

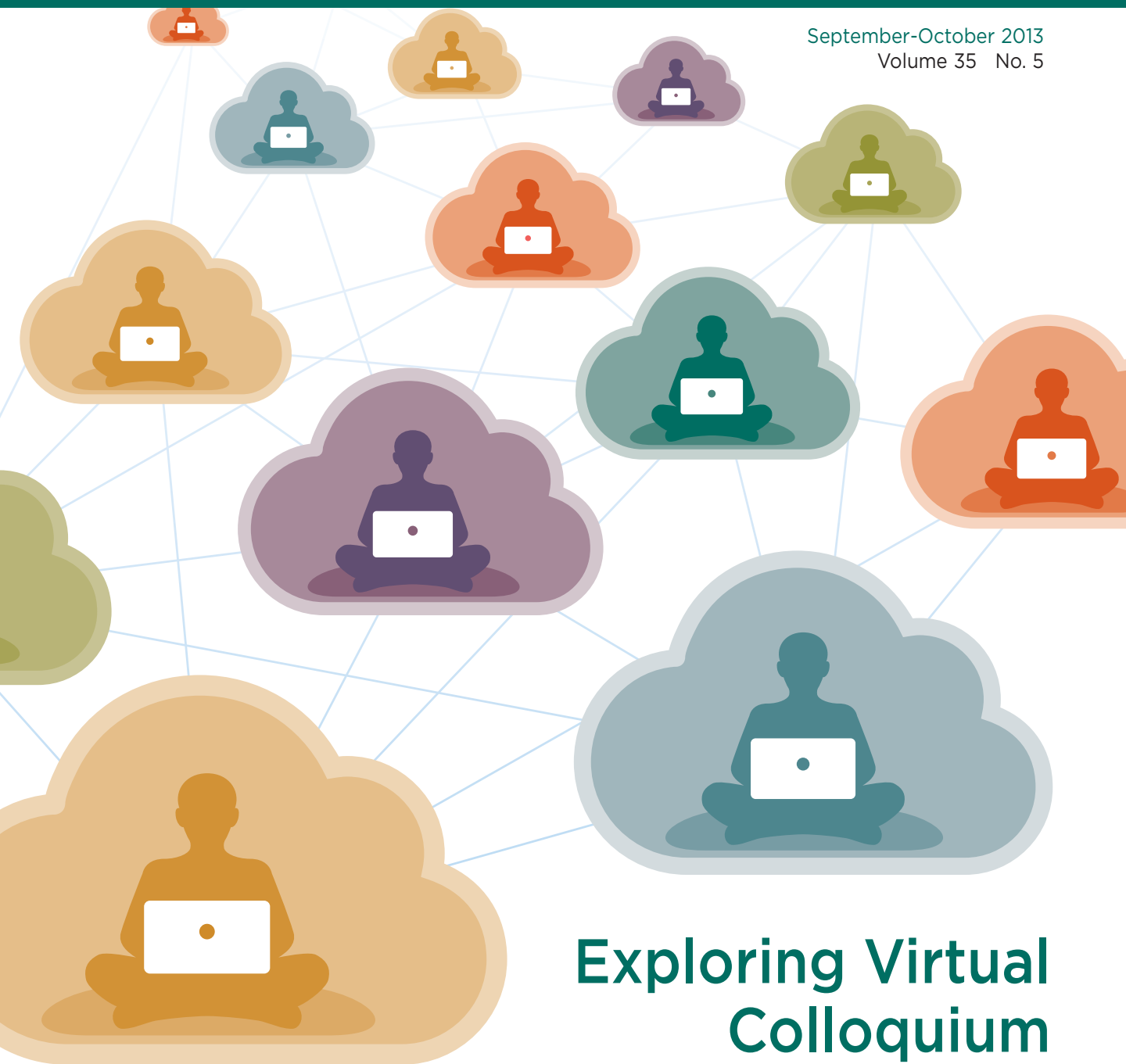
# CHEMISTRY

## International

The News Magazine of IUPAC

September-October 2013

Volume 35 No. 5



## Exploring Virtual Colloquium



INTERNATIONAL UNION OF  
PURE AND APPLIED CHEMISTRY

Celebrating Paul Sabatier ►

Chemical Education in Turkey ►



# From the Editor

## CHEMISTRY International

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Several times in this column, I have made reference to IUPAC-sponsored conferences and symposia and to the ubiquitous need that chemists (including IUPAC committees and task groups) have to gather to share experiences and advances in their fields. In this issue, Bob Belford and I report on a different type of meeting: the virtual colloquium.

When plans to hold a virtual colloquium on IYC2011 emerged as an IUPAC project in 2011, I could not pass on the opportunity to get



involved. The IUPAC Committee on Chemistry Education was keen to support this initiative and, before I knew it, Belford became our mentor, eager to share his experience in running virtual colloquium. There is a lot of background reading material available, but for me, the most influential was Thomas O'Haver's 1993-paper *On-Line Conferencing: Sitting at*

*the Virtual Table*, prepared for the first ConfChem (known at that time as ChemConf).\*

The text is now 20 years old and yet it is still interesting reading, more so if one reflects on how the available technology has evolved. When Bob and I decided to report on the virtual colloquium, as we do in the feature on page 2, O'Haver's paper became one of our key references. I can only encourage everyone interested in the topic to read (or reread) this source paper.

One quote in particular from O'Haver's paper stands out: "The most significant factor which distinguishes [organizations] which are able to make effective and strategic use of communications networks is their focus on networking people together rather than just thinking about connecting machines and data" (Lisa Carlson, Megasystems Design Group, Inc.). This, I thought, is an apt description of the ConfChem project ([www.ccce.divched.org/ConfChem](http://www.ccce.divched.org/ConfChem)), which O'Haver initiated some 20 years ago. One of ConfChem's primary goals was (and still is) to network people using the technology available. The quote is even more incisive today, recognizing the growth of online social networks since the WWW was given to the world in 1993. Who is making the best and most-effective use of social networking is a question I reserve for another column.

Towards the end of his paper, O'Haver reassured the novices by saying that "with practice, the technology ultimately fades into the background and the focus properly shifts to people and ideas." The technology of that time—email—has indeed faded into the background, but only to make space for numerous options, which in themselves can be overwhelming. Even so, in 1993 O'Haver concluded by saying "I'm afraid it will be some time before computer-based communications technology fades into the background. As usual, the real problems are not technological but human."

We are interested in getting feedback and learning about your experiences with online conferencing. As we plan to look into that topic again in future issues, your input will be appreciated. Write to us at [edit.ci@iupac.org](mailto:edit.ci@iupac.org).

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\*<http://terpconnect.umd.edu/~toh/ChemConference/BackgroundReading/OnlineConferencing.txt>

# Contents

CHEMISTRY International September-October 2013 Volume 35 No. 5

## Features

### On the Realm of Virtual Colloquium

*by Robert E. Belford and Fabienne Meyers*

2

### Celebrating Paul Sabatier: The Independent Chemist

*by Armand Lattes*

6

### A Short History of Chemical Education in Turkey *by Emre Dölen*

11

## IUPAC Wire

### 2014 IUPAC-ThalesNano Prize in Flow Chemistry—Call for Nominations

13

### IUPAC-Richter Prize—Call for Nominations

13

### For Better Impact in Africa

14

### New President and CEO at Chemical Heritage Foundation

14

### Franzosi Award to Julia Schmitt

15

### Student Physical Chemistry Cartoon Competition

2013 Prizewinners

16

## The Project Place

### Future Energy

17

### Recommendations for Isotopic Data in Geosciences

18

### UNESCO/IUPAC Postgraduate Course in Polymer Science

19

## Making an impact

### Bibliometric Analysis of Research on Secondary Organic Aerosols

20

### Definitions of Terms Relating to Mass Spectrometry

20

### Definition of the Halogen Bond

20

## Bookworm

### Practical Studies for Medicinal Chemistry—An Integrating Approach for Developing Countries *reviewed by Paul Erhardt*

21

### Macromolecular Symposia

23

## Nomenclature Notes

### The Special Case of Boron Hydrides *by Jeffery Leigh*

24

## Conference Call

### Environmental and Development Conference in Kenya

*by Joseph O. Lalah, John Unsworth, Paul Njiru, and Hesbon Nyagowa*

26

### Plant Protection Chemistry in China and the Asian

*Pacific Region by Wenlin Chen, John Unsworth, and He Xiongkui*

27

### Organic and Biomolecular Chemistry 2012 Travel Highlights

*by Mary Garson*

29

### Metal Ions in Biology and Medicine *by María H. Torre*

32

## Where 2B & Y

33

## Mark Your Calendar

35



# On the Realm of Virtual Colloquium

by Robert E. Belford  
and Fabienne Meyers

The nature of scientific communications is evolving in the digital age, and leveraging emerging technologies presents ongoing challenges and opportunities to an international scientific society like IUPAC. One of the missions of the Union is to contribute to the advancement of science by enabling communication among scientists across national, cultural, and linguistic boundaries. Historically, there have been two modes to this mission. First, IUPAC is responsible for standardizing the metrics and terminologies pursuant to effective communication among chemists. Second, it disseminates ideas and information through traditional modes of communication, including physical or face-to-face meetings and printed communications. For some time now, digital information and communications technologies have been impacting the traditional modes of communication,<sup>1</sup> while also enabling new ones through the instant transference of actual experimental data, adding a whole new layer to the needs for non-linguistic data standards.<sup>2</sup> In this paper, we will explore these questions, focus on the former challenges, and report on a Virtual Colloquium on IYC2011 which ran concomitant with the ICCE-ECRICE 2012.<sup>3</sup>

## Merging and Emerging Practices

The web has become ubiquitous in the digital age and has had a profound impact on the nature of publications, which have been changing and redefining their scope and reach, resulting in a plethora of new online features and resources. Meanwhile, for chemists and scientists in general, the nature of the face-to-face meeting has not really changed. Going to conferences continues to be a part of the academic and scientific life, where participants gather to present to their peers their most recent research and to share their findings. IUPAC is no stranger to this, and since its inception just short of 100 years ago, the Union has run assemblies, congresses, conferences, meetings, symposia, and workshops. To this day, IUPAC provides sponsorship to about international conferences yearly that wide range of specialized topics try. According to IUPAC guidelines, "IUPAC sponsorship attests to the

quality of the scientific program and indicates the host country's assurance that scientists from all countries may participate."<sup>4</sup> Such worldwide participation can still be a challenge; as traveling can not only be time consuming and costly, but acquiring the proper visas to allow timely travel can still be difficult and provide complications for many participants.

## Why are online conferences rare in the chemical sciences?

In the web 2.0 era, online communication over a variety of social media platforms like email, Twitter, Facebook, and Skype transcends national boundaries enabling worldwide participation without the need for visas, or the time and expense of international travel. Scientists are increasingly publishing their work on blogs containing comments and subscription options that trigger customizable communications to these platforms, and pioneering the use of open notebook science to share and discuss their experimental data online.<sup>5</sup> Likewise, online tools and platforms that emulate a conference are becoming more readily available. Real-time webinars are now common in which an author presents material online and discusses his or her work with attendees, but these are typically single presentations and lack the collective interaction of multiple talks in a conference symposium. Strangely, online conferences are still uncommon in chemistry circles, even though chemists were some of the first to use the internet for scientific communication, with examples like the online ConfChem conference dating back two decades.

## Origin and Evolution of ConfChem

ConfChems are online conferences (virtual colloquiums), hosted by the ACS Division of Chemical Education's Committee on Computers in Chemical Education (CCCE), which have been continuously run since 1993. According to Tom O'Haver, co-organizer of the first ConfChem (called ChemConf until 1998): "The idea originated in 1992, on the CHEMED-L listserv. Members of that listserv had been using it to announce upcoming meetings, conferences, and symposia. At one point, several interesting meetings were announced in a short period of time at difference locations; I commented that it would be difficult to attend





all of them and I mused that it would be nice if these types of conferences, with presented papers and question-and-answer periods, could be conducted over the nascent Internet. Don Rosenthal was quick to support the idea and he and I organized the first ChemConf.”<sup>6</sup>

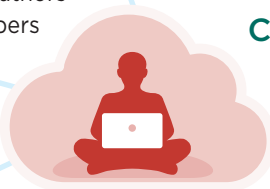
The first ConfChem, “Application of Technology in Teaching Chemistry,”<sup>7</sup> was an online conference run from 14 June to 20 August 1993, with 15 papers delivered over the internet as ASCII text files and discussed over a listserv. Images and graphs had to be sent separately over FTP and gopher servers and manually placed into the pages.<sup>8</sup> The ConfChem model blended practices of the traditional publication and face-to-face meetings. A conference organizer would pick a topic and invite authors to write papers. Once submitted, they would be published online and the organizer would set up a schedule where authors would be available to discuss the papers with participants over the listserv, with all discussions being remotely stored on listserv archive. It should be noted that ConfChem colloquia are international (with listserv recipients from all over the world) open to the public, and require no membership (ACS or CHED). As of 5 June 2013, there were 849 active email addresses on the list.

The basic format for running a ConfChem has not changed in 20 years, although the actual way ConfChems are run and archived have evolved under both technological and community pressures. Notable technology-induced changes included the adoption of web 1.0 technologies in 1996. With the first HTML-based ConfChem, participants no longer needed to separately upload and embed images and graphs into the papers. Instead, they could access the complete papers over the World Wide Web, with the discussions continuing through the listserv. The theme of that 1996 conference was “New Initiatives in Chemical Education,” and it even included a tutorial on the use of Netscape Navigator.

The next major change came with the use of web 2.0 technologies during the Spring 2011 ConfChem, on “Case-Based Studies in Chemical Education.” The new system uses the Drupal Content Management System and allows for the discussions to be threaded under each paper, instead of being remotely stored in a listserv archive. These technologies also facilitate the embedding of videos and applets into the papers allowing for easy publication of enhanced multimedia presentations. Current work involves the introduction

of social tagging of papers during discussions that will enable the generation of “folksonomies” to connect papers from different conferences.

Although individuals can self-subscribe to ConfChem papers, thereby negating the “conference” component of the discussions, ConfChem subscribes the ConfChem list to each paper, generating a community based discussion. If someone comments on a paper, it triggers an email to everyone on the list containing the comment and a “reply link.” A direct reply to the email goes to the moderator and not the list, while the embedded “reply link” goes back to the comment on the paper, with responses triggering another email to the list while being threaded below the paper. After the conference is over, only individuals that self-subscribed would get emails triggered by additional comments.



## ConfChem as a Model for Scientific Communications

Why are online conferences rare in the chemical sciences, and what can other chemical communities learn from the education community’s experience with 20 years of ConfChem? Is there a role for ConfChem-like communications in other fields of chemistry, and how can this model of scientific communication be adapted to the needs of other fields? In the background reading for the first ConfChem (accessible from reference 7), Thomas C. O’Haver wrote:

*“Scholars [in 1993] depend upon two main existing avenues of public communication with their colleagues, physical meetings and print publication. On-line conferencing is not meant to replace either one. It is rather a new medium that complements and to some degree fills in the gap between these traditional channels. On-line conferencing is distinct from electronic publishing (electronic journals), which seeks to provide a new channel for formal, peer-reviewed publication using computer networks as a medium of distribution. The essence of on-line conferencing, as any conference, is interactive discussion and exchange of ideas.”*

The fact that one can attend an online conference without leaving one’s home institution is probably the most obvious difference to a physical meeting. The advantage to this is reduced expense and the ability to attend the conference without compromising other



## On the Realm of Virtual Colloquium

professional commitments. The later aspect is also a disadvantage because attending an online conference adds to participants' normal workload, while attending a physical conference is a chance to focus on the conference topic. Online participants also have different schedules and span multiple time zones. The ConfChem model needs synchronous components to keep discussions focused on specific papers and asynchronous components to account for attendee's different schedules. Although multiple types of schedules have been used, the most common is to discuss one paper a week, running from Friday to Thursday. Over the first three days, participants are invited to read papers and submit questions to the authors, with the following Monday-Thursday scheduled as general discussion days, during which participants can interact with the author and each other.

Another facet of the ConfChem model is the "list." Although ConfChem evolved out of listserv discussions in the early 90s, there are advantages to continuing the use of this mode for social communication, although it does not need to exclude other forms of social media. Email is the most ubiquitous form of internet communication and almost everyone has an email address, while many do not participate in other forms of social media. It also needs to be understood that people do not reply to emails, but comment on a paper, which in turn triggers an email to the list. This is important because people often use email for personal correspondence and are writing in a less-professional mindset. When you comment on a ConfChem paper you are physically submitting your comment to the site of a professional society (the ACS Division of Chemical Education's CCCE), and are clearly aware that your comment is being posted to a publicly accessible scientific paper. The result is that the comments become valuable features of the paper. For example, purveying a few papers from the Spring 2012 ConfChem reveals the following: Paper 1, "An Introduction to the International Year of Chemistry-2011" (all papers are accessible from reference 3), is two pages in length, but has six pages of comments, including links to multiple resources. Paper 6, "The Periodic Table of Isotopes for the

Educational Community," is 9 pages long and contains 25 pages of comments.

The IYC 2011 Virtual Colloquium was the first ConfChem to use taxonomies to organize the web pages and several new features were added to the papers. Several authors embedded YouTube videos and a couple took advantage of the opportunity to remotely record PowerPoint presentations using the open source BigBlueButton conference management system<sup>9</sup> and Bandicam recording software.<sup>10</sup> These were global projects, where for example Bob Belford in the USA recorded Javier Garcia Martinez's online presentation from Spain, which was embedded in paper 3, "The Global Experiment of the International Year of Chemistry: Creating Online Communities for Education and Science." Likewise, Jim McQuillan in New Zealand presented a slide show on paper 9 "Chemistry Cartoon Competition: An IYC Activity from Physical Science in IUPAC." In paper 7, "Visualizing and Understanding the Science of Climate Change" we were able to embed one of the applets from the King's Centre for Visualization in the Science.

Other reasons for the underutilization of online conferences by chemistry communities may be because of the role of scientific societies, peer review, and the current practice of science. Traditional publishing has evolved out of Gutenberg Era technologies and resulted in a "filter then publish model," with scientific societies providing the filtering through the journal review process. Instead, online publications like ConfChem follow a "publish then filter" model, where the discussions amount to a different type of filtering of the content.<sup>11</sup> The consequence is that ConfChem-type publications are not considered to have been peer reviewed, reducing their value to authors in academia with respect to issues like tenure and promotion. Furthermore, some publishers still consider a ConfChem publication as prior publishing, which could prevent the work from being published in a peer-reviewed journal; this factor alone would steer potential authors of scientific works away from online conferences.

The CCCE recognized these issues and came to an arrangement with the *Journal of Chemical Education* to create a feature that took advantage of both



## On the Realm of Virtual Colloquium

of these filtering processes, whereby authors of ConfChem papers could submit communications on their ConfChem papers to JCE for peer review, with both the original online paper and discussions attached as supporting information. The journal would then publish the bundled communications in an edition of the printed journal and archive the original ConfChem papers and discussions as supporting information. The net result is a series of published communications on the topic of the ConfChem that benefited from the online discussions. The Spring 2010 ConfChem, "Educating the Next Generation: Green and Sustainable Chemistry," was the first to be published in JCE. This framework of integrating an online conference into a printed journal could be adapted to other areas of chemistry outside of education, and potentially provide higher-quality publications. The series of communications resulting from the Spring 2012 ConfChem will also appear in JCE.

### 2012 Virtual Colloquium on IYC2011

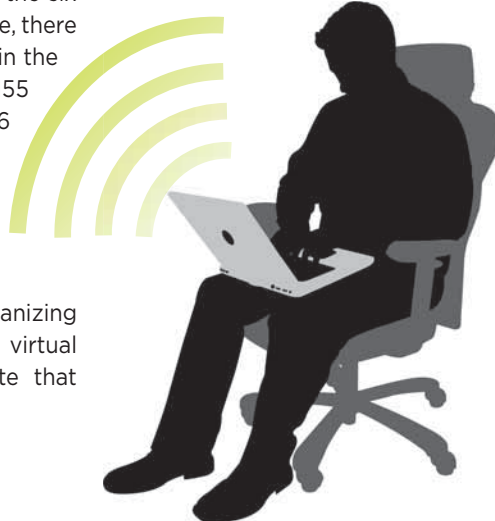
The IUPAC Committee on Chemistry Education and the ACS Division of Chemical Education's CCCE collaboratively organized the 2012 ConfChem as a pre-conference virtual colloquium to a symposium held on 15 July 2012 during the joint 22nd ICCE-11th ECRICE conference in Rome.<sup>12</sup> Jan Apotheker, the symposium organizer, described on a YouTube video<sup>13</sup> the virtual colloquium's objectives of allowing global participation in celebrating and reflecting on IYC2011 initiatives in global chemical education, with an eye on how to sustain such efforts. During the six weeks from 18 May to 28 June, there were over 850 participants in the virtual colloquium, with 155 comments containing 106 links to external resources, and 11616 total hits to the site (as of 6 August 2013, the number had grown to 41551). Although there are many challenges with organizing intersocietal activities, the virtual colloquium did demonstrate that

online conferences can enable interaction among members of different scientific societies.

Traffic statistic showed that during the conference each paper was accessed between 450 to just over 1200 times, with the number of comments varying from 2 to 30; these two factors were correlated with each other (the papers receiving the most hits also received the most comments). The discussions were more sustained when the authors were directly involved in the discussion, responding to questions and providing a continuous influx of information. Papers in which the author did not interact with the participants had the least hits. Paper 6, "The Periodic Table of Isotopes for the Educational Community," generated the greatest discussion, with the 2500 word article generating over 8000 words of discussion. This could be attributed to both the engagement of the authors with the list, and the perceived relevance of the paper to the classroom needs and practices of chemistry educators.

One drawback with ConfChem authors who were not previously involved with ConfChem was that they tended to only discuss their own papers and not engage in dialogue with the work of other authors. In fact, some authors did not even join the listserv until the week of their own paper, and one never responded at all. The discussions are an important aspect of the paper and in a sense, are like a news interview, where important facts are brought to the surface through questions and answers. More effort needs to be given to having authors interact with each other, and not just report on their own work.

During week 5, the virtual colloquium organizers attempted to emulate a poster session in which six papers, each featuring a different national IYC2011 activity, were simultaneously presented. As we were seeking an open-ended discussion on ways to promote global chemical education and sustain IYC 2011 initiatives, the participants were not only encouraged to share their thoughts about the presented "posters," but to also discuss their






own country's projects and initiatives. Since multiple papers were concurrently discussed through the same thread, the discussions turned out to be very difficult to follow. The authors were nevertheless engaged and, overall, a fair amount of information was exchanged.

Two interesting things can be noted from the archives. Paper 9 on the IUPAC cartoon competition has the second most hits even though this paper was not one of the most visited during the actual conference; this is probably because Google Image searches pick it up. So, placing a lot of images in a paper helps with respect to search-engine discovery. Also interesting is that the national IYC initiatives "poster session" received the third most hits, even though it was an abstract and the actual presentations were stored as PDF files. The 346-word article has 2222 words of comments, which contain 19 links; it is undoubtedly the discussion and not the article that search engines are finding.

## Lessons Learned

Thomas C. O'Haver ended his '93 paper with the following statement: "It is interesting to compare the development of online conferencing to other areas of our lives where media has competed with reality (e.g., concerts vs. recorded music; stage plays vs. movies; art galleries vs. art books and prints; live bands vs. DJs, flying real planes vs. flight simulators). Everyone agrees that the former is "better" than the latter, and yet it's safe to say that most people have experienced much more of the latter than the former. It's simply a matter of efficiency. The development of a technological or media-based alternative does not replace the real thing but rather promotes it to a higher level, to be appreciated more rarely, perhaps, but more fully."

Today, 20 years later, the ConfChem platform has evolved, embedding tools that are an integral part of our online world. While online communities are now commonplace, traditional meetings are still popular in the chemistry community. Yet, virtual colloquiums provide an additional type of forum for scientists, a hybrid between print and face to face, to present and share their research and findings. 

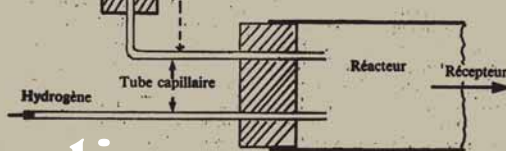
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# Celebrating Paul Sabatier



## The Independent Chemist

by Armand Lattes

The year 2012 was the centenary of the Nobel Prize in chemistry awarded to Victor Grignard and Paul Sabatier. Throughout the year, many lectures and events were held in France to celebrate this anniversary and the contributions of both scientists. To begin the year, the French Ministry of Culture published a book commemorating the French successes of 1912. On 10 April 2012, the French Academy of Sciences celebrated Sabatier and Grignard in Paris.

However, it was Sabatier, whose discovery in the field of catalysis had a profound impact on industrial development, who garnered the most attention during the centennial. The center of the tributes to Sabatier's life and work was the Scientific Toulouse University (Paul Sabatier University), which housed his laboratory and where he worked for 47 years.

In 2012, two international symposia were held in Toulouse that honored Sabatier: the 18th International Symposium on Homogeneous Catalysis (July) and the Power Plant and Power Systems Control Conference (September). Both meetings began with a lecture on the crucial contributions of Paul Sabatier to the field of catalysis.

On 12 October 2012, a museum dedicated to Paul Sabatier was inaugurated in the library of the Ecole Nationale Supérieure des Industries et Arts Chimiques

*Program from the 12 October 2012 opening of a museum dedicated to Paul Sabatier in the library of the Ecole Nationale Supérieure des Industries et Arts Chimiques de Toulouse.*

de Toulouse. Sabatier's grandson attended the ceremony. Over the following three months, lectures and movies about Sabatier were offered to the public.

During November and December 2012, four events for the general public were organized by the Paul Sabatier University in Toulouse: three lectures on the regional impact of the life and work of Paul Sabatier, the history of catalysis, and the importance of nanotechnologies in the new catalysis; and a round table conference on the role of catalysis in every day life.

Paul Sabatier was born on 5 November 1854 in Carcassonne, a small medieval town with an impressive fortress, which is 90 km from Toulouse in southwest France. He attended primary school in Carcassonne before moving to the "Lycée" in Toulouse in 1868. He finished his secondary studies at Sainte Marie's school, a catholic high school, under the supervision of Jesuit priests.

At 18, with a bachelor of sciences and a bachelor of humanities, Paul Sabatier began his preparatory studies for admission to a "grande école" at Sainte Geneviève school in Versailles. At 20, he had gained admission to both the "Ecole Normale Supérieure," where Louis Pasteur was teaching chemistry, and to the "Ecole Polytechnique;" he chose the former.

In 1877, when he was 23, Sabatier won first place in the competitive national physics *agregation* examination (agregation is a competitive examination for teaching in high schools). After teaching a few months in the Lycée of Nîmes, Louis Pasteur and Marcelin Berthelot each offered him a position as an assistant in their laboratory. Surprisingly, he chose Berthelot, an anticlerical and materialist man, philosophically opposed to Sabatier's opinions, instead of Pasteur, a practicing Catholic with a philosophy closer to Sabatier's. With Berthelot, he completed a doctoral thesis on *The Thermochemistry of Sulfides*. In 1882, he obtained a position at Toulouse, where he became a professor in 1884 at the age of 30.

Toulouse during the 1880s was a large, rich city with 150 000 inhabitants. In Sabatier's time, the economy of the city was essentially commercial and agricultural



*Paul Sabatier, Dean of the Faculty of Sciences (around 1905).*



Photo: INP-ENSIACET/www.jpgphotographie.com

## Celebrating Paul Sabatier

activities with little industrialization. When Sabatier arrived at Toulouse, the Faculty of Sciences was in very poor condition. The decrepit faculty rooms were said to have looked like an alchemist's cave. Bunsen burners were rare and charcoal stoves were used for heating retorts and flasks. Sabatier rearranged basement rooms at the old faculty building to create a larger laboratory for teaching and research and he introduced new apparatus for research.

In his teaching, Sabatier was an innovator, utilizing Mendeleiev's periodic table and discarding the notation of chemical equivalence, preferring atomic notation. This is an area in which he disagreed with Berthelot.

Throughout his career, Sabatier remained faithful to his roots in provincial France, turning down many offers of more attractive positions, notably as successor to Moissan at the Sorbonne and to Berthelot at the "Collège de France." He would have had much greater income potential and more research opportunities in Paris. Furthermore, Toulouse was not a true university at the time since it had only three separated faculties when four was the minimum to become a university. This later changed when Toulouse became one of 17 national universities.

In 1905, Sabatier was elected dean of the Sciences Faculty, a post which he occupied until 1929. Very much ahead of his time, he successfully presided over the establishment of new institutes for applied sci-

ence: chemistry in 1906, electrotechnic and applied mechanics in 1907, and agriculture in 1909. These institutes were the roots of the present Institut National Polytechnique de Toulouse.

### Scientific Works: The Story of a Discovery

For the first 10 years of his research, Sabatier focused on thermochemistry and physical chemistry, continuing his studies of sulfur and sulfides, but one scientific event and an encounter with Jean-Baptiste Senderens changed his research orientation.

Senderens, a Catholic priest who had taught chemistry at the Institut Catholique de Toulouse since 1882, had been working with Sabatier's predecessor, Edouard Filhol. When Filhol died, Senderens completed his doctoral thesis in Sabatier's laboratory. After his thesis he decided to continue working as a "post doctoral researcher" in the laboratory.

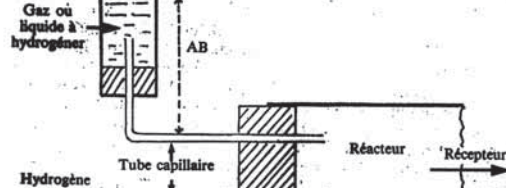
In 1890, Ludwig Mond and coworkers had synthesized the nickel carbonyl compound by direct action of carbon monoxide on very finely divided nickel. This work encouraged Sabatier to study the reaction of "incompleted" or "unsaturated" molecules on different metals. Between 1893 and 1894, Sabatier and Senderens succeeded in fixing nitrogen peroxide on copper ( $\text{Cu}_2\text{NO}_2$ ), nickel and iron; they named these compounds "Nitro Metals."

In 1896, they learned that Moissan and Moureu had tried to fix acetylene on the same metals. They had passed a current of acetylene on finely divided iron, cobalt, and nickel—freshly reduced from their oxides by hydrogen—and observed a brilliant incandescence, deposition of large quantities of carbon on the metals, formation of benzene, and the evolution of a gas they judged to consist of hydrogen, but they did not analyze the gas!

Having made certain that Moissan was not thinking of continuing the study of the reaction, Sabatier and Senderens repeated the experiment by using ethylene instead of acetylene. When a stream of ethylene was directed to nickel, cobalt, or iron, which had been freshly reduced, they observed the same results as Moissan and Moureu. However, the gas that left the apparatus was not hydrogen, but consisted mainly of ethane, a saturated molecule. Ethane could arise only from hydrogenation of ethylene, and this hydrogenation had been induced by the metal. In fact, if a mixture of ethylene and hydrogen is directed on reduced



*Paul Sabatier's laboratory in the 1920s.*



nickel, the ethylene is hydrogenated in ethane and the same metal can be used indefinitely (June 1897).

Sabatier and Senderens studied in depth the hydrogenation of unsaturated hydrocarbons and then turned to the next challenging problem: the hydrogenation of benzene; with the same experimental method they obtained practically pure cyclohexane in 1901. After these successes, Sabatier was absolutely confident of the general nature of the experimental method they were using when he stated: "Vapor of the substance, together with an excess of hydrogen, is directed on to freshly reduced nickel held at a suitable temperature (between 150° and 200°C)."

In 1912, Sabatier was awarded the Nobel Prize in chemistry: "for his method of hydrogenating organic compounds in the presence of finely divided metals whereby the progress of organic chemistry has been greatly advanced in recent years." He shared the prize with Victor Grignard who received it for discovering organomagnesium compounds. In 1913, Sabatier was the first scientist elected to a newly created section of the French Academy of Sciences for people not living in Paris.

After 1901, Sabatier went from one type of reaction to another, transforming unsaturated or functionalized compounds in saturated or newly functionalized compounds. Among these reactions two were particularly interesting:

- the transformation of water gas, the domestic gas used at that time, which contained small quantities of toxic carbon monoxide, into a completely nontoxic gas
- the production of the major types of natural petroleum (Pennsylvanian, Romanian, Galician, Bakou) by modifying conditions for hydrogenating acetylene

Besides hydrogenation and other catalytic reactions, Sabatier showed the reversibility of the catalytic process: the same catalyst could be used for the direct

and the reverse reaction (hydrogenation and dehydrogenation). One of his most important contributions toward the development of catalysis was his hypothesis about this phenomenon: "Powdered nickel is

comparable in every way with a ferment and, as in the case of the living organism which constitutes ferments, infinitesimal doses of certain substances are sufficient to attenuate and even suppress altogether their functional activities."

Last but not least, Sabatier was the father of the chemical theory of catalysis. For him, in catalysis, a temporary unstable intermediate between the catalyst and one of the reactants forms on the surface of the catalyst. That theory was translated into poetry by the rector Paul Lapie in 1913 during a local ceremony: "What is catalysis? The favorite method of Mr. Sabatier? It is the synthesis whereby two bodies, not having spontaneously a very great affinity, consent to be joined when a metal presides over their wedding. If some

metals exert this curious magistracy, we knew that before Mr. Sabatier. But we attended to this ceremony only in one case where one side of the married couple was oxygen. The Toulousain scientist has showed that hydrogen is able to play the same role and he has accurately defined the conditions whereby it is ready for use . . . Since nickel, for example, is absolutely necessary for combining acetylene and hydrogen, we must assume that nickel begins to attract hydrogen, but the capricious hydrogen soon breaks with the metal for joining with acetylene. Eyes only perceive one combination under the presence of a passive metal; the mind can explain the facts only as two weddings separated by one divorce."

## Industrial Applications of Sabatier's Work

Sabatier's discoveries lay at the root of most of the giant chemical industries of today: 90 percent of all commercially produced chemicals involve catalysis



*In the Tranquility node aboard the International Space Station, NASA Astronaut Doug Wheelock, Expedition 25 commander, works to install the new Sabatier. Photo Credit: NASA*



## Celebrating Paul Sabatier

at some stage in the process of their manufacture (e.g., petroleum treatment, petrochemicals, chemical synthesis, synthetic fuels, fat hydrogenation). The same principles Sabatier outlined also apply to the ubiquitous automotive catalytic converter, which breaks down some of the more harmful byproducts of automotive exhaust.

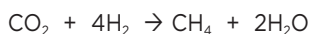
Nanotechnologies and nanoparticles represent a new frontier in catalysis because the total surface area of a solid has an important effect on the catalytic reaction rate: the smaller the catalyst, the larger the surface area for a given mass of particles. Gold is an excellent example of this assertion: traditionally regarded as inactive as a catalytic metal, gold can act as a catalyst in the shape of 3-5 nm particles.



Photo: INP-ENSIACET/www.jpgrphotographie.com


**The 12 October 2012 opening of a museum dedicated to Paul Sabatier in the library of the Ecole Nationale Supérieure des Industries et Arts Chimiques de Toulouse. Armand Lattes is on the far right.**

Finally, catalysis is one of the 12 principles of green chemistry. Catalysis impact the environment by increasing the efficiency of industrial processes or by playing a direct role in the environment. A notable example is the synthesis of fuels from carbon dioxide and hydrogen. At the beginning of the twentieth century, Paul Sabatier developed a process using a catalyst that reacts with carbon dioxide and hydrogen to produce methane and water.



This reaction provides a way to produce water by using byproducts of current life-support systems

onboard the International Space Station: it provides a way to produce water without the need to transport it from Earth. The system was integrated into the station's water recovery system in October 2011. The six astronaut-crew aboard the ISS now has water synthesized by this reaction: Hydrogen is a waste product of the oxygen generation system; Carbon dioxide is generated by crew metabolism (respiration by individuals). Water is retained and methane is vented outside of the space station. The "Sabatier Reaction System" could produce as much as 2500 litres of water per year.

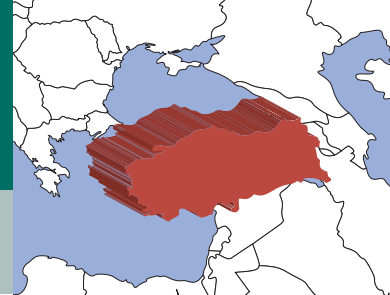
Paul Sabatier was a very reserved man. He was fond of art and gardening. He married Germaine Herail and they had four daughters. He survived his wife by 43 years and died on 14 August 1941 at the age of 87. He had worked for 57 years in Toulouse. 

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# A Short History of Chemical Education in Turkey\*



by Emre Dölen

**I**n Turkey, modern chemistry was not introduced until the 19th century, although it was limited to teaching and education since the country had no chemical technology or industry at the time. Chemistry courses were taught in vocational schools, but the scope was limited to providing students with the knowledge of chemistry necessary for their vocation. Scientific research in chemistry in Turkey only began in the late 1920s.

In the 18th century, especially in certain books on medicine and pharmacy, some indirect translations can be seen regarding the new understanding of medicine on the aftermath of the Scientific Revolution, iatrochemistry, distillation, and separation techniques.

The very earliest teaching about chemistry probably occurred at the Imperial Military Engineering School, which opened in 1795. Although there were no formal chemistry courses, some practical information on chemistry and metallurgy were delivered in relation to the technical operation of the gun foundry.

The roots of modern chemistry in Turkey can be traced to the publication of the book *Usûl-i Kimya* [*Elements of Chemistry*] in 1848. Written by Dr. Mehmed Emin Dervish Pasha, it is the first independent chemistry book published in Turkey, and it projects the level of chemistry of the period quite well. Chemist Dervish Pasha (1817-1879) had lived in England, spent three years in Paris, and graduated from the *École des Mines* [Mining School]. After returning to Turkey, he taught physics and chemistry at the War Academy.

At the Imperial Medical School, opened in 1827 and reorganized in 1839, as well as at the Civil Medical School, opened in 1867, courses of chemistry, which kept up with developments in Europe, were taught to the students of medicine and pharmacy. Also in this period, courses of chemistry were being taught at the Imperial Military Engineering School, War Academy, and Halkali Agricultural School. In 1868, Dr. Aziz Idris Beg (1840-1878) published the second Turkish chemistry book. The first volume of this very comprehensive book, which closely aligns with knowledge of chemistry during that time in Europe, was on general chem-

istry, nonmetals, and compounds. The second volume, published in 1871, was on metals and compounds.

At the Imperial University, established in 1900, chemistry courses were now offered within the curriculum of science education. Through this development, chemistry education found its real place, and within a decade, a chemistry laboratory had opened at the Faculty of Science.

Until 1917, chemistry was taught as an auxiliary course for vocations such as engineering, medicine, pharmacology, and agriculture. Throughout this period, chemistry in Turkey sometimes lagged behind the modern chemistry of Europe and at other times it was more closely aligned with the latest development. During the Ottoman period, chemistry in Turkey was one of the top fields of the fundamental sciences and was able to keep pace with European science. This was a result of Turkish students studying in Europe and visiting professors from Europe.

During the First World War, Istanbul University was reorganized, and in 1915, 20 professors were brought in from Germany. Of these, Dr. Fritz Arndt (1885-1969), Dr. Gustav Fester (1886-1963), and Dr. Kurt Hoesch (1882-1932) were chemists. These German chemistry professors established an Institute of General and Industrial Chemistry in 1917, through which chemical education was independently organized and “Chemist” certificates were awarded. This education program took three years for students to complete and laboratory practices were a large part of the curriculum. The laboratories were kept open throughout the day and the students were able to work in them when they weren’t attending the theoretical courses. This system of education continued until the end of the 1960s.

The German professors had to leave Turkey after the First World War, and education continued with Turkish professors until 1933. Throughout this period, although the curriculum did not change fundamentally, there were some developments. In 1924, an undergraduate program was initiated to educate future high school teachers in physics and chemistry. Starting in 1926, French professors were invited to be visiting professors in Turkey. One of them, Dr. Gabriel Valensi, introduced physical chemistry and electrochemistry into the university curriculum in Turkey for the first time.

In 1933, Istanbul University was reorganized and numerous German refugee professors were hired. One of them, Dr. Fritz Arndt became the director of the General Chemistry Institute, a position he held until

\*An earlier article, “Chemistry Education Research in Turkey,” by Mustafa Sozibilir, appeared in the March-April 2013 *Chemistry International*, p. 12.




## A Short History of Chemical Education in Turkey

1955. During this period, there was a major German influence on chemical education.

Between 1917–1943, the Faculty of Science at Istanbul University was the only place to receive chemistry education. In 1943, Ankara University Faculty of Science opened a program for the science of chemistry; this became a five-year chemical engineering program in 1948. Starting in 1958, undergraduate programs of chemistry and chemical engineering were offered at Middle East Technical University, Robert College, College of Engineering (Boğaziçi University), and Istanbul Technical University, Maçka Technical School. This was followed by the opening of undergraduate chemistry and chemical engineering programs at Ege University Faculty of Science in 1961, and graduate chemistry and graduate chemical engineering programs at Hacettepe University, Faculty of

Science and Engineering, in 1964.

Since 2000, the number of universities in Turkey has rapidly increased. In 2012, there were 165 universities in Turkey, 103 of which are state run and 62 of which are nonprofit private universities. Of these universities, 83 have chemistry departments: 79 are in state universities and 3 are in private universities. Yet, due to the employment problems faced by graduates, student interest in chemistry has declined, and the student quotas of chemistry departments have begun to go unfilled. Under these circumstances, some departments have ceased teaching chemistry. 

**Emre Dölen** <emredolen@gmail.com> is a professor emeritus of analytical chemistry at Faculty of Pharmacy at Marmara University, Istanbul, Turkey. His research interest includes history of science and chemistry. He has several studies on history of chemistry in Ottoman times and republican era in Turkey.

## Stamps International

See also [www.iupac.org/publications/ci/indexes/stamps.html](http://www.iupac.org/publications/ci/indexes/stamps.html)

### Just One Word: Plastics

That was the simple yet puzzling advice offered by a family friend to the character played by Dustin Hoffman in the 1967 American film *The Graduate*, for which the versatile actor received his first Oscar nomination. “There is a great future in plastics,”\*

the friend added with confidence and unusual foresight. Only four years earlier, the Nobel Prize in Chemistry had been awarded jointly to Karl Ziegler (1898–1973) and Giulio Natta (1903–1979) “for their discoveries in the field of the chemistry and technology of high polymers.” Although Bakelite, PVC, and polystyrene had been commercially available for several years, Ziegler and Natta’s contributions in the 1950s, particularly for the catalytic

large-scale production of polyolefins, made polymers the truly ubiquitous materials they are today. Almost 300 million tonnes of plastics are now produced in the world each year, with polypropylene and various types of polyethylene, widely used in the packaging

and textile industries, accounting for more than half of the total output.

The Swedish stamp illustrated in this note was issued in 1988 and commemorates the 25th anniversary of the Nobel Prize in Chemistry that Ziegler and Natta received in 1963. It is part of a set of four stamps that honors Nobel laureates in chemistry and also features Willard Libby (radiocarbon dating, 1960), Ilya Prigogine (non-equilibrium thermodynamics, 1977) and Aaron Klug (electron microscopy, 1982). The design of the colorful stamp includes a spider’s web, a substance known for its high-tensile strength and elasticity, and a molecular representation of what appears to be a linear chain of polyisoprene (i.e., natural rubber), even though the naturally occurring material contains primarily *cis*- rather than *trans*- double bonds.

Half a century after their pioneering work, Ziegler and Natta would be amazed today with the degree of sophistication attained by olefin polymerization catalysis (a driving force behind research in organometallic chemistry during the past few decades), not to mention the concerted effort in recent years to produce biodegradable and recyclable plastics.

Written by Daniel Rabinovich <drabinov@uncc.edu>.

\*<http://www.youtube.com/watch?v=DHGCvJjat1E>



## 2014 IUPAC-ThalesNano Prize in Flow Chemistry—Call for Nominations

The Call for Nominations for the IUPAC-ThalesNano Prize is now open and will be closing on 31 January 2014. The prize was established in 2011 and first awarded to Klaus Jensen in 2012. The second award of USD 7500 will be presented at the 13th International Conference on MicroREaction Technology (23–25 June 2014, Budapest, Hungary), where the recipient will give a plenary lecture on the subject of his/her research. A contribution to travel expenses will be provided.

The IUPAC-ThalesNano Prize is awarded to an internationally recognized scientist, whose activities or published accounts have made an outstanding contribution in the field of flow chemistry in academia or industry. The prize was established by a generous gift from the Hungarian Technology company ThalesNano Inc. to acknowledge the key role that flow chemistry plays in the improvement of chemical processes.

Applicants can be received by nomination only, with just one person needing to serve in that capacity, although a total of five (5) individuals should be listed as referees overall. The package must be submitted electronically and should contain a complete résumé, a professional autobiography of not more than two pages, and a one-page summary of what the indi-

vidual considers to be his/her activities, accomplishments, and/or publications that have had the most significant impact upon the field of flow chemistry. The material will be forwarded confidentially to an independent selection committee appointed by the IUPAC Committee on Chemistry and Industry. The deadline for submissions is 31 January 2014.

For further information, please contact Dr. Michael Droescher, chair of the IUPAC Committee on Chemistry and Industry at [m.droescher@t-online.de](mailto:m.droescher@t-online.de).

## IUPAC-Richter Prize—Call for Nominations

IUPAC and Gedeon Richter, Plc. are now seeking nominations for the 2014 IUPAC-Richter Prize in Medicinal Chemistry. The prize was established by a generous gift from the Chemical Works of Gedeon Richter, Plc. (Budapest, Hungary) to acknowledge the key role that medicinal chemistry plays in improving human health. The prize of USD 10000 is awarded to an internationally recognized scientist, preferably a medicinal chemist, whose activities or published accounts have made an outstanding contribution to the practice of medicinal chemistry or to an outstanding example of new drug discovery. Previous IUPAC-Richter Prizes were awarded to Malcolm F.G. Stevens in 2006, Jan Heeres in 2008, Arun K. Ghosh in 2010, and Stephen Hanessian in 2012.

The 2014 IUPAC-Richter Prize will be presented in September 2014 during the EFMC International Symposium on Medicinal Chemistry in Lisbon, Portugal, where the recipient will give a plenary lecture on the subject of his/her research. The travel expenses of the prize winner will be arranged by Richter Plc. The winner will also be invited to give a lecture at the awards symposium of the 2014 ACS National Medicinal Chemistry Symposium in Charleston, South Carolina, 18–21 May 2014.

Applicants should be received by nomination only, with just one person needing to serve in that capacity, although a total of five (5) individuals should be listed as referees overall. The package must be submitted electronically and should contain a complete résumé, a professional autobiography of not more than two pages, and a one-page summary of what the individual considers to be his/her activities, accomplishments and/or publications that have had the most significant impact upon the field of medicinal chemistry. The material will be forwarded confidentially to an independent selection committee appointed by the IUPAC Subcommittee on Drug Discovery and Development.

Nomination materials should be submitted by 31 December 2013 to the IUPAC Secretariat by email at [secretariat@iupac.org](mailto:secretariat@iupac.org).

For further information, please contact Professor C. Robin Ganellin at [c.r.ganellin@ucl.ac.uk](mailto:c.r.ganellin@ucl.ac.uk).



## For Better Impact in Africa

**B**erhanu Abegaz, executive director of the African Academy of Science shared the release of the *AAS Strategic Plan: A Roadmap to Positioning AAS for Better Impact in Africa*.

The strategic plan for 2013–2018 provides a roadmap for enhancing the role of the Academy as a key partner and leader in Africa's sustainable development and outlines the interventions, programs, activities and projected outcomes of AAS in priority areas. It will also guide the relationship between AAS and its key stakeholders, who include the Academy's Fellows, partnering organizations and policy makers. The plan prioritizes five key areas:

1. Ensuring the Vitality and Sustainability of AAS by improving governance, establishing and enhancing partnerships, widening the fellowship base, building on the asset base of AAS, and developing an effective communication system.
2. Recognizing Excellence through the designation of the most exemplary scientists in Africa as fellows of the Academy and by nurturing emerging African scientific talent, through the newly established Affiliate Membership Program and mentorship programs. AAS will also continue and strengthen its awards and prizes to recognize outstanding contribution by scientists working in Africa.
3. Building Capacity in Science and Technology through capacity-building initiatives that seek to enhance region-specific competences in key topical areas including water and sanitation; sustainable energy; food security and nutritional well being; health care; science, technology, engineering, and mathematics; and climate change.
4. Developing Databases of Scientists and Scientific Organizations that will consist of experts, as well as emerging researchers from Africa to make AAS a repository for expertise in areas of research and knowledge production.
5. Engaging Governments and Policy Makers in Africa to Promote Science Technology and Innovation by holding open, top-level, continent-wide forums, workshops, conferences, and roundtable discussions on science and technology. These meetings will bring together grass-roots activists, scientists, and policy

makers to discuss issues of common concern in settings designed to promote knowledge exchange and outcomes of collaboration.

The *AAS Strategic Plan 2013–2018* is available at <http://aasciences.org>.

## New President and CEO at Chemical Heritage Foundation

**C**arsten Reinhardt, a professor of the history of science at Bielefeld University, became president and CEO of the Chemical Heritage Foundation (CHF) on 1 August 2013. He is the third president of CHF, succeeding Thomas R. Tritton, who retired.

Reinhardt was selected following a worldwide search for a leader with a great depth of experience in the history of science and technology. He has extensively researched and published on the impact of chemistry on society through topics such as the history of industrial research, the emergence of instrumentation, and chemistry's links to physics, biology, medicine, and technology.



CHEMICAL  
HERITAGE  
FOUNDATION

Carsten Reinhardt joined the faculty of Bielefeld University in 2007. In 2006–2007 he held a fellowship at the Max Planck Institute for the History of Science. Prior to that, he spent a decade as a professor at the University of Regensburg. The author of three books, most recently *Shifting and Rearranging: Physical Methods and the Transformation of Modern Chemistry* (Science History Publications/USA, 2006), Reinhardt has contributed to five edited volumes and published nearly 40 scholarly articles. In addition, he has received many awards and fellowships, including being named a fellow at the Max Planck Institute for the History of Science and professeur invité in the

Department of Philosophy, École Normale Supérieure. Reinhardt was an Edelstein Fellow at CHF in 1998–1999. He was also an Edelstein Fellow at The Hebrew University of Jerusalem in 1994.

The Chemical Heritage Foundation is a collections-based nonprofit organization in Philadelphia, Pennsylvania, USA, that preserves the history and heritage of chemistry, chemical engineering, and related sciences and technologies. The collections are used to create a body of original scholarship that illuminates chemistry's role in shaping society. In bridging science with the humanities, arts, and social sciences, CHF is committed to building a vibrant, international community of scholars; creating a rich source of traditional and emerging media; expanding the reach of our museum; and engaging the broader society through inventive public events.

 [www.chemheritage.org](http://www.chemheritage.org)

### Franzosini Award to Julia Schmitt

**J**ulia Schmitt received the Franzosini award in recognition of her contribution to the IUPAC Solubility Data Project. She was honored at the 11th Annual Meeting of the IUPAC Subcommittee on Solubility and Equilibrium Data, held in the Qinghai Institute of Salt Lakes, Chinese Academy of Sciences, Xining, China on 21 July 2012.

Schmitt is a young scientist completing her Ph.D. at the Institute of Inorganic Chemistry in the TU Bergakademie in Freiberg, Germany, in the research group of Wolfgang Voigt. She is engaged in the determination of the solubility of lithium salts in aqueous multi-component electrolyte systems. Schmitt, a member of the IUPAC task group 2011-031-1-500 on Solubility of Lithium Sulfate in Aqueous Solutions, made a poster presentation on “Solubility Data of Lithium Sulfate in Binary and Higher Systems: Compilation and Critical Evaluation” at the 15th International Symposium on Solubility Phenomena and Related Equilibrium Processes in Xining, China.

The Franzosini Award was established by the former Solubility Data Commission (old IUPAC Commission V.8), in 1988, during its 14th meeting held in Guildford, Surrey, UK, that was hosted by A.F. Danil de Namour.

The “Paolo Franzosini Endowment Fund” was created in 1988 after a proposal from A.S. Kertes and a generous donation from Franzosini's wife and daughter after the sudden death of Paolo Franzosini, professor of physical chemistry at the University of Pavia, Italy, (Nov-Dec 2002 *CJ*), while completing the volume 33 of the Solubility Data Series on *Molten Alkali Metal Alkanoates*. The book, finished with the help of Paolo's colleagues, Paolo Ferloni, Alberto Schiraldi, and Giorgio Spinolo, was published in 1988 by Pergamon Press, which used to pay compilers and evaluators on a per page base. The Franzosini family offered, to the Solubility Data Commission, the total fees and honoraria for Paolo's book.



*Members of the Subcommittee on Solubility and Equilibrium Data with Julia Schmitt, the recipient of the 2012 Franzosini Award, in Xining, China, during the 15th International Symposium on Solubility Phenomena and Related Equilibrium Processes.*

The Solubility Data Commission established the Franzosini Award to help promising young contributors to the Solubility Data Project attend, in even years, the ISSP meetings, and in odd years, the annual meeting of the Solubility Data Commission. Since 1989, there have been 18 recipients of this prize, some of whom are still active members of the present Subcommittee on Solubility and Equilibrium Data that is the successor to the IUPAC Solubility Data Commission V.8 of the Analytical Chemistry Division. The recipients of the Franzosini Award as well as the year, the venue, and the name of the proponent are listed in a table online at [www.iupac.org/publications/ci/2013/3505/iw5\\_Franzosini.html](http://www.iupac.org/publications/ci/2013/3505/iw5_Franzosini.html).

 [www.iupac.org/nc/home/about/members-and-committees/divisions/V/502/franzosini-award.html](http://www.iupac.org/nc/home/about/members-and-committees/divisions/V/502/franzosini-award.html)



## The Project Place

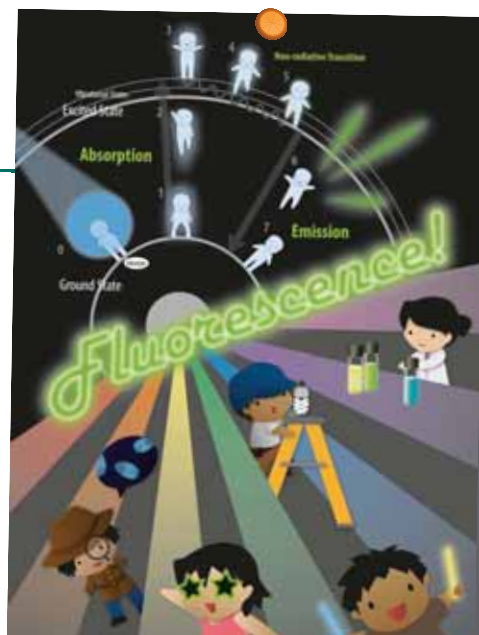
### Student Physical Chemistry Cartoon Competition 2013 Prizewinners

The prizewinners for the student physical chemistry cartoon competition run this year<sup>1</sup> by the Division of Physical and Biophysical Chemistry are as follows:

- Jenna Billbrey, a postgraduate at the University of Georgia, USA
- Rahul Chakraborty of Vishwa Bharati Public School, New Delhi, India
- Liwah Keller of University of Toronto Schools, Toronto, Canada
- Hiroyo Ohgi, an undergraduate at Chiba University, Japan
- Gracile Roxas, a postgraduate at the University of the Philippines Diliman, Philippines

The goal of the competition was to clearly illustrate an aspect of physical chemistry in a manner that can enrich the teaching of physical chemistry. The winning cartoons all addressed a physical chemistry concept with some accuracy, were all highly visually appealing and of high graphical quality.<sup>2</sup>

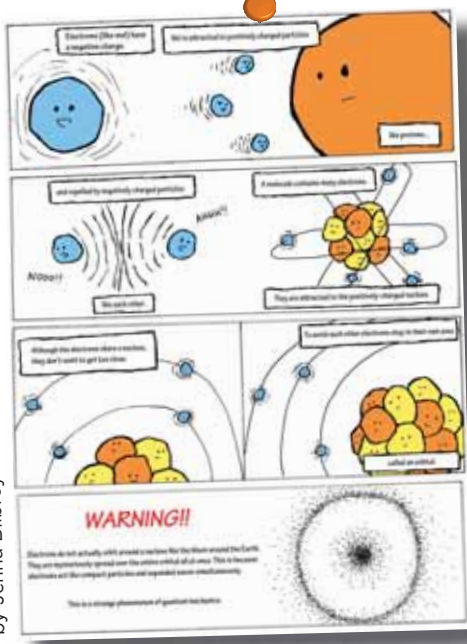
The 29 entries from 10 countries, including China, Malaysia, Indonesia, Croatia, and UK, were judged by Assaf Friedler (Israel), Jim McQuillan (New Zealand), Andrea Russell (UK), and Angela Wilson (USA) from the IUPAC Physical and Biophysical Chemistry Division. The competition was prompted by a successful student chemistry cartoon competition run by the division during the International Year of Chemistry 2011.<sup>3</sup>



by Gracile Roxas



by Rahul Chakraborty



by Jenna Billbrey



by Liwah Keller

1. <http://www.iupac.org/news/news-detail/article/pchem-cartoon13.html>
2. <http://www.iupac.org/news/news-detail/article/student-physical-chemistry-cartoon-competition-2013-prizewinners.html>
3. [http://www.iupac.org/publications/ci/2011/3306/6\\_1yc\\_cartoons.html](http://www.iupac.org/publications/ci/2011/3306/6_1yc_cartoons.html)



## Future Energy

As a result of the interest shown in the first edition of *Future Energy*, (project 2007-015-2-100, published in 2008 by Elsevier; ISBN 13: 978-0-08-054808-1) and because the subject has expanded enormously with new developments in traditional fields and new approaches in emerging technologies, a new edition is being produced with 31 chapters as opposed to the 20 chapters in the first edition. The new edition has chapters devoted to hydraulic fracturing, coal-bed methane, liquid natural gas as a transport fuel, lithium ion batteries, hydrogen as an energy carrier, carbon dioxide capture and sequestration, energy storage systems, environmental impacts of energy production, distribution and transport, smart grids, energy resources in developing countries, the transition to future energy, and the energy options and predictions in China. Singled out as it is the most rapidly developing super power, China will soon produce more energy than any other country if its development continues at its present rate.

The book looks at all types of energy that may be used in the future and not just the sustainable types such as solar, wind, tidal, and wave energy. Fossil fuel in all its forms, from coal, oil, methane gas, and even methane hydrates, is very much part of this book as these energy sources will be with us for many decades before we have expanded and developed renewable energy sources, built new nuclear fission plants, or possibly even developed new types of energy such as nuclear fission.

This book, like the first edition, is intended give the reader a reasonable, logical, and correct understanding of our future use of energy. The final decision as to which energy options should be developed in a country or region must take into account sustainability, the general safety and health of the general public, the overall energy requirements of society, the geographical position of each region, and above all, the alarming rise in atmospheric carbon dioxide over the past 50 years, which threatens to change the world's climate through global warming.

The first edition of this book had its origins in the committee meetings of the International Association of Chemical Thermodynamics, an organization affiliated with IUPAC. The book is supported by IUPAC through its Physical and Biophysical Chemistry Division.

IUPAC's adherence to the International System of Quantities is reflected in the use of SI Units throughout the book, although other units that may be more familiar to specific areas are included, usually in

parentheses. The index notation is used to remove any ambiguities (e.g., billion and trillion are written as  $10^9$  and  $10^{12}$  respectively). To further remove any ambiguities, the concept of the quantity "calculus" is used.

This volume is unique in this genre of books because each chapter is written by an expert, scientist or engineer, working in the field. Authors were chosen for their expertise in their respective fields from 19 countries: Belgium, Brazil, Canada, China, England, Finland, France, Germany, The Netherlands, India, Ireland, Italy, Japan, Luxembourg, Korea, Norway, Scotland, South Africa, and the USA.

The book is divided into eight sections:

- Introduction
- Fossil Fuels (energy sources)
- Nuclear Power (energy sources)
- Transport Energy (energy sources)
- Transport Energy (energy storage)
- Renewable Energy (energy sources)
- New Possible Energy Options
- Environmental and Related Issues

A vital concern is what is to be done when it appears that politicians deliberately misunderstand, and corporations deliberately ignore, the realities of finite fuel sources and our changing climate? The solution lies not in the realm of new technologies but in the area of geopolitics and social-political actions. As educators we believe that only a sustained grassroots movement to educate citizens, politicians and corporate leaders of the world, has any hope of success. There are such movements, but they are slow in making headway. This book is part of that education process. It presents a non-political and unemotional set of energy options for readers to consider and arrive at sensible solutions to the problems facing the world today.

The book will be published and available early in 2014.

For more information, contact Trevor Letcher <[trevor@letcher.eclipse.co.uk](mailto:trevor@letcher.eclipse.co.uk)>.

 [www.iupac.org/project/2012-041-1-100](http://www.iupac.org/project/2012-041-1-100)



### Recommendations for Isotopic Data in Geosciences

The joint task group of the International Union of Geological Sciences (IUGS) and IUPAC on 'Recommendations for Isotopic Data in Geosciences' issues its final report (IUPAC project 2006-016-1-200). In the process of evaluating data and making recommendations on the decay constants (radioactive half-lives) of isotopes of interest to the geochronology community, the task group first had to deal with the problem of the definition of the year as the unit of time most appropriate for very-long-lived nuclides. This work effort was published<sup>1</sup> in *Pure Applied Chemistry* in 2011. This publication has led to communications with representatives of the SUNAMCO committee of the International Union of Pure and Applied Physics (IUPAP), Stephan Lea, the International Bureau of Weights and Measures (BIPM), Felicitas Arias and the International Astronomical Union (IAU), Nicole Capitaine. These communications are still intermittently ongoing.

After this extended delay, work began on the major effort of the project. The task group has evaluated the published measurement results for the decay constants (half-lives) of <sup>87</sup>Rb, <sup>235</sup>U and <sup>324</sup>U. A significant part of the evaluation was the effort to follow strict metrological criteria VIM<sup>2</sup> in the assessment of the measurement uncertainties according to GUM.<sup>3</sup>

The <sup>87</sup>Rb half life has been estimated by three groups using totally independent approaches. Kossert<sup>4</sup> determined the specific activity of <sup>87</sup>Rb salts by liquid scintillation counting. This approach assumes that inter-sample variations are due to stoichiometry. Nebel<sup>5</sup> compared Rb-Sr and U-Pb ages of co-genetic minerals. This approach assumes that certain natural samples behave "ideally" (i.e., all the relevant ages are expected a priori to be equal and relies on control on the samples' petrology). Rotenberg<sup>6</sup> measured the radiogenic <sup>87</sup>Sr accumulated in a batch of Sr-free Rb salt over 35 years. This approach relies on having performed precise and accurate measurements on the concentration and isotopic composition of the Sr present in the RbClO<sub>4</sub> at the time of crystallization. The three sets of experiments yield indistinguishable results, which is a good indication that

systematic biases were either coincidentally of the same magnitude and direction in these radically different experimental designs, or negligible after accurate corrections. The resulting best estimates for the <sup>87</sup>Rb decay constant and the radioactive half life values are  $\lambda_{87} = (1.395 \pm 0.002) \times 10^{-11} \text{ a}^{-1}$  (1s uncertainty) and  $t_{1/2} = 49.7 \pm 0.1 \text{ Ga}$ , which is a preliminary estimate and data will be finalized in a follow-on project.

The U half life has been the focus of recent intense research. Following the counting experiments by Jaffey,<sup>7</sup> which yielded the U half life still deemed reliable, albeit with a higher uncertainty, the endeavor in the geo-chronological community (Schoene,<sup>8</sup> and Mattinson<sup>9</sup>) moved to determining the U half life indirectly, based on U-Pb dating of single crystals of zircon (natural ZrSiO<sub>4</sub>). The approach is based on the assumption that certain natural samples behave "ideally" (i.e., their <sup>238</sup>U-<sup>206</sup>Pb and <sup>235</sup>U-<sup>207</sup>Pb ages [hereafter  $t_{206}$  and  $t_{207}$ , respectively] are expected a priori to be equal). However, in current practice only the concentration  $N(^{238}\text{U})$  is measured at present and the concentration  $N(^{235}\text{U})$  is calculated assuming a constant number ratio,  $\eta = N(^{238}\text{U})/N(^{235}\text{U}) = 137.88$ . Recent reports on  $\eta$  measurements in the same zircon samples used for geo-chronology (Heiss<sup>10</sup>) indicate an individually variable number ratio, on average lower by  $(0.031 \pm 0.011) \%$  relative to the assumption that  $\eta = 137.88$ . Moreover, some workers reported a mass-independent fractionation of incompletely understood origin that affects odd- and even- mass isotopes in a different way (Amelin<sup>11</sup>). From these results, the task group calculated a provisional value for the <sup>235</sup>U half life of  $(703.41 \pm 0.19) \text{ Ma}$  (1s uncertainty), corresponding to  $\lambda_{235} = (0.98540 \pm 0.00027) \text{ Ga}^{-1}$ .

The U half life (Cheng<sup>12</sup>) was obtained following strict material traceability protocols and had the explicit goal of ensuring the radioactive equilibrium of natural samples. The  $\eta$  number ratios of the NBS CRM 112a and U-500 reference materials that they used as spike and detector calibrators were subsequently revised (Condon<sup>13</sup>). In particular, recalculating  $\eta$  in Cheng's spike, using Condon's revised  $\eta$  for U-500 also accounts for a shift in the  $\eta$  for NBS CRM 112a. As a consequence, the preliminary half life estimate for <sup>234</sup>U is modified by + 0.07 % to  $(245.44 \pm 0.16) \text{ ka}$  (1s uncertainty), corresponding to  $\lambda_{234} = (2.8241 \pm 0.0018) \text{ Ma}^{-1}$ .

## The Project Place

Again the data will be finalized in a follow-on project.

Preliminary results on uranium were presented in 2011<sup>14</sup> and on uranium and rubidium in 2012.<sup>15</sup>

This constitutes the final report of this project of the joint IUGS-IUPAC task group. Further support for this work will be requested via a new IUPAC project. The Executive Board of the IUGS, at its February 2013 meeting in Paris, agreed to continue funding the IUGS members of the task group for this international effort.

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 [www.iupac.org/project/2006-016-1-200](http://www.iupac.org/project/2006-016-1-200)

## UNESCO/IUPAC Postgraduate Course in Polymer Science

The 17th edition of the UNESCO/IUPAC Postgraduate Course in Polymer Science has been in progress since October 2012 and will be concluded by a final seminar in July 2013 within the scope of the workshop Careers in Polymers V. Twelve students from the following countries have been attending the course: Bulgaria, Poland, Russia, Ukraine, and Vietnam. In March 2013, the midterm seminar was held at which the students reported on the results of their research projects. More than half of the projects are likely to result in publication in international journals or in communications at meetings.

Preparations for the 18th Course are in the final stages. Out of the large number of applicants, 13 have been nominated from Croatia, Mongolia, Poland, Russia, Ukraine, and Vietnam. The course will start in October 2013 and will conclude in July 2014.

As of January 2013, the cumulative results of the 17 editions of the course held so far are as follows: 138 graduates, 20 nationalities, 285 publications in international journals, 329 communications at international meetings, more than 4500 citations. From this experience, the course organizers are able to draw a few generalizing conclusions:

1. The Course has become a global activity. Students from all continents except Australia and North America have graduated.
2. The average publication output is more than two papers in an impacted journal, two conference communications, and about 35 citations per graduate. Of course, the distribution of scientometric hits per individual is very non-uniform.
3. In several cases, a productive long-term cooperation has developed between the Institute and the graduate's mother institution.
4. In the last seven years, 20 graduates became doctoral students at Czech universities.
5. Graduation from the Course often enhances professional promotion in the home countries of the graduates.
6. The Course contributes to a positive image of IUPAC, both inside and outside the professional community.

For more information, contact Task Group Chair Pavel Kratochvíl <[krat@imc.cas.cz](mailto:krat@imc.cas.cz)>.

 [www.iupac.org/project/2011-052-1-400](http://www.iupac.org/project/2011-052-1-400)

## Bibliometric Analysis of Research on Secondary Organic Aerosols: A Science Citation Index Expanded-Based Analysis (IUPAC Technical Report)

Jinfeng Li, et al.

*Pure and Applied Chemistry*, 2013  
Vol. 85, No. 6, pp. 1241-1255

This study was conceived to evaluate the global scientific output of secondary organic aerosol research over the past 20 years and to assess the characteristics of the research patterns, tendencies, and methods in the papers. Data were based on the online version of Science Citation Index Expanded from 1992 to 2011. Publications referring to secondary organic aerosols were assessed by distribution of the number of publications and times cited, source categories, source journals, author keywords, KeyWords Plus, and the most cited publications in these years. By synthetic analysis of author keywords, KeyWords Plus, titles, and abstracts, it was concluded that modeling is currently—and will at least over the next decade continue to be—the predominant research method to validate state-of-the-art knowledge of secondary organic aerosols, and that the foci of such research will be the key precursors terpenes and isoprene, the mechanisms of oxidation and gas-phase reactions, and emission inventories.

 <http://dx.doi.org/10.1351/PAC-REP-12-08-09>

## Definitions of Terms Relating to Mass Spectrometry (IUPAC Recommendations 2013)

Kermit K. Murray, et al.

*Pure and Applied Chemistry*, 2013  
Vol. 85, No. 7, pp. 1515-1609

This document contains recommendations for terminology in mass spectrometry. Development of standard terms dates back to 1974 when the IUPAC Commission on Analytical Nomenclature issued recommendations on mass spectrometry terms and definitions. In 1978,

the IUPAC Commission on Molecular Structure and Spectroscopy updated and extended the recommendations and made further recommendations regarding symbols, acronyms, and abbreviations. The IUPAC Physical Chemistry Division Commission on Molecular Structure and Spectroscopy's Subcommittee on Mass Spectrometry revised the recommended terms in 1991 and appended terms relating to vacuum technology. Some additional terms related to tandem mass spectrometry were added in 1993 and accelerator mass spectrometry in 1994. Owing to the rapid expansion of the field in the intervening years, particularly in mass spectrometry of biomolecules, a further revision of the recommendations has become necessary. This document contains a comprehensive revision of mass spectrometry terminology that represents the current consensus of the mass spectrometry community.

 <http://dx.doi.org/10.1351/PAC-REC-06-04-06>

## Definition of the Halogen Bond (IUPAC Recommendations 2013)

Gautam R. Desiraju, et al.

*Pure and Applied Chemistry*, 2013  
Vol. 85, No. 8, pp. 1711-1713

This recommendation proposes a definition for the term “halogen bond”, which designates a specific subset of the inter- and intramolecular interactions involving a halogen atom in a molecular entity.

A halogen bond occurs when there is evidence of a net attractive interaction between an electrophilic region associated with a halogen atom in a molecular entity and a nucleophilic region in another, or the same, molecular entity. A typical halogen bond is denoted by the three dots in R-X...Y.

 <http://dx.doi.org/10.1351/PAC-REC-12-05-10>

## Practical Studies for Medicinal Chemistry—An Integrating Approach for Developing Countries

Edited by Antonio Monge and C. Robin Ganellin

Coordinated by Rosa Cattana

Published in 2011 by Universidad Nacional de Rio Cuarto, Rio Cuarto, Argentina

ISBN 978-950-665-570-9

reviewed by Paul Erhardt

Every once in a while, we are blessed by the arrival of a seemingly ordinary book that upon purview of just its first few pages, quickly turns into a “must read.” *Practical Studies for Medicinal Chemistry* is one of these books. Although written with Latin America and less-developed countries in mind, its broad appeal immediately becomes clear. All experiments are conveyed in English, with most also translated into Spanish or Portuguese. But beyond this universal readability, it is the book’s high potential to impact favorably upon education within the field of medicinal chemistry that truly causes it to shine so brightly. Historically, medicinal chemistry has relied upon chemistry courses to expose its budding practitioners to laboratory experiences. Thus, this book represents a first of its kind by its provision of exercises that are representative of medicinal chemistry and often interdisciplinary in nature. Furthermore, it arrives at a time when health science education in general has come to focus more on categorization of its exploding informational base rather than on the rigors of quantifying its long-standing, fundamental principles. Thus, this book also represents a breadth of fresh air as it goes “back to [firmly establish the credentials that will always remain critical for practitioners of medicinal chemistry into] the future.”

A total of 41 exercises are arranged in 6 chapters: I. Physicochemical Properties; II. Quantitative Structure-Activity Relationships; III. Molecular Modeling; IV. Toxicity Studies; V. Drug Synthesis; and, VI. Natural Products. These practical experiments in medicinal chemistry do not require expensive starting materials and generally depend only upon low-cost instrumentation. They have been provided by university researchers from 10 countries and are accompanied by statements pertaining to appropriate safety precautions. Some of the exercises are preceded by excellent general lectures of the topic across several pages of text, while all are adequate in their succinct experimental details and referenced descriptions of the concepts and equations associated with the basic principles that are being

investigated. Although it is beyond the scope of this review to describe all of the exercises, I am compelled to convey a few of my own favorites while also covering at least one that is representative of each chapter.

The 12 experiments in Chapter I cover the gamut from drug: Dissolution; Lipophilicity; Solvent Effects; Inter- and Intra-Molecular Interactions; Aggregation; Ionization in Relationship to pKa/pH; Free Radicals and Antioxidants; Tautomers; and, Enantiomers and Diastereomeric Relationships. The importance of these parameters on a drug’s ADME profile, as well as toward efficacy, is repeatedly emphasized across these studies. One of my favorites was Exercise I.2 Determination of Lipophilicity Substituent Constants of Sulfonamides by Means of Reversed Phase Thin-Layer Chromatography wherein the basic principles behind partition coefficients and  $\pi$  values are delineated while conducting normal and reversed phase TLC experiments. I should add that because of the practical description provided in this experiment, my labs are now making our own reversed phase plates rather than purchasing them from commercial suppliers, and we are more frequently trying them rather than relegating this veritable technique to a last resort attempt at achieving useful separations. And, finally for Chapter I, who could not like Exercise I.9 Determination of Specific Optical Rotation of Naproxen and its Sodium Salt to learn this fundamental technique for specifying compounds having asymmetric centers, while driving home the lesson that one must be very cautious about predicting optical rotation based upon structural similarity (the rotation for the eutomer of naproxen as its acid is +66° whereas that for its sodium salt is -11°).

As their titles imply, Chapters II (with 4 sections) and III (with 5 exercises), cover SAR in a quantitative and modeling capacity, respectively. Within Chapter II, the first section is instead an excellent lecture that serves as an introduction for both chapters. The remaining three sections provide useful exercises involving multivariable correlations that require basic statistical programs; with the last additionally providing a nice introductory lecture and exercise about SPARTAN software. Chapter III likewise begins with an excellent introductory lecture that utilizes the estrogen receptor as a case study and then moves on to exercises involving ChemDraw and Chem3D. Each of the next three sections begin with an excellent lecture and then provide exercises involving: III.2 Molecular Modeling Pro and Chem Site; III.3 PC Model; and, III.4 The Protein Data Bank and Protein Explorer. Given the increasing flow of biology collaborators who approach our own Center for Drug Design





and Development with a protein “target-wannabe” in hand and in need of small molecule ligands to probe for its therapeutic utility, I found section III.4 to be extremely relevant for today’s cutting-edge trends in target identification and validation wherein medicinal chemistry can play a pivotal role at this very early and critical stage of the overall process of drug discovery. Thus, III.4 was my obvious favorite across these two chapters. The final section, III.5, provides a practical QSAR exercise of curve fitting between pKa and electronic parameters for a series of phenols.

Chapter IV contains three exercises directed toward better appreciating drug toxicity. These encompass: IV.1 Perturbation of phospholipid bilayers assessed by X-ray diffraction, and of erythrocytes assessed by scanning electron microscopy (SEM); IV.2 Redox properties assessed by the MTT Assay, ELISA plate reading techniques and use of inverted microscopy (IM); and lastly, IV.3 Perturbation of the cell cycle using a colony-forming assay assessed by IM techniques. All of these experiments represent useful exposures for a medicinal chemist so as to further appreciate the associated principles, and to have a better dialogue with other investigators who have specialized in this important aspect of the drug discovery process. In addition, because this chapter flows immediately from the preceding two chapters, it should become clear to a student reader that beyond the pursuit of efficacy, there is a whole world of structure-toxicity relationships (STRs) that need to be explored and elaborated, and that at least some of the tools for that meritorious endeavor have just been laid-out for them.

Chapter V contains 11 exercises directed toward drug synthesis: Sulfasalazine (1 step); Sulfanilamide derivative (3 steps) and Reissert derivative from 6-Nitroquinolone (1 step); Latentiated derivative of Sulfathiazole (1 step); Propranolol (2 steps); Benzodiazepines (2 exercises involving first isolation and identification, and then quantification); Amino Acid derived small molecule Peptidomimetics (3 derivatives using parallel synthesis across 5 steps); Raloxifene (3 step convergent synthesis); Antihistamines (identification); Aspirin (1 step); Chalcones (11 derivatives using 1 step parallel synthesis). The composite of these experiments exposes students to a variety of synthetic strategies, reactions and reaction setups, workups and purification methods including to my own delight the veritable technique of crystallization, and finally, product characterization and quantification. All experiments are done having a drug theme in mind with the last exercise, in particular, culminating in a QSAR study where measured rela-

tive lipophilicity (TLC) is plotted versus MCF-7 cancer cell testing data (the latter being provided as a table of data for the student). One of my favorites was the latentiated analog experiment because it presented itself as an interesting twist on the prodrug theme wherein the latter in this case PREVENTS absorption so as to allow slow release for this intestinal antiseptic within the desired GI compartment. I also enjoyed the convergent synthesis and its product purification by crystallization, as well as the final parallel synthesis exercise that became coupled to a QSAR study.

Finally, chapter VI contains six exercises directed toward natural products: Extraction, purification, and derivatization of Podophyllotoxin; Solvatochromic studies of Coumarins; Antioxidant activities of polyphenolic compounds; Antioxidant activities in essential oils relative to levels of menthol determined by extraction; Extraction of Rutin; and, Analysis of Flavonoids in plants. These experiments cover a wide range of techniques such as: Extraction including solid-phase; Partitioning and solvent effects; TLC, column chromatography and HPLC; Derivatization; and, Structural characterization including common instrumentation like UV-Vis and NMR. My favorite is the exercise emphasizing derivatization of podophyllotoxin wherein chemical manipulations are performed to help a chemical characterization, in this case an epimerization reaction, oxidation of an alcohol to a ketone, and preparation of a phenylhydrazone adduct.

Upon winding-down this “must read,” you’re actually left “wanting for” yet another experiment. Simply put, these exercises are truly that entertaining in dialogue, and meaningful as an educational experience. As I mentioned in several places, we have adopted several of them into our own programs, some as part of an advanced training lab for undergraduates and early graduate students in medicinal chemistry, and others as new protocols within our daily practice of synthetic medicinal chemistry research and drug discovery. Such personal adoption is, in itself, probably the best testimonial for this book that one can offer. For those who may not want to purchase a published hardcopy, “thanks” to IUPAC, this complete book has open access and is freely available on line at: [http://media.iupac.org/publications/cd/medicinal\\_chemistry](http://media.iupac.org/publications/cd/medicinal_chemistry).

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## Macromolecular Symposia

Recent volumes of *Macromolecular Symposia* include contributions from recent IUPAC-sponsored conferences. See MS online at [http://onlinelibrary.wiley.com/journal/10.1002/\(ISSN\)1521-3900](http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1521-3900).

### Macromolecular Complexes

*Macromolecular Symposia* Vol 317–318, August 2012  
edited by Vladimir Aseyev and Heikki Tenhu

This edition of *Macromolecular Symposia* includes presentations made at the 14th IUPAC International Symposium on Macromolecular Complexes MMC-14, organized 14–17 August 2011 in Helsinki.

Various aspects of the complexes between macromolecules and metals have been studied for several decades. Mechanisms of the complex formation, as well as the structures of the complexes are an important research problem as such, but detailed knowledge of all these factors is needed for applications of the materials as catalysts, photoactive and electrically conducting materials. Macromolecular complexes are promising materials for high-performance energy devices. There are several examples of the use of macromolecular metal complexes in cancer therapy. Because macromolecules may be tailored to contain several functionalities they may be used to bind various toxic metals or organic substances from water. Owing to the remarkable advances in the methods of polymer synthesis, functional polymers can be used in advanced applications such as controlled drug delivery or delivery of active substances, from magnetic nanoparticles to human growth factor.

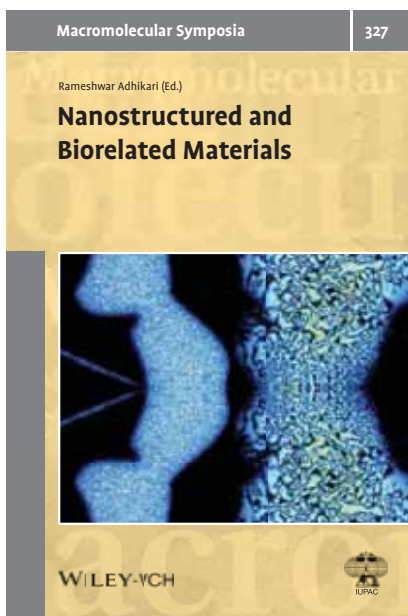
 <http://dx.doi.org/10.1002/masy.201290020>

### Ionic Polymerization

*Macromolecular Symposia* Vol 323, January 2013  
edited by Goy Teck Lim

This edition of *Macromolecular Symposia* collects 10 of the keynote and invited lectures presented at IP'11. These invited papers, authored by the leading researchers in the field of ionic (anionic and cationic) and radical polymerization, present research related to reaction control, reaction kinetics, chain functionalization, polymer morphology, and material characterization. The “International Symposium on Ionic Polymerization” (IP'11) was held 10–15 July 2011 in Akron, Ohio, USA.

 <http://dx.doi.org/10.1002/masy.201370001>



### Nanostructured and Biorelated Materials

*Macromolecular Symposia*  
Vol 327, May 2013  
edited by Rameshwar Adhikari

This special issue of *Macromolecular Symposia* is devoted to new series of international conferences to be organized biannually in Kathmandu under the banner of “Kathmandu Symposia on Advanced Materials.” KaSAM-2012 was held 9–12 May 2012 and hosted by the Nepal Polymer Institute (NPI) in association with Tribhuvan University, Kathmandu; Kathmandu University, Kavre and Université de Rouen, Rouen (France) under the sponsorship of

IUPAC. The conference series is aimed at strengthening the relationships among materials scientists from South Asian countries and the rest of the world. With the motto “CrossLinking Science and Virtues,” KaSAM has the goal of promoting education and research in advanced materials in Nepal, with a particular focus on applied nanoscience and nanotechnology.

For a report on KaSAM 2012, see [www.iupac.org/publications/ci/2013/3502/cc5\\_090512.html](http://www.iupac.org/publications/ci/2013/3502/cc5_090512.html).

 <http://dx.doi.org/10.1002/masy.201370014>

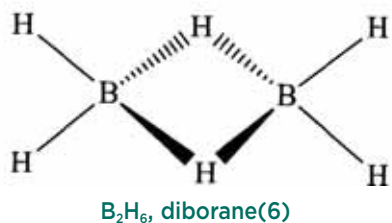
## The Special Case of Boron Hydrides

by Jeffery Leigh

When writing down chemical structures, chemists feel happiest if they can depict how atoms are arranged in space and join them together appropriately with lines, each of which represents a two-electron bond. Unfortunately, though this type of model is adequate for many structures and compounds, it is not true for all. Organic chemists have developed methods that allow for the fact that aromatic compounds are not always adequately represented by names and structure based solely upon two-center two-electron bonds, and inorganic chemists have faced similar problems with certain classes of inorganic compound, such as boron hydrides. This edition of *Principles* carries a completely new chapter devoted to such compounds.

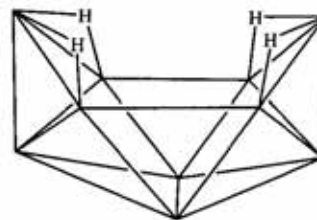
Like aromatic rings, boron hydrides are often not satisfactorily represented by structures consisting solely of two-center electron-pair bonds, though Nature still aims for full shells. The simplest boron hydride,  $B_2H_6$ , contains 12 valence electrons, and formally four pairs are localized in two-electron B-H bonds, with a further four in two three-center two-electron B-H-B bonds, as in example (a). The complete name specifies both the number of boron atoms and the number of hydrogen atoms, which differs from organic practice, which assumes that the number of hydrogen atoms in the carbon analog of diborane would be obvious.

### Example (a)



This method is extended to other boron hydrides as shown in example (b). All the apices represent B-H groups, and four three-center B-H-B bonds are designated. The name specifies the number of hydrogen atoms. In general, the polyboranes adopt the conformations of triangulated polyhedra, each of which has its own numbering convention.

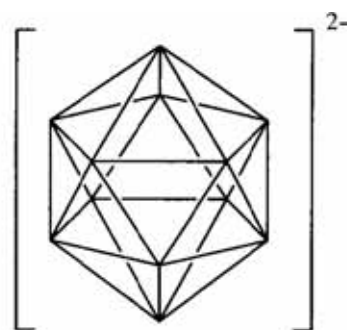
### Example (b)



$B_{10}H_{14}$ , decaborane(14)

These polyboranes may formally lose hydrons to yield anions, of which Example (c) is typical.

### Example (c)

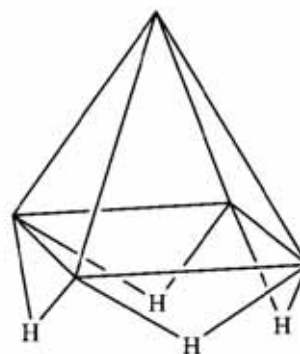


$[B_{12}H_{12}]^{2-}$ , dodecahydridododecaborate(2-)

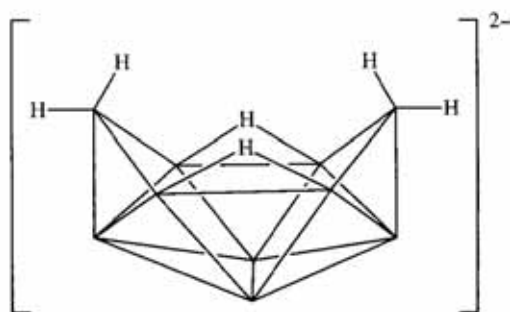
Note that in this particular case, there are no bridging hydrogen atoms, and the number of hydrogen atoms is specified in the name.

The variations chemists can produce in these materials generate a wide range of different structures. A neutral borane can lose a one or two boron hydrides to yield so-called *nido* and *arachno* structures as depicted in example (d).

### Example (d)



*nido*- $B_5H_9$ , *nido*-pentaborane(9)

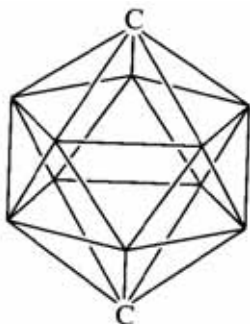


*arachno*-[B<sub>10</sub>H<sub>14</sub>]<sup>2-</sup>, tetradecahydro-*arachno*-decaborate(2-)

In addition to these variations, hydrogen atoms may be substituted. The names of resultant products must contain locants to specify at which skeletal positions substitutions have occurred.

Skeletal boron atoms may also be replaced by other atoms, operations termed subrogations by many boron chemists, yielding materials of which example (e) is an instance. There is an exo hydrogen atom, not shown, attached to each apical atom, carbon as well as boron.

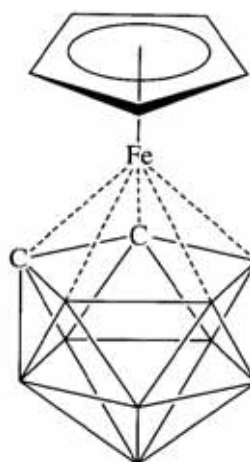
Example (e)



*closo*-1,12-C<sub>2</sub>B<sub>10</sub>H<sub>12</sub>, 1,12-dicarba-*closo*-dodecaborane(12)

Finally, the boranes may be considered to be similar to electronic delocalized aromatic systems, and like benzene and related derivatives they can also form sandwich compounds, as shown in example (f).

Example (f)



3-( $\eta^5$ -C<sub>5</sub>H<sub>5</sub>-*closo*-1,2,3-C<sub>2</sub>FeB<sub>9</sub>H<sub>11</sub>,  
3-( $\eta^5$ -cyclopentadienyl)-1,2-dicarba-3-ferra-*closo*-  
dodecaborane

Sometimes all these variations may occur in the same structure, so that considerable care is required in determining the appropriate parent borane and the number of hydrogen atoms. Example (f) is derived from a parent dodecaborane, although there are only nine boron atoms in the actual structure, the three other apical positions being occupied by an iron atom and two carbon atoms. Consequently, an accurate structural diagram and the corresponding name can be rather large and complex. *Principles* summarizes all these structural types and the appropriate methods for naming them, together with references to the original literature.

Jeffery Leigh is the editor and contributing author of *Principles of Chemical Nomenclature—A Guide to IUPAC Recommendations*, 2011 Edition (RSC 2011, ISBN 978-1-84973-007-5). Leigh is emeritus professor at the University of Sussex and has been active in IUPAC nomenclature since 1973.

 [www.iupac.org/publications/ci/indexes/nomenclature-notes.html](http://www.iupac.org/publications/ci/indexes/nomenclature-notes.html)

# Feature Articles Wanted

Contact the editor for more information at <edit.ci@iupac.org>.



# Conference Call

## Environmental and Development Conference in Kenya

by Joseph O. Lalah, John Unsworth,  
Paul Njiru, and Hesbon Nyagowa

Kenya has put in place a national long-term development blueprint, "Vision 2030," to create a globally competitive and prosperous nation with a high quality of life and a clean and secure environment. The country is currently experiencing rapid growth in its population and its economy, including agriculture, industries, and infrastructure, which in turn are leading to increased exploitation of natural resources such as energy and water. In order to address issues of sustainable development, a conference entitled **Linking Environmental Research to Kenya's Development Agenda and Vision 2030** was held 9–12 April 2013 in Nairobi. Organized by J.O. Lalah, P. Njiru, and H. Nyagowa of the Technical University of Kenya, the conference attracted 90 delegates, including seven participants from outside of Kenya. It was organized in conjunction with the Alexander von Humboldt Foundation and with support from IUPAC and the German Academic Exchange Service. The program included keynote presentations and five simultaneous technical sessions dealing with environmental and human health, environmental conservation and technologies, environmental monitoring and impact assessment, industry and water, and all other topics.

The objective of the conference was to bring together key researchers and stakeholders involved in environmental research and management in the east African region to review the current status of environmental research, monitoring, and capacity in Kenya as they pertain to "Vision 2030." Keynote presentations were made by the vice chancellor of the Technical University of Kenya, Ing. Francis Aduol, who also officially opened the conference, and representatives and CEOs of the Kenyan government from various ministries and parastatals, including the Ministries of Energy, Higher Education Science and Technology and Environment and Mineral Resources, the Kenya Bureau of Standards, the National Environment Management Authority, The Kenya Vision 2030, Multimedia University, Technical University of Kenya, the National Biosafety Authority, and the Institute of Climate Change of the University of Nairobi. These presentations focused on the state of environmental research and technology in Kenya and also looked at what is needed to ensure that the current progress is maintained in protecting the environment and health, particularly in the areas of agriculture, education, communications, environmental pollution, and waste management.

Other topics that were covered included potential areas of student funding and cooperation, the role of the Kenyan Bureau of Standards and the National Environment Management Authority, the relevant statutes pertaining to environmental laws, conventional and alternative energies, electronic technologies, water treatment and management, GMO

foods, and the possible effects of climate change. Invited speakers also gave general presentations on "Environmental Chemistry, Industrial Progress and Sustainability for Societal Development" (H. Frank, University of Bayreuth, Germany); "Molecular Exposomics: Status, Perspectives and Challenges" (K-W. Schramm-Helmholtz Zentrum, Munich, Germany); "Organic and Inorganic Trace Contaminants in Water: Analysis, Existing and Advanced Technologies" (S. Küppers, Forschungszentrum Jülich, Germany); and



"Pesticides: Exploring their Risks and Benefits" (J. B. Unsworth, Chelmsford, UK). The Alexander von Humboldt Foundation and DAAD were represented by Thomas Scheidtweiler (head of division for Africa and Middle East) and Jutta Quade (deputy director, DAAD Regional Office for Africa), respectively. IUPAC was represented by John B. Unsworth (chair, IUPAC Advisory Committee on Crop Protection Chemistry).

Overall, participants indicated that the conference was very successful and met most of its objectives. In particular, the conference provided an opportunity for many young scientists drawn mainly from the public universities, Kenya Agricultural Research Institute and Kenya Industrial Research and Development Institute, to listen to the keynote presentations and present their research work.

For further information on the conference, consult Prof. J.O. Lalah (lalahjoseph@yahoo.com), Dr. P. Njiru (njirupaul@gmail.com) or Dr. H. Nyagowa (nyagowa\_hesbon@yahoo.co.uk).

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## Plant Protection Chemistry in China and the Asian Pacific Region

*by Wenlin Chen, John Unsworth, and He Xiongkui*

The **8th IUPAC International Workshop on Crop Protection Chemistry and Regulatory Harmonization** was held jointly with the 4th China International Symposium on Pesticide and Environmental Safety and the 5th Japan Pan-Pacific Conference on Pesticide Chemistry in Beijing, China, 15-20 September 2012. This was the second time that the IUPAC workshop was held in Beijing; the first was in 2007. Over 600 researchers of pesticide science, students, and business and government representatives from 30 countries attended the triple, joint meeting, making it the largest conference on plant protection chemistry ever held in the country.

The large gathering provided a unique forum for scientists, technologists, and regulators to exchange and discuss the latest developments and future needs in plant protection chemistry, safety evaluation, and regulatory harmonization amid the rapid expansion in global trade of agricultural commodities and the increasing demands for greater food safety in the region. More than 300 papers were presented and published in the proceedings of the conference,<sup>1</sup> including

8 plenary presentations, 177 session speeches, and 150 posters covering topics from product discovery, application technologies, safety assessment, and global regulatory harmonization.

The joint meeting was organized by the Beijing Pesticide Society, IUPAC Division of Chemistry and the Environment, Pesticide Science Society of Japan, China Agricultural University, and Institute for the Control of Agrochemicals of the Ministry of Agriculture, China. Financial sponsorship and support were received from the Ministry of Education, China Association for Science and Technology, China National Science Foundation, Beijing National Science Foundation, IUPAC, and business and industrial organizations. The joint conference was co-chaired by Zhang Zhongning, president of BPS and Institute of Zoology of Chinese Academy of Sciences; John Unsworth, chair of the IUPAC Advisory Committee for Plant Protection Chemistry; and Hiroshi Matsumoto, president of PSSJ and Nagoya University. IUPAC contributions were coordinated by John Unsworth, Wenlin Chen, Ken Racke, and Laura McConnell. Local leadership to the organizing team was provided by He Xiongkui, professor and director of the Research Center for Pesticide Application Technologies of CAU.

Scientific presentations were organized around six major topics briefly summarized below.

### Global Views and Harmonized Approaches to Regulation

Globally harmonized regulatory approaches for crop protection chemicals are becoming more critical as international trade becomes more interconnected. Lois Rossi of the U.S. Environmental Protection Agency reviewed current efforts to conduct global, joint reviews of pesticide active ingredients, with examples from the NAFTA and OECD countries, and from the broader collaboration within the Codex Committee on Pesticide Residues. Rossi emphasized the importance of global collaboration for efficient regulation, when global information can be shared to inform safety assessments for a local regulatory decision such as to align maximum residue limits (MRLs). From the perspective of China, Gu Baogen, deputy director of ICAMA shared the progress China has made in adapting MRLs and refining the country's pesticide registration and management systems, using more science-based approaches and effective farmer training to safeguard safety and meet product manufacturing standards for both domestic use and exports. Ken Racke of Dow AgroSciences presented a set of universally applicable regulatory principles such that regulation

## Conference Call

“should provide incentives for innovation but also safeguard against unacceptable risks.” Representatives from Japan, Thailand, and many other countries shared their views, ideas and practices in adapting globally harmonized regulatory approaches such as GLP management and mutual acceptance of data.

### Residues in Food and International Trade Standards

A very rich set of session speeches and posters were devoted to the food residue and international trade standard symposium. Scientists and regulatory practitioners from many different countries gathered to deliver a total of 46 presentations covering residue analytical methodology, regulation of consumer safety, chiral pesticide residues, trade standards on food quality, MRLs, and mutual acceptance of data.

### Environmental Fate, Exposure Modeling, and Risk Assessment

Research on the fate and transport of plant protection chemistry in the environment has elevated the predictive capability for new products, as presented in the plenary speech by James N. Seiber of the University of California-Davis. Examples were given to illustrate new methods for measuring air and deposition samples of rainfall, fog water, and the mass exchange processes on the soil and plant surfaces. John B. Unsworth described the best use of the internet as a global information resource for crop protection chemistry and introduced the recently developed IUPAC web site (<http://pesticides.iupac.org>), which covers a wide range of technical and regulatory topics, including a comprehensive database containing records for about 1800 active ingredients and metabolites. A total of 53 presentations were delivered to the session, with topics covering fate and exposure studies and modeling in the air, water, soil and sediments; ecological effects on various species; human risk assessment; environmental residue analytical methods; and mitigation/remediation approaches.

### Pesticide Quality, Formulation and Application Technologies

Andrew Landers of Cornell University presented the challenges and opportunities in pesticide application technology development, such as precision farming with in-field sensors and GPS and better-designed sprayers and improved operator training to meet the increasing demand for food on less land while conserving the environment. A total of 46 presentations were contributed to this session covering standards

and regulations on application equipment, precision chemical application technologies, new equipment development, and new formulations.

### New Pesticide Discovery and Synthesis

On new product discovery, Toshio Fujita, world-renowned scientist and professor emeritus of Kyoto University, delivered a stimulating overview of the fundamental research on quantitative structure-activity relationship and his own groundbreaking studies of the past half century, and its application to targeted molecular design and future research.

President of East China University of Technology, Qian Xuhong, summarized the Chinese progress in research and development of novel green pesticides, using several examples of new molecule leads through fundamental approaches of chemo- and bio-informatics, molecular design, new modes of action, and target-based discovery. A total of 85 presentations were received by this symposium, covering natural product-based discovery, chemistry-based discovery, targeted molecular design, reduce risk pesticides/biopesticides, and new techniques and methodologies in discovery and synthesis.

### Mode of Action, Metabolism, and Resistance Mechanisms

Stephen O. Duke of USDA-ARS elaborated on the reason why the discovery of new herbicides appears to be declining over the last two decades and pointed out recent opportunities for new research due to the rapid development of resistance to glyphosate and other older chemistry. Advancements in biotechnology and genomics were reviewed that are expected to aid new product discoveries and commercialization in the next decade. A total of 44 presentations were contributed to this session, covering mode of action, mechanism of resistance, and methods and approaches for model of action discovery.

### Outcomes and Conclusions

At the conclusion of the conference, several awards were presented. Lois Rossi of the U.S. EPA received the prestigious 2012 IUPAC International Award for Advances in Harmonized Approaches to Crop Protection Chemistry. This award recognizes her excellent leadership and outstanding contributions to international harmonization for the regulation of crop protection chemistry. The biennial award is administered by the IUPAC Advisory Committee on Crop Protection Chemistry. Other awards were presented

## Conference Call

for the best posters, excellent conference volunteers, and special contributors.

Tangible outcomes of the joint conference include the published *Proceedings of 4th International Symposium on Pesticide and Environmental Safety & 5th Japan Pan Pacific Conference on Pesticide Chemistry & 8th IUPAC International Workshop on Crop Protection Chemistry and Regulatory Harmonization* by China Agricultural University Press.<sup>1</sup>

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3. S. Jiang, K.D. Racke, *Proceedings of 3rd International Symposium on Pesticide and Environmental Safety & 7th IUPAC International Workshop on Crop Protection Chemistry and Regulatory Harmonization*. Beijing, China, 9-13 October 2007. China Agricultural University Press.

Wenlin Chen <wenlin.chen@syngenta.com> is a senior scientist at Syngenta Crop Protection, LLC, Greensboro, North Carolina, USA. John Unsworth <UnsworJo@aol.com> is an independent consultant, UK. He Xiongkui <xiongkui@cau.edu.cn> is a professor at the Centre for Chemicals Application Technology, China Agricultural University, Beijing.

## Organic and Biomolecular Chemistry 2012 Travel Highlights

by Mary Garson

The work of the IUPAC Organic and Biomolecular Chemistry Division (i.e., Division III) is centered on six subcommittees built around the themes of Organic Synthesis, Biomolecular Chemistry, Photochemistry, Green Chemistry, Structural and Mechanistic Chemistry, and Biotechnology. Their activities include organizing conferences that have become flagships of the division and generating projects on emerging topics within the ambit of IUPAC goals. Each of the confer-

ences that were organized in 2012 drew worldwide participants and included not only eminent speakers, but also young research students in large numbers. Many of the topics also broke down the barriers of chemistry, encompassing interdisciplinary areas such as chemical biology and materials science.

The **19th International Conference on Organic Synthesis** was held jointly with the 24th national meeting of the organic division of the Royal Australian Chemical Institute at the Melbourne Convention and Exhibition Centre (Australia) from 1-6 July 2012. There were close to 500 delegates drawn from over 15 countries.

Nobel laureate Ei-ichi Negishi (Purdue University, USA) opened the symposium with an overview of his research into palladium catalyzed cross-couplings in organic chemistry. There were 11 other plenary lectures (Peter Wipf, Antonio Echavarren, Daiwei Ma, Amos Smith, Ian Paterson, Tohru Fukuyama, John Hartwig, Ben Feringa, Janine Cossy [former Division III titular member], Huw Davies, and Brian Stoltz) plus 18 invited lectures (including Margaret Brimble, current titular member), 60 contributed lectures, and more than 250 posters. Stephen Pyne presented the Birch lecture of RACI, while Professor Melanie Sanford gave a lecture on C-H bond activation as the 11th recipient of the prestigious Thieme prize of IUPAC. The next meeting in the ICOS series will be held in Budapest from 29 June-4 July 2014. The co-chairs of the Organizing Committee are Péter Mátyus and János Wölfling.

The **24th International Symposium on Photochemistry** took place in Coimbra, Portugal, in the historical buildings of the University. (See Jan-Feb 2013 CI, p. 29; www.



*Division President Krishna Ganesh (3rd from left) with Nobel Laureate Ei-ichi Negishi (2nd from left) flanked by Martin Banwell and Tony Barrett at ICOS-19 (1st and 4th from left).*



## Conference Call

[iupac.org/publications/ci/2013/3501/cc3\\_150712.html](http://iupac.org/publications/ci/2013/3501/cc3_150712.html)) Photochemistry is nowadays employed in very different areas, such as new materials for medical applications, solar cells, photoremediation of contaminated water, photodynamic therapy, manipulation of nanostructures, mimicking of biofunctionality, restoration and conservation of art objects, and more. For all these applications, basic research and theoretical understanding is a prerequisite and that was well demonstrated in lectures such as the plenary by G. Scholes on “Quantum Mechanisms for Light Harvesting in Photosynthesis.” Other plenary lecturers were given by A. Harriman, B. L. Feringa, F. Scandola, G. Bazan, T. Majima, S. J. Formosinho and L. Arnaut (jointly), and V.W.W. Yam. The Porter medal was awarded to Tom J. Meyer (Univ. North Carolina at Chapel Hill) who gave an account on “ $\text{Ru}(\text{bipy})_3^{2+}$  and other remarkable MLCT states.”



*The Opening Ceremony at the XXIVth IUPAC Symposium on Photochemistry, Coimbra, Portugal.*

Among the 640 participants from 53 countries, there were many young scientists who either contributed short communications organized in three parallel sessions, or presented more than 400 posters. Several awards for oral or poster presentations were given to these young colleagues. A remarkable session was that on solar energy conversion, which included contributions on material science and engineering for solar energy conversion. Many contributions on nanoparticles, nanocrystallites and nanocomposites, and the application of novel techniques to monitor photochemical reactions in complex materials were presented. The symposium was inaugurated by fados beautifully sung by a Tuna from Coimbra and closed by a banquet at Quinta do Sobreiro, an impressive setting. The General Assembly of the European Photochemical Association and a meeting of the

IUPAC subcommittee were held during the symposium. The next IUPAC Symposium on Photochemistry is planned to be in Bordeaux (France) in July 2014; the scientific chair is Dario Bassani.

The **4th International IUPAC Conference on Green Chemistry** (4th ICGC) took place at Foz do Iguaçu, Brazil—whose falls are considered one of the seven natural wonders of the world—from 25-29 August, 2012. Organized under the auspices of IUPAC and the Brazilian Chemical Society, the conference had as its theme “Exchanging experiences towards a sustainable society taking care of natural resources in their socio-economic development” (See Mar-Apr 2013 *CI*, p. 32; [www.iupac.org/publications/ci/2013/3502/cc4\\_250812.html](http://www.iupac.org/publications/ci/2013/3502/cc4_250812.html)).

There were around 600 participants from up to 40 countries representing all areas of chemistry as well as academic, industrial, and government sectors. More than 35 sponsors from different governmental and industrial sectors supported the event. The 4th ICGC focused on topics such as benign synthesis/process, green chemistry for energy/production, chemicals from renewable resources, green engineering, education in green chemistry, and engineering and policy. Ten senior researchers and professionals of green chemistry presented plenary lectures: Paul Anastas, Pietro Tundo, Adelio Machado, James Clark, Jairton Dupont, Buxing Han, Rajender Varma, Anita Marsaioli, Roger Sheldon, and Robin Rogers. There were 15 invited lectures.

Apart from the lectures, roundtables, and two poster sessions (>300 posters), the book titled *Contribution from Brazilian Postgraduate Studies to*



*Pietro Tundo, past president of Division III, during his plenary lecture at ICGC4.*

## Conference Call

*Sustainable Development: CAPES at Rio +20* published by Coordination for the Improvement of Higher Education Personnel, was launched. There were four poster awards, one of which was sponsored by the Royal Society of Chemistry (UK). The next meeting in this series will be held in Durban, South Africa from 17–21 August 2014.

The growth of biomolecular chemistry in China, and the opportunity to join with the 8th International Symposium for Chinese Medicinal Chemists, led to the **9th International Symposium on Biomolecular Chemistry** (ISBOC9) held at the Beijing Conference Center in August 2012. Two Nobel Laureates crowned the scientific program. Ada Yonath (Weizmann Institute, Israel) delivered the opening lecture on her work on the structure and function of the ribosome that merited the Nobel Prize in 2009. Robert Huber (MPI for Biochemistry, München, Nobel Prize for Chemistry in 1988) opened the final day of the conference with a wide-ranging and authoritative description of the cell's molecular equipment for the destruction of proteins that have served their purpose: the proteasome. He showed how this work also is being applied to understanding the structures and mechanisms of these digestive machines and its application to new drug development.

Within the six parallel sessions, the ACS endorsed a MEDI symposium headed by a plenary lecture from Jon Clardy (Harvard Medical School) giving a description of the discovery of new biologically active compounds from bacteria. Plenary Lectures from Marv Caruthers, Vern Schramm, Shaomeng Wang, Pan-Chyr Yang, Zheng Yang, and Junying Yuan held the rapt attention of the audience and covered the full spectrum of biomedical science from bench to clinic, from cell death to drug discovery. Finally, He Chuan closed the conference with a stunning presentation of how the enzymatic methylation and demethylation of nucleic acids, both for chromosomal DNA and also for RNA, impact on human diseases, in part using a bisulfite deamination reaction discovered over forty years ago.

From an IUPAC standpoint, the tremendous success of this meeting was two fold. First, it harmoniously juxtaposed biomolecular and medicinal chemistry communities and activities in a seamless presentation of the awesome progress of these two different disciplines, and second, it delivered world leading research on these twin themes to a truly international audience, whose core was hundreds of young, enthusiastic, exuberant, indefatigable Chinese students.



*The ICPOC 21 logo was the minimal saddle trefoil, created by Carlo Séquin (U.C. Berkeley).*

The **21st International Conference on Physical Organic Chemistry** (ICPOC 21) was organized by the RSC Physical Organic Chemistry Group at the University of Durham from 9–13 September (see May–Jun 2013 *CI*, p. 29; [www.iupac.org/publications/ci/2013/3503/cc1\\_090912.html](http://www.iupac.org/publications/ci/2013/3503/cc1_090912.html)).

ICPOC-21 brought together the organic chemistry, catalysis and physical chemistry communities from academia and industry to discuss the current state of the art, the development and future of physical organic chemistry. The conference consisted of 9 plenary, 14 invited and many contributed lectures, as well as poster sessions. Although traditionally considered as the study of mechanism, reactivity, structure and binding in organic systems, especially leading to the quantitative, molecular level understanding of their properties, physical organic chemistry nowadays also encompasses a wider range of contexts (such as biology and materials) than ever before. Conference themes included Physical Underpinnings (dynamics in solution, scope and limitations of transition state theory, advances in reaction monitoring, new approaches to aromaticity), Mechanisms and Catalysis (homogenous and heterogenous, mechanistic enzymology) and Supramolecular/Systems/Non-covalent interactions (molecular self-assembly, gel-forming materials).

The **International Biotechnology Symposium** (IBS) and exhibition series is a premier international biotechnology event held every two years in different parts of the world. The 15th IBS was held 16–21 September 2012 in Daegu, Korea, and was hosted by The Korean Society

### Mark Your Division III Calendar

#### 20th International Conference on Organic Synthesis

29 June–4 July 2014, Budapest, Hungary  
[www.icos20.hu](http://www.icos20.hu)

#### XXVth Symposium on Photochemistry

13–18 July 2014, Bordeaux, France  
[www.photoiupac2014.fr](http://www.photoiupac2014.fr)

#### 5th International Conference on Green Chemistry

17–21 August 2014, Durban, South Africa  
[www.saci.co.za/greenchem2014](http://www.saci.co.za/greenchem2014)

#### 22nd International Conference on Physical Organic Chemistry

10–15 August 2014, Ottawa, Canada  
<http://events.science.uottawa.ca/icpoc22/welcome.html>

#### 16th International Conference on Biotechnology

14–19 September 2014, Fortaleza, Brazil  
<http://ibs2014.org>

for Biotechnology and Bioengineering and co-hosted by The Korean Institute of Chemical Engineers, The Korean Society for Microbiology and Biotechnology, Korean Society of Food Science and Technology, and The Pharmaceutical Society of Korea. The Committee Chair Yoon-Mo Koo and Secretary General Tai Hyun Park arranged a most successful conference. The symposium was attended by 2208 participants from 53 different countries. The program included 4 plenary lectures, 161 invited lectures, 415 oral presentations, and 1012 poster presentations. The 16th IBS meeting will be held in Fortaleza, Brazil, from 14–19 September 2014.

The **27th International Symposium on the Chemistry of Natural Products** (ISCNP27), held jointly with the 7th International Conference on Biodiversity (ICOB7) was held in July 2011 in Brisbane, Australia. The division hopes to confirm the venue for ISCNP28/ICOB8 at its meeting in Istanbul in August 2013.

Mary J. Garson <[m.garson@uq.edu.au](mailto:m.garson@uq.edu.au)> is a professor at the University of Queensland, Department of Analytical Chemistry & Microbial Sciences, in Brisbane, Australia. She is the vice president (incoming president starting January 2014) of the IUPAC Organic and Biomolecular Chemistry Division.

## Metal Ions in Biology and Medicine

by *María H. Torre*

The **12th International Symposium on Metal Ions in Biology and Medicine** took place in Punta del Este, Uruguay, from 11–13 March 2013. The symposium featured 2 plenary lectures, 18 keynote lectures, 41 oral presentations, and 73 poster presentations. The sessions were organized around the following topics: Metal-Based Drugs, Toxicological Effects of Metal Ions on Biological Systems, Radiometals in Nuclear Medicine, Nutritional Aspects of Trace and Major Elements, Metal Ions in Environmental Health, Advanced Analytical Methods for Metal Ions in Biochemical and Biological Systems and Structural Biology of Metalloproteins and Metal-Based Redox Processes. About 150 researchers and students of different countries (Argentina, Brazil, Chile, China, Czech Republic, Colombia, France, Germany, Hungary, Italy, Japan, México, Poland, Spain, Switzerland, Uruguay, USA, Venezuela) participated in the meeting. The symposium proceedings can be downloaded from [www.metal-ions2013.fq.edu.uy](http://www.metal-ions2013.fq.edu.uy).

The event was preceded by a course for high school teachers in Uruguay. The lectures were given by Enrique J. Baran of Universidad Nacional de La Plata, Argentina, and Patrick Moyna of Universidad de la República, Uruguay.

IUPAC's sponsorship was advertised on symposium materials and during the inauguration of the symposium. The materials provided by IUPAC (periodic tables, *Chemistry International* magazine) were given to attendees. The funds that IUPAC provided were used to support the attendance of Baran and Moyna, as well as to provide "travel awards" to eight students in the region.

María H. Torre is a professor of inorganic chemistry in the Faculty of Chemistry, UDELAR, Montevideo, Uruguay. She was a cochair of the 12th International Symposium on Metal Ions in Biology and Medicine.

## Trans Mediterranean Colloquium on Heterocyclic Chemistry

27–30 November 2013, Rabat, Morocco

The **Trans Mediterranean Colloquium on Heterocyclic Chemistry** (TRAMECH), will be organized in Rabat, Morocco, 27–30 November 2013. TRAMECH VII is open to all international scientists either from academia or industry interested in the various aspects of the heterocyclic chemistry. In particular, scientists from countries facing the Mediterranean Sea are encouraged to attend in order to help establish a network in the region.

The principal objective of TRAMECH 2013, is to reinforce and develop the scientific exchanges among the countries of the Mediterranean in the field of heterocyclic chemistry. This meeting will help foster the next generation of leading researchers by establishing

sustainable, collaborative relations among research/education institutions in Spain, Portugal, France, Italy, Slovenia, Croatia, Albania, Greece, Bulgaria, Romania, Georgia, Russia, Cyprus, Turkey, Egypt, Jordan, Tunisia, Algeria, and Morocco.

The program is designed to focus on the synthesis, reactivity, and application of heterocyclic compounds of interest in the fields of medicinal chemistry, new materials, nanotechnologies, and biotechnologies.

This event integrates IUPAC project 2011-006-2-300, chaired by Saverio Florio, which seeks to establish a new collaborative network involving countries of the Mediterranean Sea area in order to build and foster a sustainable program of high-quality heterocyclic chemistry in less-developed countries of North Africa (see Jan-Feb 2012 *Ci*; [www.iupac.org/publications/ci/2012/3401/pp2\\_2011-006-2-300.html](http://www.iupac.org/publications/ci/2012/3401/pp2_2011-006-2-300.html)).

 [www.fsr.ac.ma/tramech7/](http://www.fsr.ac.ma/tramech7/)

## Chem for Young Scientists

27–28 February 2014  
Blankenberge, Belgium

The 12th edition of the **Chemistry Conference for Young Scientists** (ChemCYS 2014) will be held 27–28 February 2014 at the Duinse Polders conference center in Blankenberge, situated along the Belgian coast. ChemCYS is organized every two years by Jong-KVCV, the youth section of the Royal Flemish Chemical Society, which will be celebrating its 75th anniversary in 2014. It offers young scientists and industrial colleagues an opportunity to present their scientific research to a broad scientific audience by means of a lecture or a poster. Participants are final-year master students, Ph.D. students, or

young post-docs in chemistry, biochemistry, pharmacy, engineering, and other closely related domains.

The conference has six topical parallel programs available for participant entries:

- Analytical and Environmental Chemistry
- Biochemistry and Biotechnology
- Inorganic Chemistry
- Advanced Materials Chemistry
- Organic and Medicinal Chemistry
- Physical and Theoretical Chemistry

Participants will also be encouraged to master their scientific reporting skills by attending a lecture/workshop on “The Art of Writing.” Besides the scientific activities, the conference offers “KaféCV,” a more informal meeting and networking event. KaféCV provides a platform for young scientists, representatives from the chemical industry, and chemistry educators, to discuss career paths, life as a scientist in the lab, being a manager in the chemical industry, or teaching chemistry to a class . . . Its focus is on the exchange of experiences between senior chemists and the next generation of chemists by offering a peek into the life of a scientist in a professional environment.

 [www.chemcys.be](http://www.chemcys.be)





### Host-Microbe Interactions

16–20 November 2013, Marrakech, Morocco

The **14th IUBMB Conference**, on the theme of “Host-Microbe Interactions” is to be held at the Palmeraie Conference Center in Marrakech, Morocco, from 16–20 November 2013. The conference will provide a forum for intensive scientific exchanges on the latest research and best practices around molecular life sciences.

IUBMB is also pleased to encourage you and your colleagues to take advantage of this unique opportunity

to share and discuss your expertise and research in Host-Microbe Interactions with your peers. Here are the categories your abstract should fall under:

- host-pathogen interactions
- host defense mechanisms
- toxins
- bacterial resistance
- host-microbe coexistence—the microbiome

 [www.iubmb-2013.org](http://www.iubmb-2013.org)

### Molecular Order and Mobility in Polymer Systems

2–6 June 2014, St. Petersburg, Russia

The **8th International Symposium on Molecular Order and Mobility in Polymer Systems** will be held in St. Petersburg, Russia, 2–6 June 2014. The main aim of the symposium is to discuss the modern problems of physics and chemistry of complex stimuli-responsive polymer systems with nano-structure organization and “soft” order preserving a pronounced molecular mobility. Both the experimental data and the results of theory and simulation will be presented. The main focus of the symposium will be the equilibrium properties of polymer systems.

Symposium topics include the following:

1. conformations and properties of macromolecules of complex architecture: star-like molecules, molecular brushes, dendrimers
2. structure and properties of polymer brushes and haired nano-objects
3. macromolecular self-assembly: micelles, multi-compartment structures, inter-polymer/polyelectrolyte complexes
4. structure and properties of complexes of polymers with nano-particle or biological object
5. polymer networks and composites

 [www.macro.ru](http://www.macro.ru)

### Polymer-Solvent Complexes and Intercalates

22–25 September 2014, Salerno, Italy

The **10th International IUPAC Conference on Polymer-Solvent Complexes and Intercalates**, will be held in Salerno, Italy, from 22–25 September 2014. POLYSOLVAT-10 will be the latest in a series of successful meetings organized every two years, the most recent of which were held in Kiev (2012), Strasbourg (2010), and Marrakech (2008).

The conference will focus on the formation mechanisms, morphology, molecular structure, and properties of compounds from synthetic polymers, biopolymers,

proteins, and supramolecular polymers. The bulk state, the solutions and the systems formed at surfaces/interfaces will be considered.

The program for the conference will consist of 10 invited lectures, about 20 oral communications, and 2 poster sessions, which will provide participants the opportunity to highlight their recent work. The conference proceedings will be published in a special issue of *Macromolecular Symposia*.

The conference will be organized and hosted by Christophe Daniel and Gaetano Guerra of the Dipartimento di Chimica e Biologia, Università degli Studi di Salerno.

 [www.polysolvat10.unisa.it](http://www.polysolvat10.unisa.it)



## The Fourth Polymer International – IUPAC Award for Creativity in Applied Polymer Science or Polymer Technology



### Call for Nominations!



Recognize the achievements  
of your colleagues by nominating  
them for this award.

**Your nominee could win US\$ 5,000!**

The award will be presented at the **IUPAC World Polymer Congress – MACRO 2014**, 6th -11th July 2014 in Chiang Mai, Thailand. The winner will be awarded **US\$ 5,000** plus travel and hotel accommodation expenses to attend MACRO 2014, where he/she will present an award lecture.

The winner will be selected by the Scientific Committee, representing Polymer International and the IUPAC Polymer Division after 30th November 2013.

Join our previous PI-IUPAC Award Winners:

**2012: Ali Khademhosseini**

*Harvard-MIT's Division of Health Sciences and Technology  
and Harvard Medical School*

**2010: Molly Stevens**

*Imperial College London*

**2008: Zhenan Bao**

*Stanford University*

Nominees must be aged under 40 years on 31st December 2014, and must be available to present an award lecture at MACRO 2014.

**Please include a current resumé for the nominee including the following information in your nomination:**

- ▶ Your name and address
- ▶ Full name and date of birth of nominee
- ▶ Business address of nominee
- ▶ Nominee's academic background and education
- ▶ Nominee's employment history (position, organization, duties, dates)
- ▶ Nominee's publications, patents, unpublished reports, papers presented at meetings
- ▶ Nominee's honors and awards
- ▶ Scientific achievements for which the candidate is nominated for this award
- ▶ Self nominations will not be accepted

Please send your nominations by email to Polymer International: [polyint@wiley.com](mailto:polyint@wiley.com) before 31st October 2013.

For further details please go to:  
[wileyonlinelibrary.com/journal/pi](http://wileyonlinelibrary.com/journal/pi)  
clicking on 'PI-IUPAC Award'

**WILEY**

## 2013 (after 1 October)

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### 17–22 October 2013 • Novel Materials • Shanghai, China

*9th International Conference on Novel Materials and their Synthesis (NMS-IX)*

Prof. Yuping Wu, Fudan University, Department of Chemistry, New Energy & Materials Laboratory Shanghai, 200433 China, Tel: +86 21 55 664 223, Fax: +86 21 55 664 223, E-mail: wuyup@fudan.edu.cn

### 8–13 December 2013 • Frontiers of Polymers • Auckland, New Zealand

*12th International Conference on Frontiers of Polymers and Advanced Materials (ICFPAM 2013)*

Prof. Paul Kilmartin, School of Chemical Sciences, University of Auckland, 23 Symonds Street, P.O. Box 92019, Auckland 1142 New Zealand, Tel.: +64 9 373 7599 x 88272, E-mail: p.kilmartin@auckland.ac.nz

## 2014

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### 12–17 January 2014 • Carbohydrate • Bangalore, India

*27th International Carbohydrate Symposium (ICS 2014)*

Prof. N. Jayaraman, Indian Institute of Science, Department of Organic Chemistry, Bangalore 560 012, India  
Tel.: +91 80 2293 2578, E-mail: ics27@orgchem.iisc.ernet.in, [www.ics2014bangalore.in](http://www.ics2014bangalore.in)

### 27–28 February 2014 • Young Scientists • Blankenberge, Belgium

*Chemistry Conference for Young Scientists 2014*

Prof. Thomas Vranken, Universiteit Hasselt, Institute of Materials Research, Martelarenlaan 42, B-3500 Hasselt Belgium, E-mail: thomas.vranken@chemcys.be, [www.chemcys.be](http://www.chemcys.be)

### 3–4 April 2014 • Chemistry Education • Colombo, Sri Lanka

*Professional Chemical Education and Research for Industrial Development and Sustainable Economic Growth*

Prof. Ramanee D. Wijesekera, University of Colombo, Department of Chemistry, P.O. Box 1490, Colombo 3, Sri Lanka, E-mail: ramanee@chem.cmb.ac.lk, [www.ichemc.edu.lk](http://www.ichemc.edu.lk)

### 2–6 June 2014 • Polymer Systems • St. Petersburg, Russia

*8th International Symposium on Molecular Mobility and Order in Polymer Systems*

Prof. Tatiana Birshtein, Russian Academy of Sciences, Institute of Macromolecular Compounds, Bolshoi Pr. 31 RF-199004 Saint Petersburg, Russia, E-mail: birshtein@imc.macro.ru, [www.macro.ru](http://www.macro.ru)

### 26–30 June 2014 • Physical Chemistry • Kharkiv, Ukraine

*Modern Physical Chemistry-2014 (MPC '14)*

Dr. Olexander Lebed, Department of Physical Chemistry, Karazin Kharkiv National University, Svoboda Square 4, UA-61022 Kharkiv, Ukraine, E-mail: beketov2014@karazin.ua, [www-chemo.univer.kharkov.ua/beketov2014](http://www-chemo.univer.kharkov.ua/beketov2014)

### 29 June–4 July 2014 • Organic Synthesis • Budapest, Hungary

*20th International Conference on Organic Synthesis*

Monika Bondar, Hungarian Chemical Society, H-1015 Budapest, Hattyú u. 16. II/8.  
E-mail: icos20@mke.org.hu, [www.icos20.hu](http://www.icos20.hu)

### 6–11 July 2014 • Macro • Chiang Mai, Thailand

*IUPAC World Polymer Congress (MACRO 2014)*

Wild Blue Congress Organizer, 19/2 Ekkamai 10, Sukhumvit 63, Wattana, Bangkok 10110.  
E-mail: info@wildblueorganizer.com, [www.macro2014.com](http://www.macro2014.com)

### 13–18 July 2014 • Chemistry Education • Toronto, Canada

*23rd International Conference on Chemistry Education (ICCE-23)*

Prof. Judith C. Poë, University of Toronto, Mississauga, Department of Chemical & Physical Sciences, 3359 Mississauga Road, Mississauga, ON L5L 1C6, Canada, E-mail: judith.poe@utoronto.ca, [www.icce2014.org](http://www.icce2014.org)

### 13–18 July 2014 • Photochemistry • Bordeaux, France

*XXVth IUPAC Symposium on Photochemistry*

Dr. Dario M. Bassani, Université de Bordeaux, ISM, UMR 5255, 351, Cours de la Libération, F-33400 Talence, France, E-mail: d.bassani@ism.u-bordeaux1.fr, [www.photoiupac2014.fr](http://www.photoiupac2014.fr)

### 13-18 July 2014 • Organometallic Chemistry • Sapporo, Japan

*XXVth International Conference on Organometallic Chemistry (ICOMC 2014)*

Prof. Munetaka Akita, Hokkaido University, Catalysis Research Centre, Sapporo 060-0811, Japan. Tel.: +81 117 069 149, E-mail: tamotsu@cat.hokudai.ac.jp, www.ec-pro.co.jp/icomc2014

### 10-14 August 2014 • Pesticide Chemistry • San Francisco, California, USA

*13th International Congress on Pesticide Chemistry*

Dr. Kenneth D. Racke, Dow Agrosciences, 9330 Zionsville Road Building 308/2E, Indianapolis, IN 46268, USA  
E-mail: kracke@dow.com, www.iupac2014.org

### 10-15 August 2014 • Physical Organic Chemistry • Ottawa, Canada

*22nd International Conference on Physical Organic Chemistry*

Paul M. Mayer (Local Organizing Committee)

E-mail: pmmayer@uOttawa.ca, http://events.science.uottawa.ca/icpoc22/welcome.html

### 17-21 August 2014 • Green Chemistry • Durban, South Africa

*5th International Conference on Green Chemistry*

Prof. Liliana Mammìno, Department of Chemistry, University of Venda, P/Bag X5050, Thohoyandou 0950, South Africa, Email: sasdestria@yahoo.com, www.saci.co.za/greenchem2014

### 24-28 August 2014 • Boron Chemistry • Prague, Czech Republic

*XVth International Meeting on Boron Chemistry (IME Boron XV)*

Prof. Bohumir Gruner, c/o IMEBORON XV Secretariat, CTU in Prague, Faculty of Mechanical Engineering, Technická 4, 166 07 Praha 6 - Dejvice, Czech Republic.

Tel.: +420 224 355 688, E-mail: secretary@imeboronxv.cz, www.imeboronxv.cz

### 8-12 September 2014 • Photobiology • Córdoba, Argentina

*16th International Congress on Photobiology*

Prof. Silvia E. Braslavsky, Max Planck Institute for Chemical Energy Conversion, Postfach 10 13 65, D-45413 Mülheim an der Ruhr, Germany

Tel.: +49 208 306 3681, E-mail: braslavskys@mpi-muelheim.mpg.de, www.photobiology2014.com.ar

### 14-19 September 2014 • Biotechnology • Fortaleza, Brazil

*16th International Conference on Biotechnology*

www.ibs2014.org

### 22-25 September 2014 • Polymer-Solvent Complexes • Salerno, Italy

*10th International Conference on Polymer-Solvent Complexes and Intercalates (PolySolvat-10)*

Dr. Christophe Daniel, Università degli Studi di Salerno, Dipartimento di Chimica e Biologia, Via Ponte don Melillo, I-84084 Fisciano, Italy, E-mail: polysolvat10@unisa.it, www.polysolvat10.unisa.it

## Visas

It is a condition of sponsorships that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all bona fide chemists from throughout the world to attend irrespective of race, religion, or political philosophy. IUPAC sponsorship implies that entry visas will be granted to all bona fide chemists provided application is made not less than three months in advance. If a visa is not granted one month before the meeting, the IUPAC Secretariat should be notified without delay by the applicant.

## How to Apply for IUPAC Sponsorship

Conference organizers are invited to complete an Application for IUPAC Sponsorship (AIS) preferably 2 years and at least 12 months before the conference. Further information on granting sponsorship is included in the AIS and is available upon request from the IUPAC Secretariat or online.

 [www.iupac.org](http://www.iupac.org)



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