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,[1] 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.[2] 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.[3]

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.[4]" 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.[5] 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."[6]

The first ConfChem, "Application of Technology in Teaching Chemistry,"[7] was an online conference run from 14 June to 20 August 1993, with 15 papers delivered over the internet as asci II 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.[8] 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

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[9] and Bandicam recording software.[10] 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.

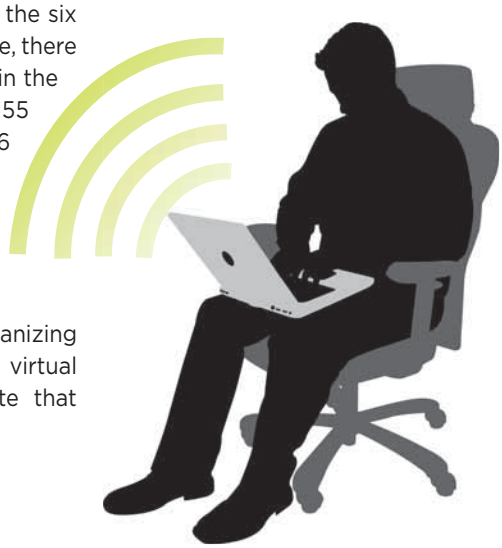
Other reasons for the underutilization of online conferences by chemistry communities may be because of the role of scientific societies, peer review, and the current practice of science. Traditional publishing has evolved out of Gutenberg Era technologies and resulted in a "filter then publish model," 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.[11] 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

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–11thECRICE conference in Rome.[12] Jan Apotheker, the symposium organizer, described on a YouTube video[13] 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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