemical Biology at Northeastern University in Boston. He also holds the position of Faculty Fellow in the Barnett Institute of Chemical and Biological Analysis. Prior to coming to Northeastern, he was an Assistant Professor of Chemistry, Biochemistry and Molecular Biology at the University of New Mexico in Albuquerque and a Member of the University of New Mexico Cancer Center. Professor Engen holds two BS degrees (molecular biology and biochemistry) from Union College (Lincoln, NE) and a PhD in Chemistry from the University of Nebraska (working with David L. Smith). He completed postdoctoral work at the European Molecular Biology Laboratory (EMBL) in Heidelberg, Germany and at Los Alamos National Laboratory. He is a Fellow of the European Molecular Biology Organization (EMBO).

Professor Engen has become a recognized expert in the area of understanding proteins and protein conformation with mass spectrometry. He uses hydrogen-deuterium exchange to probe conformation and dynamics during various activation states. Current research projects in his laboratory include (1) investigations of kinase conformation to understand their regulation and aberrant signaling in various disease states including cancer, (2) analysis of the conformation of viral accessory proteins from HIV and several Herpesviruses, and (3) optimization and methods development in hydrogen exchange mass spectrometry.

Award in Spectrochemical Analysis



John W. Olesik
Ohio State University

John is a Research Scientist, Adjunct Associate Professor and Director of the Trace Element Research Laboratory in The Ohio State University School of Earth Sciences. His group is investigating analytically-useful plasmas using spectroscopic imaging and mass spectrometry as well as ion-molecule chemistry for ICP-MS. The group provides elemental analysis for OSU and external clients to part per trillion concentrations. Recent projects include laser ablation ICP-MS measurement of fish otoliths to identify migration patterns and high precision coral element ratios as proxies for temperature and river flow into oceans. John received a B. S. (Chemistry) from the University of Rochester in 1977, a Ph.D. from the University of Wisconsin-Madison in 1982 with Prof. John Walters and was a postdoctoral research associate at Indiana University, working with Prof. Gary Hieftje, from 1982 to 1984. He was a Chemistry faculty member at the University of North Carolina-Chapel Hill from 1984 to 1991. John currently serves on the Editorial Boards of *Applied Spectroscopy* and *Spectrochimica Acta Part B,* and as well as being the North American Regional Associate Editor of the *Journal of Analytical Atomic Spectrometry*. He was the Program Chair for the 1997 Federation of Analytical Chemistry and Spectroscopy Societies meeting and the winner of the Society of Applied Spectroscopy Lester Strock Award 2001.

J. Calvin Giddings Award for Excellence in Education
Sponsored by the Division of Analytical Chemistry

Daniel C. Harris
Naval Air Systems Command

Daniel C. Harris is a Senior Scientist at the Naval Air Systems Command in China Lake, California. His textbooks *Quantitative Chemical Analysis* and *Exploring Chemical Analysis* are used in half of U. S. universities and many others around the world. He manages research and development programs for the Navy in transparent ceramic sensor window materials. In his earlier academic career, he studied proteins for iron transport and storage.

Award in Electrochemistry

James F. Rusling
University of Connecticut

James Rusling obtained his B.Sc. in Chemistry from Drexel University, and Ph. D. from Clarkson University. He is Professor of Chemistry at University of Connecticut and Professor of Cell Biology at University of Connecticut Health Center. Current research includes electrochemical arrays for toxicity prediction and early cancer detection, and fundamental bioelectrochemistry. He has nearly 300 research papers, several books, and is also a musician interested in Irish and American folk styles.

Award for Distinguished Service in the Advancement of Analytical Chemistry
Sponsored by Waters Corporation

Edward S. Yeung
Iowa State University

Edward Yeung received his A.B. in chemistry from Cornell University and his Ph.D. in Chemistry from the University of California at Berkeley. Since then, he has been on the chemistry faculty at Iowa State University, where he is currently Robert Allen Wright Professor and Distinguished Professor in Liberal Arts and Sciences. His research interests span both spectroscopy and chromatography. He has published in areas such as nonlinear spectroscopy, laser-based detectors for chromatography, capillary electrophoresis, trace gas monitoring, single-cell and single-molecule analysis, DNA sequencing, and data treatment procedures in chemical measurements, and has received several major awards for his work. He has been an Associate Editor of *Analytical Chemistry* and served on the editorial advisory board of many journals and on scientific committees of many international conferences. He was appointed Honorary Professors of Zhengzhou University, Zhongshan University, Xiamen University and Hunan University. He served as Councilor and as Chair of the ACS Division of Analytical Chemistry, as well as a member of the ACS Committee on Science. He is an advisory member of various academic and government institutions in Asia.

Do you have an innovative idea that can revolutionize cancer research?

Opportunities and Resources for Innovative Cancer Technologies from the National Cancer Institute

Mark David Lim, Ph.D.
Acting Program Director for the NCI Program for Innovative Molecular Analysis Technologies (IMAT)
Office of Biorepositories and Biospecimen Research, National Cancer Institute, NIH
Email: limm2@mail.nih.gov

The integration of innovative technologies into the biomedical research and clinical communities is due in part to the efforts of physical scientists who continue to push the limits of detection and are able translate these developments into novel tools capable of directly observing molecular interactions in the human body. For example, "-omics" based technologies (genomics, proteomics, metabolomics, etc.) continue to emerge from the retooling and development of various techniques previously limited to analytical chemistry – their application provides the physician with the ability to make better informed decisions from the molecular analysis of a patient's specimen. These technologies also create new avenues for cancer research. For example, the ability to detect circulating tumor cells would not have been possible without recent advances in technology. This focus on team-based translational medicine has advanced our understanding of the basic elemental processes occurring in the body as they relate to health and disease, and is part of a cycle that continually challenges innovators to incorporate newfound knowledge into applications that benefit the health of our society.

In 1998, the National Cancer Institute (NCI) created the program for Innovative Molecular Analysis Technologies (IMAT, http://innovation.cancer.gov) as an investment in the potential of innovation to revolutionize its mission for reducing the burden associated with cancer. IMAT is only interested in the development of a technology and does not support hypothesis-based research where the novelty resides in the biological question being asked. The IMAT program supports out-of-the-box approaches that at the time of inception are considered innovative and high risk, but if successful would have high-payoffs in advancing research and medicine. IMAT is the primary trans-divisional technology development program offered by the NCI, allowing individual innovators to access the resources at the NCI and direct the application of their technologies in the areas of cancer research into its biology, prevention, therapy and detection, or cancer control and epidemiology. If successful, these technologies could be used to help advance traditional hypothesis-based cancer research and medicine, or could be further developed and commercially disseminated with support from the NCI's Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR, http://sbir.cancer.gov) programs. The NCI SBIR Development Center currently offers a phased approach to support technology development, including a "Bridge Award" that covers the funding gap between the end of a Phase II award and full commercialization. This latter opportunity is available to those who develop strategic partnerships with third-party investors and/or strategic partners to bring their technologies closer to commercialization.

To jumpstart and advance innovation, IMAT supports the inception and development of both innovative and emerging technologies. Innovative technologies are those in which no current comparison exists and emerging technologies have not yet demonstrated feasibility in their intended use. For all of the IMAT solicitations, an "innovative technology" is left for the innovator to define as long as the

nature of its novelty and anticipated use are clearly described in the application. The only targeted need for technologies is in the area of "sample preparation". This solicitation addresses those technologies that can maximize the utility and value of a human specimen (biospecimen), or the analytes derived from a biospecimen. For example, such technologies would assess or minimize the introduction of pre-analytical variations that occur with biospecimen collection, handling, and/or storage; or, are technologies that can preserve isolated analytes such as RNA for downstream research. More information about the issues in the biospecimen sciences can be found from the NCI Office of Biorepositories and Biospecimen Research (http://biospecimens.cancer.gov).

As shown in Figure 1, IMAT's philosophy for supporting innovation divides the development of technologies into two broadly defined and sequential stages. The first stage is the demonstration of feasibility, where technical metrics such as specificity and sensitivity are addressed. IMAT utilizes an NIH R21 funding mechanism for this exploratory stage of technical development. There are currently three different R21 funding opportunities from IMAT that cover the development of innovative, emerging, or biospecimen/sample-preparation technologies. Since IMAT's R21 funding opportunities are for exploratory and pilot stage studies, applications are not required to have preliminary data nor do the proposed technologies have to be developed within their biological context. All require quantitative milestones as part of the application; these should reflect a technical metric of accomplishment for each specific aim that is proposed. The second stage of development is supported through an NIH R33 funding mechanism for the validation and advanced development of an emerging technology. It is expected that these technologies have already demonstrated technical feasibility (proof-of-concept data are required as part of the application) and these opportunities aim to support its further optimization in context of its intended use. IMAT currently has two R33 funding opportunities in the areas of emerging and biospecimen/sample-preparation technologies.

There is an urgent need for those who have the tools and expertise to understand basic interactions at the molecular level and can translate those skill sets to address unmet technology needs in cancer research and medicine. The NCI IMAT program aims to support the development of your innovative technology in the fight against cancer and welcomes your application and inquiries. IMAT will host a symposium at the 2010 Pittcon called "The Application of Innovative Analytical Technologies to Cancer Research", featuring speakers who have used various approaches to successfully develop a cancer technology. We invite you to participate in our symposium or for more information about current IMAT solicitations, please visit http://innovation.cancer.gov or email Mark David Lim, Ph.D. at limm2@mail.nih.gov.

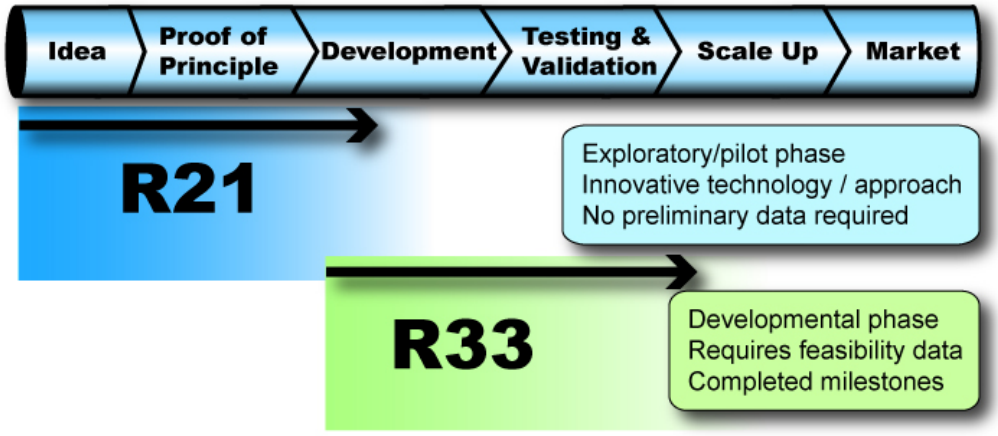


Figure 1: IMAT's funding mechanisms to support the pipeline for innovation


PITTCON 2009
FACSS 2009
FACSS
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SHIMADZU

UNIVERSITY RESEARCH AND TEACHING - SYMBIOSIS OR CONFLICT?

GARY M. HIEFTJE

As we approach the end of the 20th century, there is a justifiably increasing concern about the present and future economy of the United States. Few doubt that there is a need for stronger emphasis on information-oriented products and systems, and none would argue against the importance of advanced technical education in achieving the transition to that new emphasis. The field of chemistry, particularly analytical chemistry, will have an essential role in the "information age," in establishing techniques by which new materials can be characterized, by which biomolecular systems can be understood, controlled, and utilized, and by which the impact of new technologies on our lives and environments can be assessed.

Although recruiting young people into science will be essential to insure that these needs are met, and although innovative approaches to undergraduate education must be adopted, graduate-level training in analytical chemistry will be required to impart the skills, attitudes, and reasoning processes that can lead to effective, meaningful measurements. The question is how that graduate training can best be carried out. Are existing approaches adequate? Are new curricular developments necessary? If new approaches are adopted, to what extent do the current needs of potential industrial employers have to be considered in the design of new courses and in the implementation of graduate education? On an even more basic level, is the recognized and accepted emphasis within large schools on fundamental research consistent with the overall education process? And if research *should* be performed as a part of the educational environment, to what level should that research be applied and to what degree should it be fundamental in nature?

In this brief treatment, a personal view will be offered of how these questions might be answered. A framework for graduate education will be outlined that no doubt will not enjoy universal appeal, but which has seemed effective in my own research group and in our local environment. The same thoughts have been offered to others in both formal and informal settings; comments from many individuals have been considered and in some cases adopted in the discussion.

Overall, the thesis will be developed that research in a university environment is teaching if projects are properly configured and executed. Furthermore, it will be argued that the principal goal of graduate education should be to impart to students a way of thinking and a breadth of experience. Although the ability to innovate cannot be taught directly, it would seem that an environment can be created in which innovation is fostered. Finally, provided that the foregoing goals are at the center of the graduate research experience, the degree to which a research activity is fundamental or applied is not particularly important.

Research vs. Teaching

Many claim that research and teaching in a university environment are mutually exclusive, that research faculty care nothing about instruction and have a condescending attitude toward those who do. In contrast, I would suggest that there are really two sorts of teaching activities, both extremely important: classroom instruction and that carried out in the research laboratory. Indeed, research is one of the most effective and exciting forms of learning, the distinction being that in a research activity, the student and the instructor often learn together. The student can then, on a first-hand basis, experience the enthusiasm of discovering new information, of making a new measurement approach work for the first time, or of identifying a cause-and-effect link upon which a phenomenon might rely.

Regrettably, this level of excitement and involvement is often difficult to carry over into a classroom setting. Nonetheless, faculty engaged in graduate-level or undergraduate research have a responsibility, I feel, to relate to students stories of recent discoveries, by their own groups or by others. In my experience, classroom discussions of this sort do more to instill in students the character of chemistry than can the equivalent amount of time invested in the inculcation of new factual material.

Broad Training for Solving Problems

Just what should be the main goal of a graduate education program? Analytical chemistry, indeed all of science, involves solving problems. Moreover, it seems that the most effective and productive scientists are also the best problem solvers. Thus, one of our principal goals should certainly be to teach problem solving. Regrettably, such a goal is often incompatible with the common graduate research experience. For a student to be awarded a doctorate, that student must perform original research, for research ability is the hallmark of the Ph.D. In turn, if a student is to make an original contribution to a scientific field, and in a realistic length of time, he/she must of necessity focus attention on a small part of a relatively narrow problem. In doing so, the student is likely to lose the broad perspective which was already developed partially in a high-quality undergraduate program. Thus, during graduate research, the perspective is more likely to narrow than broaden. Yet, a broad range of experiences is often what distinguishes an excellent problem solver from a weak one. Those adept at solving problems often have a broad range of experiences from which to draw, so a new problem can be considered from several different vantage points. The best approach to the problem can then be selected and tried; even if it is unsuccessful, alternative strategies will already have been considered and could be tested next.

Is it possible to design a graduate program that enables a student to make steady and meaningful progress on a research project while maintaining or even expanding breadth? To overcome this dilemma in our own research group, we have adopted several strategies. First, the group is intentionally large and its activities diverse. Experience shows that the closest communication among students in graduate school is within a given research group. Consequently, if a range of projects is pursued simultaneously within that group, it is likely that each student will become somewhat expert in several fields of endeavor. Just as importantly, each student brings to a problem-solving discussion a slightly different perspective, which often offers unique insights into the problem under consideration and which can be conveyed to other participants.

Second, students in our research group adopt <u>at least</u> one secondary project by the second year of graduate study. This parallel activity not only broadens the student's perspective, but also brings new technology into the research group, improves work efficiency, and reduces frustration. Often, students engaged in a single research activity encounter obstacles that seem insurmountable. A piece of instrumentation breaks down, a critical chemical compound must be ordered, a component from the machine shop must be fabricated, or an unexpected result simply does not make sense. During these times, frustrations can mount and time is wasted. If the student has a second (or third!) project to turn to, these difficulties can largely be avoided. The machine shop finishes the part, the electronic shop can fix the instrument, the chemical arrives, or the explanation to the poorly understood result suddenly appears. This last point is particularly interesting; it would appear that one's subconscious continues to solve problems even when one's principal attention is on another subject.

Another effective tool to broaden students is to encourage the formation of special-purpose task forces which are formed to address new research ideas. Frequently, these tangential research projects are of only moderate duration, but can profitably employ the talents of several group members at once. If the new idea is devised by a student, that student automatically becomes the task force leader and is encouraged to recruit into the team others from within our research group or from other groups. For example, one participant might be chosen because of a particular level of expertise in software, another in machining, another in nonlinear optics, etc. Assembling the task force helps to hone the "salesmanship" of the leader and managing the team develops leadership skills. Also, participating in the special-purpose group helps all student participants learn important aspects of the team-oriented approach to research which is so common in the "real world."

Fostering Innovation

Ideally, it would be possible not only to teach students how to solve problems and train them in using the tools of their trade, but at the same time to teach them how to be innovative. Unfortunately, this ideal seems unattainable. To me, the essence of innovation is to make conceptual connections that were not previously apparent, even to one with substantial experience and expertise. If such is the nature of innovation, we cannot truly teach it. The best we can do is to create an environment that fosters innovation. In this environment, the tools to perform new kinds of science must be available, students must be constantly challenged and, perhaps

most important of all, students must be given freedom, especially the freedom to make mistakes. Often, an individual will learn more by going down a fruitless path than by being shown the direct route to an identified goal. For this reason, I believe it is important for university professors not to discourage students from initiating new projects, even if those projects lie outside the range of activities the group usually pursues or if the chances of success seem small. The new activity will no doubt broaden the group's view of science and might lead to those new connections from which true innovation can spring. Also, the student might just discover things that were not apparent to his/her mentor.

In the same vein, it is critical that students not be supervised too closely. Day-by-day direction can stifle an individual's creativity and can lead to frustration and slavish obedience to protocol. There is a natural desire on the part of most individuals to produce "what the boss wants." Thus, not only activities but also the outcome of experiments can inadvertently be pre-ordained. There is a natural tendency by everyone to discard the most suspicious data points. If the research advisor suggests too strongly to a student the likely outcome of an experiment, the student will naturally look most diligently for reasons to discard data that do not conform to those expectations.

Naturally, some degree of guidance is not only appropriate but indispensable in a research activity. Still, a doctorate should symbolize a certain level of independence on the part of a student. Excessive interference by the research director makes it impossible to develop that independence and evaluate it fairly.

Basic vs. Applied Research

Finally, it is appropriate to address the question of how fundamental university research should be. Is collaboration with industry a subversion of the principal mission of a university? Is applied research solely the province of industrial and governmental laboratories? Or, on the other hand, should research professors direct students to perform "real-world" research, so they are immediately ready to address problems when they leave?

In my opinion, training students to perform only specific kinds of research or to become highly expert only in particular kinds of instrumentation is both inappropriate and short sighted. Although a student trained to be expert in the application of a particular kind of sophisticated instrumentation might be of immediate benefit to an employer in solving a current problem, the student might then lack the flexibility necessary to change when new technology appears or when a different set of problems arises. As my earlier comments would suggest, the more proper approach to me is to train the student broadly and to inculcate the characteristics and techniques of problem solving.

Clearly, both basic and applied research belong in a university environment. Indeed, it is often difficult to distinguish the two. The entire field of chromatography was developed on the basis of an existing need to separate compounds in complex mixtures. It was not until some time after the first applications had been developed that a fuller understanding of chromatographic principles was achieved. On the opposite side, the fundamentals of nuclear magnetic resonance spectrometry and of mass spectrometry were known long before any applications of the technology could be developed.

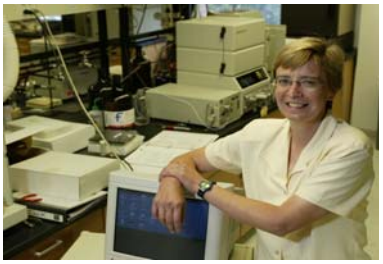
Interestingly, in both these examples, whether the application or the theory comes first, it is often instrumentation that dictates how rapidly a field can develop. A theoretical concept can be reduced to practice only through availability of appropriate instrumentation. Similarly, application of an existing technique is often constrained until its theoretical underpinnings are better understood. In turn, developing that underlying theory often requires specialized instrumentation and procedures.

From these examples, I would argue that students trained well in the field of analytical chemistry will be in a key position to influence the future of chemistry and of our society. Chemical separations and measurements will no doubt form the basis for many of the advances we see in the future. It is all of us, not just those in a university or college, who must bear the responsibility for insuring that the training is adequate to meet these exciting opportunities.

Subdivision of Chromatography and Separations Chemistry

From the Chair,

Susan Olesik, olesik.1@osu.edu



At the end of this month my term as Chair ends. Thanks to the members of this subdivision for this opportunity. As past-chair, I will take over the task of supervising the Young Investigator Award selection process and Brian Bidlingmeyer will become your chair.

Analytical separation science continues to be a vibrant area of science. The subdivision continues to take efforts to showcase new innovations through the outstanding symposia offered at the ACS meetings and the Pittsburgh Conference.

Election Results

It is my great pleasure to announce the results of the SCSC election. The SCSC selected Neil Danielson, University of Miami, as the Chair-Elect for 2009-2011, with Chuck Lucy, University of Alberta, and Lisa Holland, University of West Virginia as the new members of the Executive Committee. Congratulations Neil, Chuck and Lisa. Also, many thanks go to Luis Colon for his service on the executive committee and also to Lisa Holland for her contributions during the last two years.

Another voting result of substantial importance is the change in the Analytical Division's bylaws that now allows the Chair of the Subdivision to function as a voting member of the executive committee of the Division. This change was voted on within the Analytical Division elections and was overwhelmingly approved. I believe this change in the Division executive committee structure will allow more communication and collaboration between the Division and subdivision.

ACS Division of Analytical Chemistry Award for Young Investigators in Separation Science (ANAL. YISS)

The nominations for the 2010 Award are currently sought. The deadline for nominations is Nov.1. See http://www.analyticalsciences.org for information on the nomination process.

Two ACS National Awards in Separation Science

The ACS National awards affiliated with the Analytical Division were reviewed during 2008-2009 by the ACS Awards Review Committee.

The results of the evaluation of both the ACS Award in Chromatography and ACS Award in Separation Science and Technology indicated improvements were required.

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(Effective Oct 1, 2009)

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For both awards, more nominations of outstanding candidates should occur. Please read the award criteria for each award and consider submitting a nomination of an outstanding separation scientist(s) for these awards.

Furthermore, there was the perception that too much overlap existed in the purpose of these awards.

Based on discussions among members of the SCSC executive committee and the executive committee of the Separation Science Subdivision of the Industrial and Engineering Chemistry Division, beginning next year (fall 2010) the ACS Award in Separation Science and Technology will be repurposed. The new goal of the award will be described as:

"recognizing the development of novel applications with major impacts and/or the practical implementations of modern advancements in the field of separation science and technology."

Both subdivisions would like to formally thank the review committee for their evaluation.

ANYL Councilor Michelle Buchanan giving the keynote address at the WCC luncheon at the 238th ACS Meeting in DC. The event was Tuesday, August 18, 2009. (Communicated by Dorothy J. Phillips. Photo credit to Linda Wang/C&EN)

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Cake, YummY
Subdivision 25th Birthday

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University of Arkansas, J. William Fulbright College of Arts & Sciences

University of California - Riverside

University of Illinois at Urbana-Champaign, Department of Chemistry

University of Utah

Analytical Chemistry and the Chemical and Biological Microsystems Society are pleased to announce the 2009 Young Innovator Award, a new annual award to honor the contributions of an individual who has demonstrated exceptional technical advancement and innovation in the field of micro- or nanofluidics in his or her early career. To be eligible a nominee must be within 15 years of receiving his or her doctoral degree and must have made an outstanding contribution to the field of micro- or nanofluidics.

The award will be presented at µTAS 2009 in Jeju, Korea, November 1-5, 2009. The award consists of $2,500, a plaque, and reimbursement of up to $1,500 of travel expenses to the meeting.

Nominators should send the CV of the nominee and a nomination letter including:

- Name, affiliation, and e-mail address of the nominee
- Name, affiliation, and e-mail address of the nominator
- Alma mater and graduation date of the nominee
- Paragraph describing the nominee's accomplishments
- Citation of a specific technical achievement (to be printed on the award certificate)
- Top publication(s) relevant to the nomination

Nominations may also include up to two seconding letters. Self-nominations are allowed. Nominations will carry over for two additional years. Nominee need not be present at the meeting at which the award is presented. Nominations should be sent to j_griffiths@acs.org.

Contact Information

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The deadline for receipt of candidate packages is October 2, 2009.

Past Recipients of the Young Innovator Award: 2008, Joel Voldman, Massachusetts Institute of Technology (MIT)

ACS DIVISION OF ANALYTICAL CHEMISTRY DIVISION AWARDS PROGRAM

call for nominations

ACS Division of Analytical Chemistry

Chemical Instrumentation
Sponsored by the Dow Chemical Company

J. Calvin Giddings Award for Excellence in Education
Sponsored by the Division of Analytical Chemistry

Spectrochemical Analysis

Electrochemistry

Arthur R. Findeis Award for Achievements by a Young Analytical Scientist
Sponsored by Phillip Morris USA

Distinguished Service in the Advancement of Analytical Chemistry
Sponsored by the Waters Corporation

Young Investigators in Separation Science
Sponsored by Agilent Technologies

THE DEADLINE FOR ALL NOMINATING MATERIALS IS NOVEMBER 1, 2009

Previous winners and nomination procedures: www.analyticalsciences.org/awards.php

ACS Division of Analytical Chemistry
Pittcon 2010 in Orlando, Florida, Feb. 28 – March 5, 2010

The ACS Division of Analytical Chemistry is pleased to announce that we are again programming at Pittcon in 2010. This venue worked very well for us last year in Chicago and we expect it to be equally as exciting for Orlando. Find below a list of the 6 invited symposia, nine contributed oral sessions, and a poster session. An ACS award session is also scheduled.

Invited Symposia

New Approaches to Address Emerging Environmental Pollutants: Environmental analysis has gained a renewed interest through the recognition that lower and lower levels of contaminants can significantly affect human health in addition to the environment. Analytical chemistry has played a critical role in these measurements by providing the ability to detect more analytes at lower concentrations than ever before. This symposium will bring together experts from a broad set of disciplines within analytical chemistry to discuss new developments in instrumentation for environmental analysis.

Electrochemistry and Energy: Because of their 100 % theoretical efficiency and reliance on domestic, renewable fuels, electrochemical energy systems are inherently advantageous as a means to address growing energy concerns. Here, the confluence of electrochemistry and energy is explored as electrochemical power sources are highlighted with focus on the advantages and challenges of biofuel cells, fuel cells, batteries, and photovoltaics.

New Frontiers in Mass Spectrometric Analysis of Proteins: Protein identification and quantification are essential analytical measurements that enable researchers to better understand human health and disease. Mass spectrometry is an essential tool for these analyses, and its capacity to solve ever more challenging research problems related to proteins is not yet fully realized. This symposium brings together several emerging thought leaders in the area of protein analysis by mass spectrometry to describe new tools and techniques that are now available to interested researchers.

Pushing the Envelope in Capillary Gas Chromatography: Capillary GC and GC/MS are workhorse analytical techniques spanning most geographies and industries. Although considered by many to be mature techniques, advances in columns and instrumentation continue to push their limits of performance and utility. Multidimensional GC separations are easier than ever to perform. New stationary phases and approaches have expanded the range of samples amenable to GC. New instrument, accessory and software designs have widened the applications and venues wherein GC and GC/MS can be reliably performed. And the improvements keep on coming. Speakers are renowned for their contributions to the art and practice of capillary GC and will report on their recent work pushing the envelope in capillary gas chromatography.

Microfluidic Systems with Electrochemical Detection for the Investigation of Biological Processes: Electrochemical detection coupled to microfluidic devices can be a powerful tool for the investigation of biological processes. The small dimensions of the microfluidics systems make it possible to monitor biological processes with high temporal resolution and minimal sample dilution. Electrochemistry provides a selective and sensitive method for the detection of redox active species such as catecholamines and peroxynitrite. The microfluidic platform also provides an ideal format for high throughput biological assays based on electrochemical detection.

Separation and Characterization of Large Macromolecules and Nanoparticles: There's Plenty of Room at the Top: This very timely symposium addresses cutting-edge developments and technical challenges related to the separation and characterization of large macromolecules and nanoparticles. Most engineered materials do not exist as single entities but as distributions in molecular weight, size, shape, composition, surface functionality, architecture, etc. Many important biological systems also exist in the nanometer size regime and have the additional complexity of undergoing dynamic changes that affect biological activity.

Contributed Sessions

Innovative Approaches to Analytical Science Education, Part I & II: The latest innovations in analytical science education will be explored in a collection of presentations spanning two sessions. Topics covered include curriculum development, web resources, research-based instructional methods, databases and digital libraries, societal issues in analytical chemistry, and instruction in consensus standards and quality assurance. Presentations will examine best practices and effective projects and highlight broad issues in analytical science education.

New Investigators in Analytical Chemistry, Part I & II: This symposium will highlight the research being done by a number of investigators in the beginning years of their academic position, or in the later years of postdoctoral research who are looking to be placed in academic positions in the near future. The talks will cover the gamut of analytical chemistry and include separations, mass spectrometry, electrochemistry, spectroscopy, and education.

Innovations in Separation Science, Part I & II: The separations step is a key component of most analytical methods. In this session, new materials and strategies to enhance chemical separation are reported for the analysis of a variety of biomolecules including carbohydrates, nucleotides and proteins. Approaches to predicting separations, improving sample introduction as well as analyte detection, and novel applications of mature separation methods will also be described.

Advances in Pharmaceutical and Biomedical Analysis: This session concerns new and evolving techniques for the analysis of drugs and biomolecules of medicinal interest in formulations and biological fluids.

Bioanalytical Approaches to Study Cellular Communication: With the common goal of probing cellular communication systems, a variety of methods will be presented. Recent advances in mass spectrometry, electrochemistry, fluorescence, chemical cytometry, microscopy, microfluidics, nanosensors, and atomic spectroscopy will be shown to provide new insights into chemical signaling in biological systems.

New Frontiers in Electrochemical Energy Conversion and Storage: This session will present innovative methods for storage and energy conversion using electrochemistry. This includes the development of novel materials and chemistries for solar energy conversion as well as new hydrogen fuel cells. The role of nanotechnology in energy conversion will also be presented.

Poster Session: ACS Poster Session on Monday, March 1, 2010.