SPRING–SUMMER 2016 • VOLUME 39 • NUMBER 1

SCIENCE EDITOR

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On the cover: Due to a lack of blood vessels and other characteristics, cartilage heals very slowly. One way to accelerate natural cartilage repair and growth is to use tissue engineering, or the artificially-stimulated production of functional replacement tissue. The image shows a three-dimensionally woven biomaterial scaffold. The scaffold consists of multiple layers of resorbable fiber bundles that have been woven into a porous structure. The scaffold is then seeded with cells that grow to become new tissue as the fibers are resorbed. The fibers provide stiffness and strength in a manner that mimics native collagenous tissues such as cartilage. This work to use tissue engineering to generate replacement cartilage is supported by National Institutes of Health funding from the National Institute of Arthritis and Musculoskeletal and Skin Diseases. Recent work using this 3D woven scaffold to develop a bioartificial hip was published in PNAS (www.pnas.org/content/early/2016/07/25/1601639113.abstract). Image credit: Farshid Guilak (Washington University, St. Louis, Missouri) and Frank Moutos (Cytex Therapeutics, Inc). 2012 FASEB BioArt (faseb.org/Resources-for-the-Public/Scientific-Contests/BioArt/About-BioArt.aspx) contest winner, reprinted courtesy of FASEB.

Welcome to the New *Science Editor*!

On behalf of our Editorial Board and the *Science Editor* Redesign Task Force, we hope you enjoy our newly designed online and print versions. CSE's membership includes leaders in scientific and academic editing and publishing, and we want to reflect best practices in all the ways we interact with members and others.

Because effective design isn't just a matter of tinkering with fonts and images, we partnered with Windmill Design (who conceived and created the new CSE logo and website in 2014). More than just updating the aesthetics, our process meant creating a brand new website for the journal separate from the CSE site, fresh PDF designs, and revamped production workflows. Windmill understood the nuances of our audiences and the academic nature of our work and customized the *Science Editor* website and print design just for CSE.

The new look and feel of *Science Editor* are decidedly clean and modern. We've included interactivity (yes—we're going to have polls!) and, with continuous publishing, frequent posting of new articles. We've added editorial board members and plan to expand content areas to serve our diverse membership. To complete our transformation, we've also launched a redesigned print version.

As scientific communicators of all stripes, we want our articles to be easy to find, read, and share. In this way, CSE can help its members to act as resources for our colleagues and communities. In fact, some articles will be made open access so that you can more easily share and discuss them with those outside of CSE. We will also tag all articles going forward (and we've retroactively tagged 6 years of our archive!), so you can search and browse by the topics you're interested in today.

Finally, we'd like to thank the CSE Board of Directors for its unwavering support in this very important project.

Tell us what you think! We also invite you to submit original research papers for peer review as well as article ideas. To learn more about how you can contribute, contact us at scienceeditor@councilscienceeditors.org.

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On Questions, Community, and Conduits

Tracey A DePellegrin

How many reviewers should I invite?
Is it OK to add an author after my manuscript has been accepted?
When an editor asks for "all the raw data"—does she really mean all the data?
What's a preprint?
If my scientific society wants to start a new open-access journal, will our other journals lose submissions?

Let's face it: we field a lot of questions. And we ask a lot, too. Whether you're an editor-in-chief, production assistant, managing editor, or publications committee chair for a scholarly society—I suspect you spend a significant portion of your day on one side or the other of a query.

During my early days as a managing editor in an editorial office of one person, our flagship journal *GENETICS* at just more than 80 years old was publishing around 55 articles each month. The print issues had the heft of a phone book. You could practically feel not only the heat of a just-published discovery but also the years researchers spent conducting experiments, analyzing, starting over, writing and revising, and ultimately communicating a complete scientific story to colleagues.

Those monthly journal tomes were weighty in more ways than one. Even though each article seemed self-contained in maybe 13 pages and a supplemental data file, I quickly realized that the network surrounding a paper was in fact vast and complex. Funding agencies such as the National Institutes of Health and grant reviewers played a role in a project's very origin. Department chairs, international review boards, public information officers, dozens of collaborators, and even companies that supplied reagents or genome sequencers mattered, too. Consider the time spent by academic editors and reviewers evaluating the manuscript and helping the authors to ensure lasting intellectual impact. Copyeditors and compositors, art directors, digital content developers, indexers, and librarians worked behind the scenes. No doubt I've missed others.

We mustn't forget our readers, the ultimate consumers of an article. These readers may be basic scientists who use the findings as building blocks for their own discoveries, physicians who depend on the most up-to-date therapeutic recommendations, climatologists who share data and analyses on global warming, or materials scientists who want to learn about the latest in artificial tissue.

So back in those first months, my predecessor left me with big shoes to fill and (I later realized) scant preparation. I had experience as a human factors researcher at Carnegie Mellon University Libraries, a science writer, and software documentation instructor plus a history of a motley assortment of waitressing, editing, and indie newspaper journalist jobs—all of which came in handy at one time or another when trying to satisfy a disgruntled author or helping to design new journal websites. I know colleagues (many of whom I met at CSE annual meetings) whose backgrounds and paths to publishing are similar. To be frank, most of us as kids didn't have dreams of being an editor when we grew up.

Despite my inexperience and what seemed like a never-ending whirlwind of changes in scientific publishing, I lucked out. I was schooled daily by a diverse group that included vendors, authors, reviewers, and editors. Most of all, I learned the ropes because of Elizabeth W Jones, a formidable editor-in-chief, yeast geneticist, and pioneer in science education, to whom I owe my career as well as the thick skin necessary to thrive as an editor.

What struck me then and continues to do so now is the assortment of talented, idealistic, curious, and committed individuals in scholarly publishing and, in particular, those involved with CSE. Despite seemingly disparate backgrounds,

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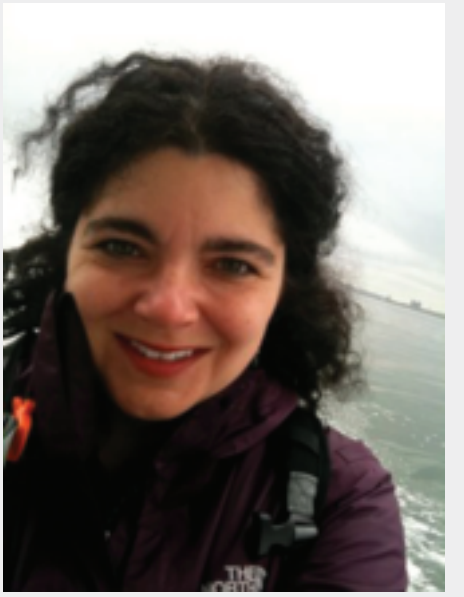
we have much in common. Ultimately, our community exists to serve science. Through questions we're asked and answers we provide, through our collaborations and creativity, we function as conduits between multiple groups—authors and readers, reviewers and editors, vendors and staff, plus others. Our web of knowledge is broad and deep.

It is in this spirit of acting as a conduit that I hope you will embrace CSE and today's launch of the redesigned *Science Editor*.

Whether it's your first month as a manuscript editor or your 20th year managing a stable of journals, we invite you in. Browse our articles. Learn something new. Then tell people. Be that publishing expert your boss turns to when she's not sure about a new business model. Share with your editors an article about authorship in federal research labs. Encourage an intern to read about career-development options. Advise an author from a developing country who needs access to writing resources. If you missed the CSE annual meeting in Denver or want to refresh your knowledge of a topic, our meeting reports detail session highlights and discussions by leaders in the field whose insights are priceless.

Let *Science Editor* and its articles serve you, as you in turn serve others in the spirit of science and discovery.



Tracey A DePellegrin
Editor-in-Chief, *Science Editor*

Science Publishing Innovation: Why Do So Many Good Ideas Fail?

Lenny Teytelman

Most experiments done by a researcher fail. It is the endless repetition and constant tweaking of the methods that leads to the occasional useful result. Failure of an experiment in itself is not informative; rather, it is the understanding of why something didn't work that can be fruitful. Yet when it comes to innovative ideas in science communication, it is common to view failures as mathematical proof that a given idea can never succeed. The following is a look at postpublication discussion, preprints in biology, and crowdsourced protocol repositories—three brilliant ideas that initially flopped despite their greatness.

Postpublication Review and Discussion

Over a decade ago, BioMed Central (BMC) recognized the importance of postpublication discussion. Prepublication review can improve papers and catch errors, but only time and subsequent work of other scientists can truly show which results in a publication are robust and valid. Unlike a print journal (or print as a medium, in general), the Internet permits the readers to comment on published papers over time. So in 2002 BMC developed and enabled commenting on every one of its articles across its suite of journals. Not only does this allow for postpublication review, but it enables readers to easily ask authors and other readers a question, with public responses enriching the original manuscript, clarifying, and helping to improve the comprehension of the work.

This is a terrific idea, but it didn't really catch on. When analyzed in 2008 by Euan Adie, after five years of commenting, only 2% of the 37,916 BMC papers had a comment.[1] Another innovative publisher, PLOS, enabled commenting a few years later, with 18% of the papers receiving comments, 40% of which were from the papers' authors.[2] This commenting is still useful, even if rare, but seems to be far below the expectations of BMC and PLOS. Skeptics concluded from this experiment that scientists don't have the interest or time to comment on other people's papers—a reasonable but (I believe) wrong conclusion.

LENNY TEYTELMAN is the founder of www.protocols.io.

One barrier to postpublication commenting on journal websites is the reluctance of scientists to create accounts with individual publishers. Time is precious for researchers, and while they may have a minute to ask a question about a paper, they don't have the 10 minutes it may *take* to open an account on some publishers' websites. While registering at PLOS is relatively quick and painless, any registration button is a deterrent. However, if scientists can comment without creating an account, they do so happily; hence, there is vibrant and active discussion of research articles on Twitter.

Another big hurdle to postpublication discussion is the fear of repercussions for commenters. Neither PLOS nor the PubMedCommons commenting platforms permit anonymous posts. Figure 1 shows what happened when the online journal club PubPeer began to allow true anonymity.

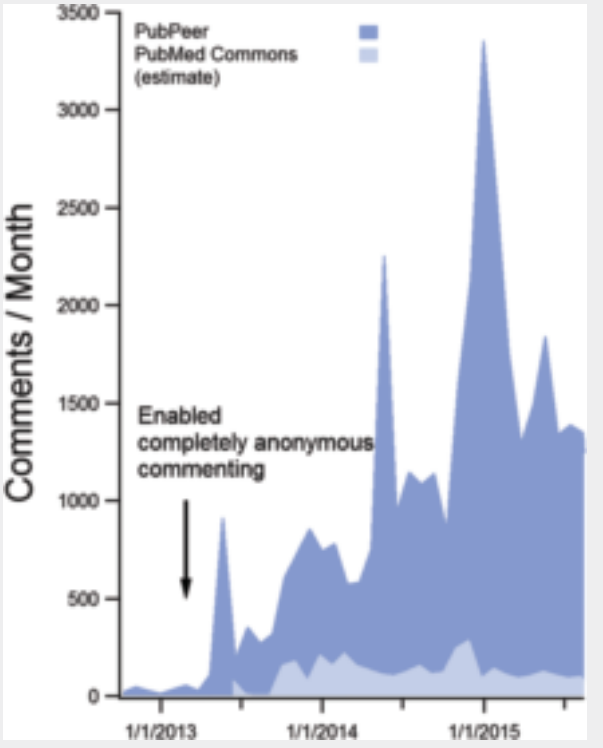


Figure 1. Monthly comments at PubPeer and PubMed Commons over time (http://blog.pubpeer.com/?p=200).

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Preprints

Remarkably, despite the creation of arXiv for physicists in 1990 and despite the enthusiastic embrace of preprints by the physics community, it has been assumed this is impossible for biology. The common argument is that biologists are different from physicists and the arXiv success is not informative. What many did find telling is the death of the 2007 preprint initiative from the Nature Publishing Group (NPG). NPG tried preprints with *Nature Precedings*, but adoption was low and in 2012 NPG pulled the plug on the experiment.[3] This triggered some skepticism about the prospects of the bioRxiv preprint effort from Cold Spring Harbor Lab (CSHL) Press.[4] Critics told the director of CSHL Press, John Inglis, that a preprint for biologists simply couldn't work.[5]

Once again, we must ask the cause of the *Nature Precedings* failure. Did NPG kill it because biologists wouldn't behave in the same way as physicists? We know that isn't the case. Preprints in biology are all the rage today, with recent articles inthe *New York Times*[6] and the *Economist*.[7] They speed up science communication and ensure an open-access version of the paper is available—scientists tend to love them. Compared to the 20 years of preprint use in physics, it's still the early phase for bio-preprints, but deposits in bioRxiv are growing rapidly (Figure 2); in addition to bioRxiv, there are also thousands of biology preprints at The PeerJ, F1000 Research, and figshare.

I don't have insider knowledge why *Nature Precedings* shut down. My guess is it was one or more of the following: lack of a clear monetization plan (Cold Spring Harbor Lab Press, which publishes bioRxiv, is a nonprofit and is supporting bioRxiv as a community resource); realization that preprint adoption requires a major culture shift and would take promotion and time; a hesitation of biologists to support a platform with content hosted by a commercial publisher (again, as part of the CSHL nonprofit, bioRxiv is in a good position to be the independent cross-publisher preprint resource and advocate).

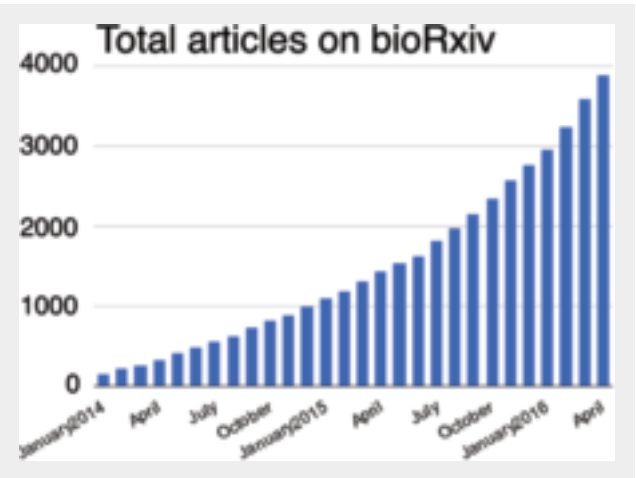

Figure 2. Cumulative count of preprints in bioRxiv, over time.

Crowdsourced Community Protocols

In the winter of 2012, Alexei Stoliartchouk and I came up with the idea for protocols.io—a central place where scientists can share and discover science methods. We wanted to create a site where corrections and the constant tweaking of science methods could be shared, even after publication in a journal.

Before we launched our protocols.io journey, my PhD advisor Jasper Rine connected me to a former postdoctoral scholar of his, Chris Yoo. A few years before I came to Berkeley, Chris left Jasper's lab to cofound bioprotocols.com.[8] With a million dollars of venture capital, he set out to create exactly the protocol repository that Alexei and I were proposing to build, a decade later. Bioprotocols.com did not work out, and I suspect strongly that Jasper predicted my meeting with Chris would arm me with a long list of reasons why that company failed. Indeed, I got that list, but I also got an enthusiastic promise from Chris that he would do everything in his power to help us create protocols.io and make sure that this take two at his dream would be successful.

Few people know about bioprotocols.com, but many know about OpenWetWare (OWW) and Nature Protocol Exchange—both open-access community resources for sharing protocols. Both have been mentioned to me countless times as evidence that protocols.io wouldn't work. As with preprints, the problems that OWW and Protocol Exchange faced seemed to be proof that biologists would not sharedetails of their methods on such a platform. As with bioRxiv, we are in the early days of protocols.io, but judging from the growth in the figure below, it's hard to argue that biologists don't need this or that they won't take the time to publicly share their methods.

Every researcher who fails to reproduce someone's published result has to ask, "Is the published result wrong? Did I screw up? Or is it the difference in the cell line, strain, or some such detail in my application?" Knowing why a

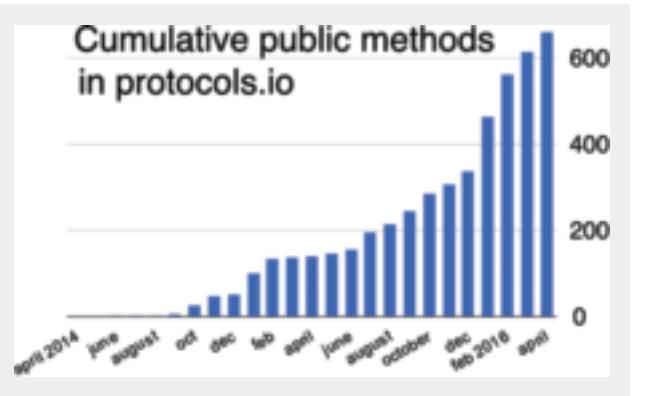

Figure 3. Cumulative growth of public methods on protocols.io.

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good experiment fails is critical and informative; assuming the wrong reason for an idea's failure is a serious barrier to innovation in science communication.

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Authorship Guidance in a Federal Research Laboratory: A Case Study

Joseph E Flotemersch and Justicia Rhodus

Abstract

As science has become more specialized and collaborative, a need has emerged for research organizations to develop authorship guidance that can be shared and discussed with potential collaborators. We present the guidance developed for a United States (US) federal research laboratory that collaborates with both governmental and nongovernmental colleagues globally. Topics included in the guidance were identified during a review of existing authorship guidelines and discussions with laboratory scientists and managers. Criteria are presented that clearly define what constitutes authorship, and guidance is provided for addressing author order, equal contributorship, unique coauthorship issues, author responsibilities, authorship abuse, contributorship statements, acknowledgments, and dispute resolution. Although not exhaustive, this list of topics provides a strong starting point for other scientific research organizations needing to prepare authorship guidance of their own. The views expressed in this article are those of the authors and do not necessarily represent the views or policies of the US Environmental Protection Agency.

Introduction

The executive branch of the United States (US) federal government is responsible for enforcing the laws of the land. To effectively accomplish this mission, the government relies on a suite of federal research laboratories that reside in various executive departments and independent agencies. Critical to the success of these laboratory research programs is communication and the utility of their research to influence and impact decisions. Paramount to the communication of this research is the development and distribution of both oral and written scientific and technical products. Authorship and publication of these products are important not only to the research programs but also to the authors of these products, as authorship and publication influence their reputation, promotion, and funding support.

The authorship guidance developed by the US National Exposure Research Laboratory of the Environmental Protection Agency (EPA) is presented here as a case study. Establishing an authorship standard in the Laboratory was of critical importance, as the Laboratory's research products often involve collaborative efforts among the Laboratory's scientists, other EPA scientists, EPA contractors, non-EPA colleagues, and cooperative and interagency agreement partners. Scientific and technical products resulting from the Laboratory's research include books and book chapters, communication products, internal reports, journal articles, proceedings, presentations, published and unpublished reports, newsletters, and more.[1]

The Laboratory's authorship guidance was developed based on results of a scientific literature search of existing authorship guidelines conducted in 2010 and was further refined through input from management and staff from throughout the Laboratory. The guidance established uniform criteria for authorship of scientific and technical products and addresses author order; equal contributorship; unique coauthorship issues, such as shared first authorship, senior authorship, and group authorship; author responsibilities; authorship abuse; contributorship statements; acknowledgments; and dispute resolution. Although this guidance is reproduced here with the consent of the Laboratory, the guidelines presented herein should not be construed as the current authorship guidance of this Laboratory or any associated laboratory or agency, as authorship convention is constantly evolving within and across disciplines.

Although much of the guidance on authorship and contributorship in the literature was initially formulated for biomedical publications, many of the underlying concepts and principles are applicable to all areas of science and, hence, have been embraced by a number of other scientific fields as well. We feel the list of topics provided herein, though not exhaustive, is a strong starting point for other scientific research organizations needing to prepare authorship guidance of their own.

JOSEPH E FLOTEMERSCH is an ecologist at the US Environmental Protection Agency, Office of Research and Development. JUSTICIA RHODUS is an environmental science editor with CSS-Dynamac, a contractor to the US Environmental Protection Agency.

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Authorship Criteria

Generally, the guidance discussed herein defines an *author* as someone who has made substantial contributions to the published research.[2–10] For the sake of discussion, a "substantial contribution" is considered "intellectual" in nature.[2,3] Adapting the criteria developed by the International Committee of Medical Journal Editors (ICMJE),[5] the Laboratory's authorship criteria define an author as an individual who has contributed to the published research as follows:

1. Made substantial intellectual contributions to one or more of
   a. Conception and design (e.g., formulation of hypotheses; development of study objectives; definition of experimental, statistical, modeling, and analytical approaches)
   b. Acquisition of data and modeling (e.g., nonroutine fieldwork, such as adapting or developing new techniques or equipment necessary to collect essential data; nonroutine labwork, such as development of new methods or significant modification to existing methods essential to the research; literature searches; theoretical calculations; and development and application of modeling specific to the research)
   c. Analysis and interpretation of data
2. Been involved in the writing or critical revision of the product to provide critical intellectual content
3. Read and given approval of the final product being submitted for clearance and any subsequent revisions as requested by the editors and reviewers

All authorship guidelines examined in the literature required a contribution to criterion 1 *or* criterion 2 at minimum. In embracing the importance of intellectual contribution, both criteria were included in the Laboratory's authorship guidance. With the credit of authorship comes responsibility, which explains criterion 3's requiring every author to approve the final version of the work to be published. In meeting criterion 3, it is the explicit responsibility of the lead or first author to initiate and maintain the inclusion of potential coauthors (i.e., those who have made a substantial intellectual contribution to the research) in all lines of communication for the project and in preparation of the project's scientific and technical product(s). Excluding such contributors, whether through active exclusion or lack of initiative, is unethical and can result in a technical product that falls short of its potential. Any and all individuals who have met criteria 1, 2, *and* 3, independent of their rank and affiliation, should be named as authors.[4,5,8,10] Provided they fulfill these three criteria, authors may include federal employees, contract employees, non-EPA scientific colleagues, cooperative agreement and interagency agreement collaborators, and others. It should be noted the International Committee of Medical Journal Editors has since updated their authorship criteria to include a fourth criterion: agreement to be accountable for all aspects of the work in ensuring questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.[6]

Contributions Not Meeting Authorship

Authorship should *not* be granted to those who do not meet the criteria for authorship. Providing routine assistance, acquiring funding, supervising research group members, and holding positions of authority (e.g., supervisory or management positions) are not criteria for authorship.[2,3,5,6,8,11–16] That is, supervisors and managers who aid or support the research are not automatically granted authorship without providing a "substantial contribution," as previously defined. Likewise, none of the following contributions, in and of themselves, meet the criteria for authorship:

- Providing a routine technical contribution (e.g., routine data collection, assistance in literature searches, technical writing and editing, routine data analysis)
- Providing previously published data, instrumentation, or materials obtained from a third party[3,10,17]

Individuals who have made a *routine* technical contribution (e.g., laboratory technicians, data collectors, field personnel, technical writers and editors, statisticians, or others who perform only routine data acquisition and analysis following the specific instructions of the research plan or standard operating procedure) but provide no other intellectual input to the research or scientific and technical product have not made a "substantial contribution."[3] To earn authorship, technical contributors must have made a substantial intellectual contribution to the research (as defined in criterion 1) and met the remaining two authorship criteria as well.[17]

Deciding where to draw the line between those who are worthy of authorship and those whose contributions are more appropriately named in the Acknowledgments is often a difficult aspect of publication.[18] The authorship criteria defined here will help with this challenge. All individuals who have assisted in the work reported in the scientific and technical product but do *not* meet the criteria for authorship, should be recognized in the Acknowledgments.[2–6,8,10–14,16–19] Guidance on how to acknowledge these contributors is discussed in the section on Acknowledgments.

Establishing Authorship and Authorship Order

As science has become more specialized and collaborative, transdisciplinary research has become more common, and

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multiauthored publications have become the norm across scientific disciplines.[18,20–23] In fact, the National Academy of Sciences reported that the average number of authors per article increased more than twofold (from 3 to 7) in the past 30 years, with some journal articles having "more than 15 authors or no named authors at all, just a consortium representing a group of authors."[22] To help mitigate issues of authorship, the development of preliminary publication plans is advised.

Preliminary Publication Plans

Early in the research, the lead investigator or project chairperson should discuss with collaborators who is expected to contribute to the research project, what each person's role in the research is, publication plans, potential authors for scientific and technical products, publication leads, and potential authorship order.[24–26] All contributors to a research project should be aware of the authorship criteria and have a complete understanding of the type of work worthy of authorship. This upfront communication is especially important for avoiding authorship conflicts later in the project and gives contributors outside of the Laboratory the opportunity to recognize this guidance and discuss authorship issues with their organization. If outside collaborators are bound by their organization's authorship guidelines and policies, this is the time to reach agreement on how inconsistencies can be resolved.

The publication plans for a research project may be documented at an early stage of the process, but it is important to recognize that initial authorship and authorship order can (and likely will) change as the research progresses (see Common Reasons for Change in Authorship). These initial decisions should be revised, as necessary, to ensure that final authorship and authorship order reflect the actual contributions of all contributors.[24,25,27] However, once the list and order of authors have been established, no changes can be made without the consent of all research contributors.[10,14,27]

Authorship Order and Equal Contributorship

Authorship order is based on the level of contribution put forth by each author, with the first (primary) author listed having contributed most to the work and coauthors listed in descending order of contribution.[10,23,27–29] The exception to this is when a "senior" author is listed last in the byline and designated by a footnote. To establish the level of contribution made by each author, we recommend determining what percentage of the work was performed by that individual (i.e., assigning a percentage of the contribution to each author). Authorship order is a collective decision of the research collaborators,[16] and depending on the scope of a particular project, several scientific and technical products could be planned, each involving different authors or different authorship orders (or both).[24]

As a result of the emerging trend in transdisciplinary research, it is becoming more common that two or more coauthors could have contributed equally to the work. In cases of equal contributorship, this may be indicated by a footnote to the byline or author list, with a caption that reads, "These authors contributed equally to this work." Designations of equal contributorship, and authorship order in general, only reflect the relative contributions of authors. However, contribution statements may be used to disclose each author's contributions and discern the value of those contributions to the research (see section on Contributorship Statements).

Common Reasons for Change in Authorship

Changes to authorship and authorship order established early in a research project can entail adding additional authors, eliminating individuals initially identified as authors, or rearranging authorship order. An author may be added to a scientific and technical product if (a) the project has expanded in scope, (b) the added individual possesses the expertise necessary to complete the research or address major concerns expressed by a reviewer of the publication or product, or (c) a contributor who was initially not expected to meet the criteria for authorship becomes significantly more involved in the product and now meets the authorship criteria.[26,30]

Likewise, an individual initially expected to serve as an author may be eliminated from the final authorship of a scientific and technical product because he or she did not contribute to the project as originally expected and no longer meets the criteria for authorship. If the actual contributions of authors differ significantly from those originally expected or if an author accepts increased responsibility or delegates a portion of his or her responsibility to other authors, the authorship order should be revised to reflect the actual contributions of each author.

Unique Coauthorship Issues

Authorship credit is a critical issue in research publication and can have major career implications for those involved. As the number of scientists involved in collaborative research endeavors increases, unique issues are arising regarding recognition of authors, in terms of both reflecting contributions and publication records.[23] This includes identification of first and senior (last) authors and use of group authorship.

Shared first authorship

As discussed previously, the first author of a publication is the person who has contributed most to the work, which

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often includes contributing the most to writing the scientific and technical product.[10,23, 27–29] Because of the implications of first authorship for employment, promotion, funding, and award potential, the increase in transdisciplinary research has produced a rising trend in shared or multiple first authors (also referred to as co–first authors or joint first authors). When two or more individuals are identified as first author, a footnote can be used to designate equal contributorship, as described in the section on Authorship Order and Equal Contributorship.[2,26,27,31,32]

Although shared first authorship can be used to accurately recognize and credit individuals for their contributions, care must be taken to ensure the pressure to publish does not lead to abuse of this designation. It is also important to note that numerous issues regarding co–first authorship are still yet to be resolved within the general scientific community. For instance, whereas equal contribution can be designated in curricula vitae (CVs) by a footnote or similar method, review of a CV for first authorship may not reveal this designation. Similarly, many bibliometric databases and counting methods are not currently capable of recognizing additional byline information about equal contribution and accurately allocating publication and citation credit.[33] To minimize conflicts over these issues, alphabetical order has often been used to list equal contributors, but this option creates a permanent and unfair bias toward those whose last names appear early in the alphabet. A frequent alternative is to use random selection (e.g., flip of a coin) to select authorship order. If several scientific and technical products are planned for the research project, another option is for co–first authors to be listed in different authorship orders for each. If authorship order is based on alphabetical or random order, this should be noted in a footnote to the byline or author list.

Senior authorship

In many scientific disciplines, the last author in the byline or author list also has major significance and many times is thought to have made the second most important contribution, behind that of the first author.[19,23,27,31,32] This individual, often referred to as the "senior" author, is typically the senior member of the research team—the senior scientist who served as the driving force intellectually (and possibly financially) behind the concept, organized the project, and perhaps provided guidance throughout execution of the research. Senior authors are also sometimes the head of a research group, laboratory, or department under whose auspices the research was conducted; or a mentor or advisor to more junior scientists who are conducting the research.[19,23,27,32] In many cases, these senior scientists are at a point in their careers where they are able to conceive of more research projects than they can execute themselves. In order to conduct the research in a timely fashion, these research concepts are often passed down to junior scientists, who take ownership of the project, execute the research, and assume the role of first, second, etc. author(s) for the project, depending on their contributions to the research. The senior individual serves to conceive and organize the project and may provide guidance through completion.

It is important to recognize individuals who make these types of substantial contributions to the concept and design of a research project, either in the byline (as a senior author) or in the Acknowledgments section (as a contributor), depending on whether the criteria for authorship have been met. That is, senior authorship is not automatically bestowed on senior scientists but rather should depend on their contributions to the work in light of the authorship criteria.[27] Awarding authorship to a senior scientist, department or laboratory head, or mentor who does not meet the criteria for authorship is an abuse of authorship (see section on Authorship Abuses).[2,10,19,27] Senior individuals who aid or support the research do not have an automatic right to authorship without providing a "substantial contribution," as previously defined.

Like first authorship, senior authorship has implications for career development, funding, and award potential. Without the recognition of senior authorship, senior scientists may feel pressure to identify themselves as first author (even though they did not perform the majority of the work) or shelve the project until they have time to conduct it themselves. Also important to note in the case of senior authorship is that citation credit could be lost if a large number of coauthors exist for the product. Buehring et al. found that the significant increase in authors per publication has led to limits being placed on the number of authors allowed in cited references.[32] Consequently, when the author list is truncated, the last position in the byline (e.g., the senior author) may be left off the citation.[32]

As in the case of multiple first authors, the increase in transdisciplinary research has produced a rising trend in shared or multiple senior authors. Because of this trend and the lack of a standardized position for the senior author in the author list, it is suggested senior authorship be indicated by a footnote to the byline or author list (when applicable), with a citation that reads, "senior author." Not all journals observe the "senior author" category, however (e.g., *Environmental Science & Technology* [*ES&T*]); *ES&T* uses the term corresponding author, which in most cases encompasses the roles of both senior and corresponding author (personal communication with Barbara Booth, Assistant Editor of *ES&T*).

Group authorship

The number of collaborative publications involving large numbers of investigators working under a single group name

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is on the rise in the sciences, particularly in the life sciences.[23] Group authorship may be appropriate for scientific and technical products when a large group of researchers has collaborated on a project, such as in the case of integrated, transdisciplinary research or development of a framework document or white paper. In the case of these large collaborative products, there may not be enough space to list all of the collaborators in the byline or author list, and not all collaborators may meet the authorship criteria; therefore it is necessary to determine how to communicate credit for these group efforts and identify responsibility for the product's contents.[4–6,16,34,35]

In group authorship products, the group should identify all individuals who meet the authorship criteria, the group name, and the preferred citation.[2,5,6,16] There are essentially two group authorship models;[4,16,34,35] The Figure provides sample byline and citation examples for each:[35]

1. *Authorship in which each person in the group meets authorship criteria*. In this case, the group name is listed as the author, with author names appearing in the byline and/or elsewhere in the product for proper indexing of author contributions.
2. *Authorship in which a select subgroup of the whole meets authorship criteria*. In this case, the group name and individuals who meet authorship criteria are named as authors. Nonauthor group members are identified in the Acknowledgments.

Tscharntke et al. suggested using alphabetical order when listing the authors of a group in the byline or elsewhere in the publication to avoid conflict or disharmony in the group.[23] As mentioned previously, using alphabetical order creates a permanent and unfair bias toward those whose last names appear early in the alphabet and, if used, should be noted by a footnote to the author list.

Final Authorship and Authorship Order

The contributors to a research product must work together to make informed decisions regarding authorship and authorship order. Prior to publication, the publication lead is responsible for obtaining written authorship agreements from all authors, verifying that each individual meets the criteria for authorship, agrees with the contributions attributed to their name, and accepts responsibility for the intellectual content of the scientific and technical product.[14,30,36] The agreements should at a minimum contain

- The author's name, affiliation, and contact information;
- The title of the product; and
- A brief paragraph stating the author (1) meets the criteria for authorship, (2) agrees with the contributions attributed to his or her name in the scientific and technical product and the percentage of contribution assigned, (3) gives final approval of the final submitted product, and (4) accepts responsibility for the intellectual content of the scientific and technical product.

Should contributors fail to come to a collective decision regarding authorship and author order, mediation may be required to resolve the dispute (see section on Dispute Resolution).

Authorship Responsibilities

All Authors

During preparation, review, and revision of scientific and technical products, authors are responsible for providing timely input regarding their specific contributions. In addition, all authors are responsible for the accuracy, editorial quality, and intellectual content of the product and should be able to publicly describe the work detailed in the publication.[4–6,9,14] Authorship carries with it substantial credit but also weight in allegations of research misconduct.[4,37]

Publication Lead/First Author

It is the primary responsibility of the publication lead (i.e., the first or primary author) to manage and coordinate the scientific and technical product from draft to review, clearance, and publication. The first author, in some instances, may delegate these tasks to others (e.g., the corresponding author, senior author), but maintains overall responsibility for these tasks. Ultimate responsibility for the work and the validity of the product's contents rests with the first author. In consultation with the other contributors, the publication lead assumes responsibility for (and should be able to articulate the reasons for) coauthors and acknowledgees' contributions and establishment of authorship order.[38] The first author must also ensure all contributions are accurately represented in the final scientific and technical product and the results and interpretation of input provided are consistent with the contributor's intent.[38]

Corresponding or Communicating Author

The *corresponding author* (sometimes also referred to as the *communicating author*) is responsible for submitting the scientific and technical product and serving as the point of contact for all communications with the publisher (revision, review, release of proofs, etc.). The corresponding author is responsible for relaying details about the publication process to other authors of the product and incorporating and representing all author changes. The name and email address of the corresponding author is often noted in the scientific and technical product, as he or she serves as a point of contact for any inquiries. After publication, the

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Group authorship in which each person in the group meets authorship criteria.

A. The byline and citation contain the group name, but no named individual authors.*

Byline: Group Name

Journal Citation: Group Name. Year. Title. Journal Volume: Page Numbers.

Report/Book Citation: Group Name. Year. Title. Publisher, Publishing Location.

B. The byline and citation contain the names of select individual authors** followed by the group name. Using the connector *and* indicates that there are additional members of the group who meet the authorship criteria, but are listed elsewhere in the publication.

Byline: Author 1, Author 2, Author 3; and the Group Name

Journal Citation: Author 1, Author 2, Author 3; and the Group Name. Year. Article Title. Journal Volume: Page Numbers.

Report/Book Citation: Author 1, Author 2, Author 3; and the Group Name. Year. Title. Publisher, Publishing Location.

Group authorship in which a select subgroup of the whole meets authorship criteria and are listed as authors on behalf of the group.

A. The byline and citation contain the names of individual authors followed by the group name. Using the connector *for* indicates that the authors in the byline represent the group, which also includes additional members who do not meet the authorship criteria.***

Byline: Author 1, Author 2, Author 3; for the Group Name

Journal Citation: Author 1, Author 2, Author 3; for the Group Name. Year. Article Title. Journal Volume: Page Numbers.

Report/Book Citation: Author 1, Author 2, Author 3; for the Group Name. Year. Title. Publisher, Publishing Location.

* Each individual author is listed somewhere in the publication. Note: Bibliographic databases may include individual author names in their citations or allow for retrieval of citations by group name and/or individual author names.

** Often publishers will require that at least one individual author be named "to assume the role of content guarantor."

*** Nonauthor group members should be listed in the Acknowledgments of the publication.

Figure. Group Authorship Byline and Citation Examples.[35]

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corresponding author manages all communication and correspondence regarding the product on behalf of the publication's coauthors. The corresponding author does not have to be the first author or senior author of the scientific and technical product but should be an author who is able to answer questions about and provide materials related to the conduct of the study. When the responsibilities of corresponding author are shared, each individual serving in this role should be identified as such. Listing more than one corresponding author may also be desirable on collaborative products involving authors from different organizations or when the first corresponding author is not a permanent Laboratory employee and a more long-term point of contact is warranted.

Authorship Abuses

The literature identifies several common abuses of authorship that either diminish the significance of or fail to recognize author contributions: *honorary* or *gift* authorship, *guest* authorship, *ghost* authorship, and *surprise* authorship.[2,11–1316,17,19,36] *Honorary* or *gift authorship* is authorship credit given to someone who has not contributed directly to the work but is in a position to expect or demand authorship (e.g., the head of a branch or division or someone who helped to obtain funding).[2,8,10,19] In contradiction to honorary authorship, which is often offered out of a sense of obligation, *guest authorship* is offered to an individual whose name is expected to increase the credibility of the research and the likelihood of publication, even though others did the work.[2,11,12,19] *Guest authors* make no discernible contributions to the study and, therefore, do not meet the criteria for authorship. *Ghost authorship* is the failure to give authorship credit to an individual who meets the authorship criteria.[2,12,13,39] All individuals who have made substantial contributions to the work reported in the scientific and technical product should be acknowledged as authors if they meet the criteria for authorship. If these individuals do not meet all the authorship criteria, they should be listed in the Acknowledgments. *Surprise authorship* occurs when an individual unknowingly finds his or her name on the byline of a publication without having contributed to the work or accepted responsibility for the publication's content (or both).[36]

Efforts must be made to protect the integrity of scientific and technical products from these abuses of authorship. Establishing and enforcing criteria for authorship and requiring contributorship statements are two practices that can help to reduce these abuses.

Contributorship Statements

The purpose of contributorship statements is to have each author and contributor personally affirm his or her role in the research (from its inception to publication), to disclose publicly the contribution(s) that he or she has made, and to take what has been described as "public responsibility for content."[9,11,19,40–44] The concept is for all contributors to disclose their specific contributions to the scientific and technical product (i.e., work conducted) and for this information to be included as a footnote to the byline, in a designated author contributions section, or in the Acknowledgments section for nonauthors.[8,9,19,44] When necessary, the publication lead is responsible for obtaining statements from all contributors to the scientific and technical product. All contributors to the scientific and technical product should discuss and agree on the contributions that will be disclosed for each individual. The Table identifies examples of general research contributions.[4,25,38] Contributors may list more than one contribution, and more than one contributor may have contributed to the same aspect of the work.[9,44] Contributorship statements should be sent to the publication lead.

Contributorship statements in scientific publications are akin to credit lists, like those used in the film industry, but it is important to distinguish a contributorship statement from the credits listed at the end of a film, which indicate an individual's title, rather than the work that was done.[43,45] It is imperative that the work actually done be disclosed if honorary, guest, and ghost authorships are to be eliminated. Clear contributorship statements also allow readers and editors to know which contributors were responsible for which aspects of the research and who can be contacted for more information about different parts of the work.[41,44,45]

In addition to removing the ambiguity surrounding author contributions, these contributorship statements also perform a number of other functions:

- Support final determinations of authorship and author order[24,25]
- Reduce abuses of authorship[44]
- Meet journal or society publishing requirements[4–6,8–10,46–50]
- Provide clear information regarding an individual's contributions for consideration in promotion or funding evaluations[41,44]

Although varying authorship standards exist among scientific organizations and disciplines, contributorship statements enable the standards that have been applied for authorship to be open to public scrutiny by colleagues, editors, and readers.[40] This practice will not eliminate all abuses of authorship, but it does promote open discussion of who contributed what, and those individuals who might typically abuse the system will have to do so publicly.

The practice of disclosing contributorship provides accountability for work, which can be especially difficult in

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Table. Examples of General Research Contributions.[4,25,38]

Conception and Design	formulation of hypotheses; development of study objectives; defining experimental, statistical, and analytical approaches
Data Acquisition	fieldwork; labwork; theoretical calculations; literature searches
Analysis and Interpretation of Data	making sense of and presenting the results; data analysis (statistical or other)
Writing Publication	creating all or a substantive part of the scientific and technical product
Critical Revision of Publication	reworking the scientific and technical product for intellectual content before submission (not just spelling and grammar checking)
Approval of Final Publication	providing approval of the final product version to be published
Supervision	oversight and responsibility for the study; general supervision of the research group
Resources	funding; equipment; facilities; personnel vital to the project; unpublished data
Technical, Administrative, or Material Support	provision of materials, reagents, or analytical tools; technical writing and editing; peer review; quality assurance; computer runs; advice
Other	novel contributions

transdisciplinary and multicenter research projects. With regard to multiauthored, collaborative research projects, this practice may result in a large increase in the number of authors for a scientific and technical product, but this recognition is appropriate for those who make substantial contributions to the research.[17,44] Suggestions on how to address authorship in collaborative group products is presented in the section on Group Authorship.

The need for a system to properly attribute credit and accountability in publications has long been acknowledged but has been made more acute by the increase in collaborative, interdisciplinary research efforts.[19] In 2014, a multistakeholder group met that need by developing the CRediT Taxonomy—a 14-role contributor taxonomy—for use in scientific publications.[44] This contributorship taxonomy has since been adopted by the CellPress and PLOS families of journals.[47,48]

Acknowledgments

Acknowledgment of contributions is warranted for all individuals and institutions that have provided assistance to scientific and technical products. The approach is similar to the way data sources, literature, personal communications, and software are expected to be formally acknowledged in research or publications. All contributors who do not meet the criteria for authorship should be named in the Acknowledgments section of the product, with their affiliation and specific contributions defined.[4,10,14,44,51]

Contributions that warrant inclusion in the Acknowledgments include routine data collection and analysis; editorial or technical review and assistance (without prior or continuing involvement in the publication); peer review; quality assurance; identification and acquisition of funding; equipment, materials, and facilities; provision of unpublished data; computer runs; critical advice; administrative, technical, contractual, and/or logistical support; and general support by supervisors and management who aided or supported the project.[4,14,28,44,51]

In addition to defining the contributions of acknowledgees (nonauthor contributors), the Acknowledgments may also include disclosure of potential conflicts of interest of authors and acknowledgees, including financial interests and relationships; sources of funding and support; explanations of the role of sponsor(s); disclaimer statements, such as

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those now required for clearance of many laboratory's scientific products; and other notices.[4]

As with authorship, written permission should be obtained from individuals before their names appear in print in the Acknowledgments.[4–6,14,16] Similar to contributorship statements and authorship agreements, the publication lead is also responsible for ensuring written permission is obtained, when necessary, from all nonauthor contributors whose names will appear in the scientific and technical product. These agreements should be received in writing and should meet the following requirements:

- The contributor's name, affiliation, and contact information
- The title of the product
- A brief paragraph stating the contributor (1) agrees with the contributions attributed to him or her in the scientific and technical product and (2) gives permission for acknowledgment in the product

Dispute Resolution

Disagreements and conflicts over the assignment and ordering of authors are common because of the incentives and rewards associated with authorship, especially in the case of first authorship. Contributors to the scientific and technical product should first attempt to resolve any dispute over authorship issues themselves, through the careful consideration of the guidance contained in this document. However, if a contributor considers the outcome of this process to be unsatisfactory, the individual may request assistance from management to facilitate resolution. If resolution is unattainable even with the assistance of direct management, the dispute should be elevated one level of management. The publication lead, in consultation with the individuals serving in these management roles, will have the final authority to resolve the dispute. If the dispute involves coauthors from different organizations, management from the involved organizations should be included in discussions to reach resolution.

A number of resources are available to assist in resolving these types of authorship disputes and other issues involving publication ethics, such as those offered by the Committee on Publication Ethics (COPE; publicationethics.org).

Conclusion

Regardless of how carefully and comprehensively prepared, no guidance on authorship will resolve all issues. Rather, authorship guidance should serve as a tool for those navigating the often contentious topic of authorship. Authorship convention is constantly evolving in response to the dynamic nature of publishing within and across scientific disciplines. For example, there is currently little concurrence among journals on how issues such as group, senior, and shared first authorship are handled. As a result, specific guidance on these topics is difficult to find. However, providing recommendations on how such issues might be handled is beneficial in the interim until such concurrence is reached. Final authorship guidance for an organization should be clear and concise but not so overprescriptive as to interfere with an organization's ability to deal with unique authorship situations. And any guidance on authorship should be viewed as a living document that will require periodic updates as new issues are identified and authorship convention evolves.

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Keynote Address: The Poisoner's Guide to Communicating Science

SPEAKER:
Deborah Blum
Director, Knight Science Journalism Program
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Cambridge, Massachusetts

REPORTER:
Peter J Olson
Senior Copyediting Coordinator
Sheridan Journal Services
Waterbury, Vermont

When entering "Chemistry is" as a search term in Google, the decidedly negative words *boring*, *hard*, and *useless* appear as top-tier suggestions to complete the phrase. This indicator of the general public's prevailing attitude toward chemistry epitomizes the challenge scientists face in communicating the importance and relevance of their trade to the average citizen. However, this year's keynote speaker has been steadily crafting a fascinating means to that end.

Deborah Blum, a Pulitzer Prize winner and a one-time chemistry major, made her 2010 book *The Poisoner's Handbook: Murder and the Birth of Forensic Medicine in Jazz Age New York* the centerpiece of a riveting talk about how the combination of nonfiction material and narrative storytelling—a genre known as creative nonfiction—can be a powerful tool for science writers to engage the public in matters of science and help them apply scientific principles to their daily lives. Blum stressed that in addition to a firm narrative structure, every story must have a strong central idea to serve as a pivot point for that structure. Somewhat ironically, her initial attempt to use the pivotal word *Chemistry* in the subtitle of *The Poisoner's Handbook* was rejected by her publisher for fear that its inclusion would result in poor sales. She compromised but only after a debate that exemplified the plight of science writers who are attempting to create what Blum called a "common-sense filter" for society.

Quoting Emily Dickinson's poem "Tell All the Truth but Tell It Slant," Blum noted that an inherently good story should capture a reader's attention—the trick is developing a compelling narrative arc to enhance it. Blum further noted that her goal is to achieve the delicate balance of weaving a suitable amount of science into the fabric of her narrative but not so much that her readers suffer from information overload. Stating that she does not write for scientists but rather for people who have become disaffected toward science, Blum said her aim in writing creative nonfiction is to

Deborah Blum

"pull people toward the campfire" with suspense, dialogue, strong characters, and a narrative arc—components that are critical to any good story.

The Poisoner's Handbook has all of these components in droves. For attendees who had not read the book, Blum

Patty Baskin, Deborah Blum, and Angela Cochran

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recounted a handful of the many actual—and gruesome—criminal investigations in New York City in the early twentieth century that were integral to the birth of forensic medicine and its eventual recognition as a credible and vital field. Using chemistry to unravel the mysteries of poisoning tales both accidental and nefarious, Blum enthralled her modern-day audience in the same way her protagonists, forensic medicine pioneers Charles Norris and Alexander Gettler, ultimately captivated a skeptical public by revealing the science behind the stories.

The good news, according to Blum, is that science writing is experiencing a boom. The Knight Science Journalism Program, where she currently serves as director, is among many organizations that have been focusing on the intersection of science and society in recent years. In response to a follow-up question from CSE president Angela Cochran about overblown reports of scientific studies by the media, Blum said this focus is imperative in an era in which mainstream journalists often report individual studies as singular, significant events rather than as part of a larger, comprehensive process. She added that this culture clash between journalism and science is what inspires the National Association of Science Writers (of which Blum is a member) in their crusade against "single-study reporting" and drives their ongoing dialogue about reporting science responsibly to a disengaged and even distrustful public.

All is not lost, however. Google also suggests completing the phrase "Chemistry is" with the words *life* and *fun*. With journalists like Deborah Blum leading a new wave of science writers, perhaps these terms will one day represent the average citizen's predominant association with science.

Plenary Address: The Leading Edge of Publishing

MODERATOR:
Sarah Tegen
Vice President
Global Editorial and Author Services
American Chemical Society
Washington, DC

SPEAKERS:
Annette Flanagin
Executive Managing Editor
Vice President Editorial Operations
JAMA and the JAMA Network
Chicago, Illinois

Alex Humphreys
Director
JSTOR Labs
JSTOR
New York, New York

Cassidy R Sugimoto
Associate Professor
School of Informatics and Computing
Indiana University Bloomington
Bloomington, Indiana

REPORTER:
Frederic E Shaw
Editor in Chief, *Public Health Reports*
US Public Health Service
Washington, DC

For the 2016 annual meeting, the organizers changed the format of the plenary address to a 90-minute colloquy among three panelists about the leading edge of science publishing. The discussion covered many current topics in publishing. If one theme flowed through the address, perhaps it was *disruption*—continuing disruption of the editing profession, of scientific communications, and of the publishing industry.

The session began with the question "What is the biggest challenge in peer review today?" Annette Flanagin said it was the threat posed by predatory publishers and journals. She mentioned hijacked journals, bogus papers, and nonexistent reviewers. Underneath all these problems, she said, was a rapid increase in the number of science articles being published. "I would argue that many of these articles probably don't need to be published. There are problems with the sheer volume and the fact that some of these articles are of dubious quality and are associated with problems like unrecognized and unmanaged bias and conflicts of interest and just pure shoddy science. Articles with shoddy science are threats to the public trust in science and to the overall scientific enterprise," she said.

The panelists identified bias as another big challenge for peer review, including bias by gender, institutional affiliation, geographical location, celebrity author status, and other forms. Flanagin cited studies showing bias is ubiquitous. Although you cannot really avoid all bias, she said, you can be transparent about it, recognize it is there, and try to educate editors and reviewers about it.

The discussion then shifted to publishing metrics. Cassidy Sugimoto reflected on journals' continuing preoccupation with impact factors. Journals cling to impact factors even though they recognize impact factors can cause distortions in science. She argued that journals should think about more nuanced ways to assess the value of what they do. New research is finding ways to better assess scientific communications, she said, such as sophisticated composite indicators that encompass not just scientific citations but social media, news impact, and many other metrics.

Alex Humphreys talked about JSTOR Labs, where he and his colleagues work with partners in the community to develop new tools and products for research and teaching. A big issue for JSTOR is choosing which products deserve development time and resources. The old way was to simply ask users what they want and then build it. Humphreys called this the "product death cycle" because, by the time you have built the product people said they wanted, either the need has changed or you find what they wanted wasn't really what they needed. This can lead to a product that isn't useful. To make useful products for JSTOR, Humphreys said he must focus not on what people say they want but on what users' problems are. He must test products in development with users, early and often, to ensure the products are really solving the users' problems. This has allowed his lab to build many interesting products, such as a mobile app that makes it possible to take a picture of any page of text to find articles in JSTOR on the same topics.

An audience member asked about differentiating between "posted" and "published," triggering a discussion about preprint servers and Sci-Hub. Humphreys said he thinks Sci-Hub is a symptom of the bigger problem of access to scientific content. Access is heterogeneous across the world, and everything we have done to improve it has had little effect on equitable distribution. Users still need to jump through hoops to access content they have a right to, especially on mobile devices, he noted. Flanagin agreed that publishers make it very hard to obtain content and even to let people know a lot of content is available for free. Sugimoto agreed, too, that Sci-Hub is a symptom of inequitable access: many users are not in the developing world but are North Americans who use Sci-Hub to more easily locate content to which they already have access.

When asked about the role of mega-journals, Flanagin said they are a potential threat. Mega-journals work on a different business model than other journals. For example, a

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mega-journal can publish tens of thousands of papers each year and have a 60%–70% acceptance rate. A big question is how users will be able to manage the sheer volume of this content. Sugimoto suggested that more tagging of content and more metadata could provide signaling to help readers find the content they need. Crowdsourcing also has a role as a way to bring the most salient content to the surface, she said.

The final question was, "What is the biggest disruptor in publishing?" Flanagin pointed to her cell phone and commented, "I think this little iPhone thing has been the biggest disruptor." Although scholarly publishing has existed for about 360 years, the iPhone has existed for only nine years. "This little disruptor," she said, "and the mobilization of our content, have driven more change than anything else." The next big disruptor is the "multimediazation" of scientific publication, when we go from being able to review scholarly content on a tiny screen to serving our short attention spans with snippets, tweets, key points, audio and video summaries, infographics, and cartoons. The good news for us, she observed, is that you cannot have all this without a foundation of structured scientific research articles and databases.

When Humphreys thinks of disruption, he worries about how diffuse the system of scholarly publishing is and about its ability to grapple with the big changes coming from enormous companies such as Amazon, Google, and Apple. Scholarly publishing is ripe for a disruption even bigger than Sci-Hub, he stated.

What will all this continuing disruption mean for CSE? According to Flanagin, "at least in the near future, this means we'll still be coming to a CSE meeting—for the next 10 years or so. After that, I'm not so sure."

Emerging Standards: Data and Data Exchange in Scholarly Publishing

MODERATOR:

Tony Alves
Director of Product Management
Aries Systems
North Andover, Massachusetts

SPEAKERS:

Jeffrey Beck
Technical Information Specialist
National Center for Biotechnology Information (NCBI)
National Library of Medicine
Bethesda, Maryland

Jay Henry
Chief Marketing Officer
Ringgold Inc
Portland, Oregon

Jennifer Lin
Director of Product Management
CrossRef
Lynnfield, Massachusetts

Heather Pierce
Senior Director of Science Policy and Regulatory Council
Association of American Medical Colleges
Washington, DC

REPORTER:

Michael Di Natale
Business Systems Analyst
Aries Systems Corporation
North Andover, Massachusetts

For this session, moderator Tony Alves brought together a knowledgeable group of professionals from several organizations. The group discussed new initiatives that addressed several challenges, including standardizing conflict-of-interest reporting, easily identifying funding sources, clarifying contributor roles for research papers, and managing institution disambiguation.

Jeffrey Beck, who has been involved in the PubMed Central project since it began in 2000 and is a co-chair of the Journal Article Tag Suite (JATS) Standing Committee, began the session with a JATS history lesson. He explained that JATS is a National Information Standards Organization (NISO) standard that grew out of the preexisting National Library of Medicine (NLM) standard, which began in 2003 and carried forward until the NLM 3.0 release in 2008, after which the working group for the NLM was dissolved and a new group started development on JATS. For the uninitiated, he explained that JATS defines the elements and attributes used in XML as markup language, whereas the DTD defines the order elements must appear in the XML in order to validate.

Beck stressed the importance of a JATS in supporting article interchange. JATS serves as a common language and allows users to simplify the reuse of their content. According to Beck, whether data are flowing to or from a vendor, the process is smoother when using a standard others already know.

The next speaker, Jennifer Lin, also spoke to interoperability of data as she reviewed CrossRef's heavy use of scholarly metadata exchange. CrossRef collects metadata through its repository and propagates it to many other systems. The common schema provided by JATS allows the data to easily flow in and out of the CrossRef database and be reused for a variety of needs. Lin cited CrossRef's Open Funder Registry initiative as an example, noting that funding data become easily searchable with unique, disambiguated funder identifiers (IDs). The funder IDs and grant numbers will flow downstream into the CrossRef database and be available for search and through an open application programming interface. Lin noted CrossRef's database is the only central source of standardized funding acknowledgments from publications.

Lin also discussed CrossMark, which allows publishers to provide access to all of the metadata associated with a paper through a publisher's web platform. More than 15 million views have been logged since the service launched.

Ringgold's institutional name database, Identify, and the associated Ringgold IDs were discussed next. Jay Henry stated that identifiers are the foundation of good data and noted that Ringgold has built a stable and up-to-date database with Identify that is focused on places, including centers of research, funders, and universities. Ringgold IDs allow for easy interoperability between otherwise siloed systems and Identify helps provide context for the institution in the form of additional metadata.

The Ringgold ID itself is not a NISO standard, but it has emerged as an accepted persistent identifier. Henry indicated that Ringgold IDs are mapped to existing standards (International Standard Name Identifier) and hierarchies make the identifier vital to organizations looking to link authors and institutions as accurately as possible.

The final presenter was Heather Pierce, discussing the creation of Convey, a global financial disclosure system from the Association of American Medical Colleges. Convey provides a repository for records of financial interests and allows individuals to disclose them to any organization that uses the system. The intention is to advance a streamlined and standardized system that also allows organizations to

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tailor the disclosure process to obtain the information they need.

Pierce sees the key benefit of Convey being realized the second time an individual makes a disclosure, when he or she begins with the financial information saved in the system. Organizations using Convey each have a specific disclosure process so individuals would determine which information goes to the one organization and which to another. Only the user would have access to his or her personal repository of disclosure information, and he or she would be in full control of what they disclose to an organization.

Implementing Standards: Data and Data Exchange in Scholarly Publishing

MODERATOR:

Tony Alves
Director of Product Management
Aries Systems
North Andover, Massachusetts

SPEAKERS:

Michael Di Natale
Business Systems Analyst
Aries Systems
North Andover, Massachusetts

Gabriel Harp
Senior Product Manager
Cell Press
Cambridge, Massachusetts

Susan King
Executive Director, Rockefeller University Press
Chair, CHOR Inc
New York, New York

REPORTER:

Colleen M Sauber
Editor and Instructor, Scientific Publications
Mayo Clinic
Rochester, Minnesota

Acronyms in scholarly publishing continue to proliferate. The initiatives they stand for represent the increasing interchange of scientific data and publishing support, transparency, and availability. Information collected during manuscript submission is translated into identifiers in standardized formats readable to digital systems. Information about funders of an author's research, for example, could be shared and the author's work tracked and recognized.

Speakers in this session assured attendees that the arrival of these and other systems is helping establish standards that benefit authors, journals, and the science community. Such systems can remove the "need to reinvent the wheel for each separate process," one speaker noted.

Susan King, Executive Director, Rockefeller University Press, and Chair of CHOR Inc, reported that nonprofit CHORUS, born in 2013, was built from existing infrastructure and standards, including those of CrossRef Open Funder Registry and ORCiD. The open-access policy-agnostic service currently comprises 46 publishers who work with 6 agencies, including the National Science Foundation and US Department of Energy.

CHORUS, a suite of services and best practices, assists agencies and publishers in providing public access to published articles about funded research in the United States. Publishers collect funding details from authors during submission, and Rockefeller University Press journals mine acknowledgments to capture this information in a standardized format. CHORUS presents metadata and links through DOIs to the full text on publishers' websites. Its search application allows users to find the latest research articles through agency portals and common search engines.

King stressed that active engagement with each federal funding agency is important. For the agencies, CHORUS supplies email alerts and establishes a dashboard application that assists the monitoring and reporting of funders and publishers. It enables ingestion of bibliographic, funder, and license information to enrich agency portals.

Next, Gabriel Harp, Senior Product Manager at Cell Press, spoke about CRediT, a cross-organization initiative that involves academic institutions and funders, among others. Harp echoed what various presenters cited during the conference: The number of authors per manuscript has increased markedly. "The traditional author list does a poor job in conveying what each of these people has done," Harp said. CRediT was created to address the fact that author lists cannot fully convey the complex and varied contributions that go into a scholarly work.

Harp explained the CRediT taxonomy of contributor roles (used primarily for biomedical and life sciences). After an initial workshop in 2012, the taxonomy was piloted on recently published papers in 2013. In 2015, Cell Press added CRediT to its author guidelines, encouraging but not mandating that authors use the taxonomy. Cell Press now mandates that authors provide a contributions statement near the Acknowledgments section. This statement is "a simple flat paragraph of text," Harp said. "In the long run, we want to go way beyond that." In fall 2015, Cell Press surveyed the first 100 papers that used CRediT. The 38 respondents recognized CRediT's potential value for standardization, and 76% found CRediT useful in accurately reflecting authors' contributions.

Today, ORCiD is building CRediT into its registry, Harp reported. Next steps are "sharing our learning with others; surveying authors who have chosen not to use CRediT; and to begin tagging the CRediT roles in the article XML."

Finally, Michael Di Natale, Business Systems Analyst at Aires Systems, described his company's endeavors with JATS (Journal Article Tag Suite). JATS is run in Aries's Editorial Manager (EM) for web-based manuscript submission and peer review and in ProduXion Manager, its production tracking tool. It sends and receives data during submission, facilitates manuscript imports from sister publications, and delivers

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editorial files to a third-party production system and to other services, including vendors. In this way, JATS can respond to multiple needs for data portability during publishing and beyond and can be a standard for data exchange.

JATS supports ORCiD, Ringgold Institution IDs, and CrossRef, soon to be joined by CRediT, in a machine-readable arrangement in XML format for article metadata. JATS can import submission files from journals not in the EM system, possibly moving the submission to an open-access journal. Thus EM can communicate with any system that supports JATS. Di Natale explained the details of JATS XML include the corresponding author's name, address, and affiliation; ORCiD and Ringgold ID data; coauthors' information; funding information through CrossRef; and manuscript metadata, including title, sections, and supplementary pieces.

Editorial and Publishing Questions—Data Informed Solutions

MODERATOR:
Jill Jackson
Manuscript Processing and Publishing Administrator
American College of Physicians
Philadelphia, Pennsylvania

SPEAKERS:
Esmeralda Buchanan
Senior Director, Journals and Books Publishing
American Cancer Society
Atlanta, Georgia

Brittany Campbell
Marketing Manager
Proceedings of the National Academy of Sciences
National Academy of Sciences
Washington, DC

Kerry Kroffe
Senior Editorial Manager
PLOS ONE
San Francisco, California

Jeanette Panning
Assistant Director, Publications Programs
American Geophysical Union
Washington, DC

Sarah Tegen
Vice President, Global Editorial and Author Services
American Chemical Society
Washington, DC

REPORTER:
Tony Alves
Director, Product Management
Aries Systems Corporation
North Andover, Massachusetts

This session was a series of six "lightning talks" that focused on how various organizations, with varied and diverse constituencies, use data to make tactical and strategic decisions. Each presenter focused on a practical, work-related question.

Jill Jackson, Manuscript Processing and Publishing Administrator at the *Annals of Internal Medicine*/American College of Physicians, started by asking the question, "Are my users my customers?" Jackson showed that by looking at how *Annals of Internal Medicine* content was accessed, they could determine if users were also paying customers. *Annals* learned that approximately 40% of people accessing content were paying customers, while 60% of people were users accessing free content, such as guidelines or abstracts. High usage is important because it brings exposure to *Annals* content and other products. In order to learn more about these users, *Annals* would need to require users to sign in for access to free content or drive the users to download the application. Both actions would provide more information about the user.

Esmeralda Buchanan asked the question, "Should we increase the frequency of publication and page budget?" Using the American Cancer Society's journal *Cancer Cytopathology* as a case, Buchanan discussed what kind of data they regularly review and how those data influenced their decision-making process. By recognizing that the time to first decision was increasing and the acceptance rate was going up, it was determined that it might be a good time to think about increasing the size of this high–Impact Factor journal. The American Cancer Society then looked at how long the publishing process was, where rejected papers were going, whether editors could recruit more papers if needed, and what the financial data looked like. In the end the data showed that they could increase frequency to monthly, increase the page budget from 436 to 672 per year, and add two new article types.

Brittany Campbell asked the question, "How can we reach our audience on social media?" Campbell presented statistics showing that the *Proceedings of the National Academy of Sciences* has 57,110 Facebook likes (average gain, 1,300/month) and 41,300 followers on Twitter (average gain, 1,300/month). The goal was to use social media to drive traffic to PNAS.org, increase awareness of Front Matter content (http://frontmatter.pnas.org/), engage with authors and readers, and add value for authors by promoting their research. Facebook and Twitter offer rich data and analytics, which were used to evaluate the effectiveness of their postings. Analytics can help answer who and where your audience is and inform your goals.

Kerry Kroffe asked the question, "How do I determine the most effective reminder strategy to ensure the most efficient peer-review times?" For *PLOS ONE*, the largest peer-review journal in the world, obtaining reviews on time is a major undertaking. Kroffe described the reviewer reminder process, which includes a reminder three days after an invitation and several reminders before and after a review is due. PLOS looked at various factors that might predict which reviewers might be late or fail to return a review. For reviewers who had to be reminded of an invitation, 52% failed to submit and 77% were late. They also looked at the effect of extending reviewer deadlines. Although 50% of reviewers who received an extension submitted on time, it only increased on-time performance by 3%. Finally, PLOS looked at data to see if it was worth waiting for a late review. Although 81% of late reviewers submitted within 10 days of their due date and just 6.6%

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submitted after 30 days, a specific cutoff timeline could not be determined. They concluded that extensions did not necessarily help performance.

Jeanette Panning asked, "Who in the world is accessing our publications, and how do we target them?" Panning stated that the goal of the American Geophysical Union was to expand into growing markets. To do this, they had to determine where those markets were and what they are most interested in. Using full-text download data, they recognized that China, Japan, and Brazil represented the most potential for growth. In both China and Japan, they used social media to draw attention to titles and topics of interest, translated materials, held workshops, supported travel to meetings, and expanded the editorial board. Similar efforts are ongoing in Brazil. The American Geophysical Union is also examining gender bias in peer review and will be using similar methods to engage women to serve as editors and reviewers.

Sarah Tegen asked, "How can I use data to understand the editorial and production strengths and weaknesses of my journal compared with competing journals?" Tegen discussed various performance metrics and how to use them to make decisions. Metrics examined by the American Chemical Society include acceptance rate, time to decision, geographic distribution, and various quality measurements. Data are particularly useful when trying to encourage editors to modify behavior. The American Chemical Society also evaluates production performance, such as time to publication, downloads and citations, open access purchases, and compliance with mandates. Tegen pointed out that these metrics are useful for improving performance and identifying gender and geographic biases. The American Chemical Society also compares its metrics against those of the competition. For example, when the American Chemical Society tracked where rejected manuscripts ended up, they learned that there was an opportunity to launch a new open-access journal.

These six presentations touched on several ways data analysis is being used today to support major publishing initiatives. Publishers have access to a variety of data collected through their submission systems, online platforms, social media outlets, and marketing departments. Interviewing authors, reviewers, editors, and readers is also a rich source of information. All of these data can be used to improve performance and quality, reach new markets, and build new brands.

Insights and Strategies for Career Development

MODERATOR:
Mary K Billingsley
Managing Editor
American Academy of Child and Adolescent Psychiatry
Washington, DC

SPEAKERS:
Lauren Fischer
Deputy Managing Editor
JAMA Network
Chicago, Illinois

Tom Lang
Principal
Tom Lang Communications and Training International
Kirkland, Washington

Rajashree Ranganathan
Manager, Journal Production
American Society of Civil Engineers
Reston, Virginia

REPORTER:
Erin Russell
Assistant Editor
Canadian Medical Association Journal
Ottawa, Ontario, Canada

This session delivered insights and traditional and non-traditional strategies for career development from editorial, production, and freelance perspectives.

Lauren Fischer has worked for the JAMA Network for 17 years—she started as a manuscript editor and has recently been promoted to deputy managing editor. She kicked off her presentation by announcing "*There is no game plan!*" when it comes to career development. Although there may be no game plan, Fischer provided the audience with a number of useful suggestions for career advancement from the more traditional (e.g., join a professional organization, keep up with technology) to the less traditional (e.g., organize happy hour). Three key points from her talk were

- Learn the hard stuff, and your colleagues will think you're a genius. "It's important that you give yourself permission to be the authority on a given emerging topic" (e.g., copyright, conflicts of interest, statistics, ethics, legal issues).
- If you're ever asked in a job interview, "If you have a style question you don't know the answer to, how would you solve it?" do not answer, "Ask my manager." Fischer implied she would not consider hiring anyone who gave this answer.
- In work, as in life, it's important to have a big-picture view. Specifically, it may help to see things from your boss' perspective. His or her goals are different from yours and anything you can do to help your boss will not go unnoticed.

Rajashree Ranganathan has been with the American Society of Civil Engineers for 10 years and has worked her way from production editor to journal production manager. To excel in the field of production, she acknowledged that a candidate requires certain hard qualifications (e.g., academic qualifications, experience, technical skills), but equally important are the soft skills such as personality, earnestness, and adaptability. Although we all know to list our hard skills in our resume, employers are just as interested in our soft skills, which should be highlighted in a carefully worded cover letter.

As communication and collaboration are key to successful journal production, Ranganathan's team hosts an annual production workshop at which all staff members contribute presentations on assigned workflow topics. This gathering leads to better understanding of what colleagues are working on and can even help to improve efficiencies. The workshop is so popular that this year they plan to invite associated departments to discuss editorial issues, such as peer review. Ranganathan concluded her presentation with an image of a tree branch and urged the audience to reach out and grow: "Growth is not always vertical; do not discount lateral growth."

Whereas Fischer and Ranganathan addressed insights and strategies for career development in a large, structured work environment, Tom Lang was invited to discuss career development when you're "on your own." For the past 17 years, he has been principal, Tom Lang Communications and Training International. Those of you who work for medical journals may be familiar with his book, *How to Report Statistics in Medicine*. Lang echoed the sentiment of the earlier presentations that it is important to let yourself evolve: "Instead of looking for specific career advice, consider developing qualities that will prepare you to take advantages of opportunities as they arise," he said. As an independent consultant, Lang provided some useful tips for marketing oneself:

- What you call yourself makes a difference; who makes more money, freelancers or consultants?
- You're not in the writing and editing business. You're in the "make-the-client-look-and-feel-good" business.
- Stay current.
- Network, network, network.
- Underpromise and overdeliver.

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He reminded us of what we know to be true of all consumers: "Clients only buy two things: Solutions to problems and good feelings."

Moderator Mary K Billingsley opened the floor to questions, and members of the audience all seemed to have the same questions:

1. My team is constantly pressed for time. How do you make time for professional development?
2. My organization does not really value development. How can I push the leadership team to make it more of a priority?

In response, the speakers sympathized with these common predicaments (lack of time or support). Fischer and Ranganathan noted that development does not have to require as much time as you might think and an initial investment in professional growth serves well in the long run. Lang suggested employees find a way to pitch the development opportunity to their employers as either a solution to a problem or a good feeling. Billingsley reminded the audience it is important for employees to demonstrate return on investment. For example, be sure to tell your employer all of the great things you learned at this CSE annual meeting!

Think. Check. Submit.—The Impact of Predatory Journals and How to Identify Them

MODERATOR:
Ken Heideman
Director of Publications
American Meteorological Society
Boston, Massachusetts

SPEAKERS:
Nick Shockey
SPARC and Right to Research Foundation
Washington, DC

Charlie Rapple
Kudos
Oxford, United Kingdom

Donald Samulack
President, US Operations
Editage/Cactus Communications Inc
Trevose, Pennsylvania

REPORTER:
Darren Early
Senior Director of Journal Editorial and Production Operations
American Society for Nutrition
Rockville, Maryland

The session's first speaker, Nick Shockey, reviewed the open-access movement and its various initiatives and organizations in the context of predatory journals. He explained that the Scholarly Publishing and Academic Resources Coalition (SPARC), a library membership organization with members primarily in the United States and Canada, is working to make research more available. He also mentioned the OpenCon 2015 meeting and the fact that more than 2000 individuals have participated in OpenCon meetings; OpenCon is devoted to open access, open education, and open data. He referred to John Bohannon's *Science* article "Who's Afraid of Peer Review?", which found that a spoof manuscript received little or no scrutiny at many open-access journals. He noted that the Directory of Open Access Journals has recently begun removing journals from their directory if they have not submitted all required information. In their *BMC Medicine* article "'Predatory' Open Access: A Longitudinal Study of Article Volumes and Market Characteristics," Shen and Björk found that most authors publishing in predatory open-access journals were from Africa and Asia, where academic pressure to publish in international journals is intense. Shockey pointed out how that result dovetailed with the fact that most signatories to the San Francisco Declaration on Research Assessment are institutions in North America and Europe; in Africa and Asia, evaluation of researchers on the basis of the impact factors of the journals in which they publish is still the norm. The Open Access Academy and Why Open Research? are two projects devoted to helping authors learn about open access. To the question "What makes a journal predatory?" Shockey responded that there are multiple factors, including insufficient peer review, questionable marketing practices, and fraudulent editorial board members.

Charlie Rapple began her presentation by asking how researchers know who the good guys are. She stated that predatory journals can give all journals a bad name and make authors suspicious of all publishers. She mentioned Jeffrey Beall's list, which identifies predatory journals, and Cabell's, which has a white list identifying reputable journals but plans to launch a black list also. The bulk of her presentation, however, was focused on Think. Check. Submit.—an initiative launched in September 2015 to help researchers identify trusted journals. She explained that this was necessary because more research was being published, new journals are being launched every week, up-to-date guidance can be hard to find, and stories of misconduct and deception are increasing. Publishing in a predatory journal can have the following negative implications for authors: the journal has a lower or no profile among the researchers' peers, which can lead to fewer citations; a paper may not be indexed or archived; the author may have a poor publishing experience; and the author's reputation may be damaged. Rapple then explained the initiative's components. The "Think" component involves asking whether you are submitting to a trusted journal and whether it is the best journal for your work. The "Check" component consists of asking a number of questions on the checklist about the journal and publisher, such as "Can you easily identify and contact the publisher?", "Is the journal clear about the type of peer review it uses?", and "Is it clear what fees will be charged?" Publishers should ask themselves the questions on the checklist, because Rapple has found that some reputable journals do not satisfy all the checklist criteria. Authors should submit to a journal only if they can answer "yes" to most or all of the checklist questions. Publishers can help the initiative by including a link to thinkchecksubmit.org from their websites, blogging about the initiative, including information about the initiative in their information for authors, mentioning the initiative in workshops, and adding information about the initiative in electronic tables of contents.

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Donald Samulack's presentation focused on the broader problem of predatory and irresponsible commercial services being targeted to authors. He explained that predatory and irresponsible practices now permeate every facet of the "axis of publication." These practices include editorial-board solicitation, peer-reviewer solicitation, manuscript solicitation, and predatory author services such as manuscripts for sale. Samulack's personal call to action on this issue began with Jeffrey Beall's blog post "Is This a Paper Mill?", which exposed a seemingly sophisticated but predatory author services website. Further investigation by Editage revealed that the website and associated sites were offering to write theses, provided scholarly recognition certificates, had questionable nondisclosure agreements, and had irregularities with respect to web traffic (Pakistan) and payment processing (Dubai). He also mentioned scipaper.net, which is a Chinese site for buying manuscripts and authorship. Another example of predatory practices is the existence of hijacked and look-alike journals. Fake impact factors and misleading practices are other problems. For example, names such as "International Scientific Indexing" and "International Scientific Institute," which have the same acronym ("ISI") as the old acronym associated with the Thomson Reuters impact factor, can be used to confuse authors. To counteract these predatory practices, the Coalition for Responsible Publication Resources (CRPR) was formed; their website is www.rprcoalition.org. Individuals can also pledge to publish ethically via the Editage website (www.editage.com/pledge-to-publish-ethically). The Alliance for Scientific Editing in China is also taking steps to counteract predatory practices. In addition, in response to the recent wave of retractions of papers from China that involved third-party peer-review fraud, the China Association of Science and Technology has launched a "5-don't" policy for Chinese scholars, which stipulates that third parties should not write, submit, or modify the scientific content of manuscripts; that authors should not provide false peer-reviewer information; and that a manuscript's author list be limited to researchers involved in the research itself or the writing of the manuscript. The CRPR is attempting to make sense of all the predatory activity and provide authors and CRPR members with transparency, discoverability, and accountability of publication resources.

Building a Better Mousetrap—New Models of Peer Review

MODERATOR:
Michael Casp
Production Services Coordinator and Director of Business Development
J&J Editorial
Cary, North Carolina

SPEAKERS:
Annette Flanagin
Executive Managing Editor and Vice President
Editorial Operations, *JAMA* and The JAMA Network
Chicago, Illinois

Andy Collings
Executive Editor
eLife
Cambridge, United Kingdom

Trish Groves
Head of Research, *The BMJ*
Editor-in-Chief, *BMJ Open*
London, United Kingdom

REPORTER:
Brit Stamey
Client Manager, Copy Editor
J&J Editorial
Cary, North Carolina

Annette Flanagin opened the session by presenting an overview of both the process of peer review itself and the many "flavors" of peer review: double blind, single blind, and open. The presentation provided an overview of the history of peer review as well as the purposes (assessing quality, evaluating scientific soundness, detecting flaws) and weaknesses (unfair, slow, inefficient, expensive) of traditional peer review. She also discussed studies that have shown very few differences in quality between double-blind, single-blind, and open peer review, although some have found that double-blind reviews may better manage some biases.

Flanagin also described the variations within open peer review in particular (including optional open peer review, prepublication open peer review, and postpublication open peer review), as well as evolving practices and services surrounding the peer-review process, such as postpublication commenting, collaborative peer review, and portable or cascading peer review (i.e., rejected manuscripts and their reviews are shared with another journal within a group of journals). Another important point Flanagin touched on was the evolving ways journals choose to recognize the service of peer reviewers, including publicly listing reviewers, providing them with free journal subscriptions, and annual best reviewer awards. Some newcomers to this group are publicly compiling reviewer statistics, using ORCID to track reviewer activity, and providing citations for published reviews.

Andy Collings presented *eLife*'s variation of peer review, one he said was driven by their desire to make the peer-review process less painful for authors and to decrease the need for authors to return to the lab based on peer-review results. Collings also believes many journals are working toward making the peer-review process more efficient and effective, which allows room for both improvement and experimentation. As a result, *eLife* has developed a peer-review process that shares reviewers' names and comments with one another and also enables them to share their names with the authors if they choose.

The reviewers' discussions take place on the site, overseen by the editors, while the paper is in peer review. The whole process takes longer, but the reviewer comments are more constructive as a result, and this helps explain why most papers at *eLife* only have to go through one round of revisions. Once a paper is published, the decision letter is published online with the paper, along with the authors' responses, and reviewers can choose to remain anonymous to the author if they wish (although the reviewers will be known to one another based on their discussions during the peer-review process). In an attempt to encourage this process to remain open, *eLife* changed the wording of the question about whether reviewers wanted to be anonymous to authors to an encouraging paragraph explaining the process. After the change in wording, they saw a 10% increase in reviewers agreeing to share their names with the authors.

Groves ended the session with an anecdote about open peer review in the real world: *The BMJ* chose to disclose (with permission from all parties) the four reviewers' comments on a paper they had rejected, along with an explanation of their decision to reject, after the authors took their rejection to the tabloids claiming the reviews had been biased. In fact, the reviewer they had most thought would be biased against them turned out to have returned a positive review; the journal had been flooded with submissions about the same topic and this paper had simply not been a standout among so many similar papers.

Now, more than ever, the publishing industry has the ability to experiment with how the peer-review process works and with what works best for each particular journal and within individual fields. These presentations show the future of peer review will only continue to develop more "flavors" in the future.

Mind the Gap: Gender Disparities in Leadership Positions in Scholarly Publishing

MODERATOR:
Lauren Kane
Chief Operating Officer
BioOne
Washington, D.C.

SPEAKERS:
Angela Cochran
Director of Journals
American Society of Civil Engineers
Reston, Virginia

Ken Heideman
Director of Publications
American Meteorological Society
Boston, Massachusetts

Louise Page
Publisher
PLOS
San Francisco, California

Charlie Rapple
Sales and Marketing Director
Kudos
Oxford, United Kingdom

REPORTER:
Jessica LaPointe
Managing Copy Editor
American Meteorological Society
Boston, Massachusetts

Identifying the Problem

This well-attended session began with Lauren Kane showing pie charts about the gender distribution in scholarly publishing: Only one-third of scholarly publishers have a female CEO and only one-fifth have a female board chair. The industry is about 60% female, yet the top leadership positions tend to be occupied by men.

Angela Cochran noted data from a Society for Scholarly Publishing survey showed most people who work in scholarly publishing are white women, and there are broad disparities in gender, race, and country of origin. Louise Page remarked that the age of an organization makes a difference: newer organizations tend to be more progressive, but the structure of older organizations can help provide opportunities and a clear pathway for advancement. In newer organizations, the lack of structure requires staff to forge their own career trajectories.

Ken Heideman noted with surprise that there were very few men in the room and felt that was emblematic of the topic under discussion. In his own profession of meteorology, Heideman outlined the progress that has been made in recent years: it was overwhelmingly male when he was in college but there have been improvements, at least at the undergraduate level, where the split now is about 50–50 between men and women. The gender disparity in meteorology, Heideman explained, arises at the graduate level: women enroll in graduate studies at a much lower rate than men. As he pointed out, this results in the loss of "a whole cohort of women" in meteorology.

Cofounder of Kudos Charlie Rapple confessed she would not have joined this panel a few years ago because she did not notice the gender gap problem. She didn't identify as a feminist when she was younger, but now she's noticed gender disparities in her profession. She came to realize she was being paid less than men doing the same or lesser work and noticed the keynote speakers of conferences she attended were always male.

Forging a Career Path

Cochran's career path resulted from a mixture of happy accidents, including relocating several times for her husband's career; she luckily found jobs in the various new cities and fell into a managing editor position with a journal focused on cancer research. Cochran encouraged women seeking advancement to consider changing jobs because many women never receive the salary increases they deserve when they have worked at a company for a long time. Women are often paid less than men when they are hired, and so a promotion might net only a 5% salary increase. But, she said, "If you leave your job and return, you can command a higher salary."

Page told how she launched the first online medical journal and through that experience learned a whole new skillset, which she leveraged into a new job. Her advice for managing career advancement follows from her experiences: "If someone trusts you to do something new; give it a try. What matters is who are you influencing, who listens to you."

Work–Life Balance

To manage work–life/family balance, Rapple said employers must have very clear policies regarding maternity leave, and they should be generous with benefits (such as flexible schedules) to retain staff. Men also deserve support when they need to be primary caregivers. Rapple urged successful women to "Be the mentor you would have wanted as a young worker, and encourage female members of your team to think strategically about their careers." She also counseled women to be realistic about planning family life after a baby

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and stressed that having sufficient support is essential. All participants spoke about the difficulty of balancing maternity leave and the demands of a new baby with their desire to return to work. Page advised new mothers to be honest with themselves and their employers about what they can handle, both physically and emotionally. Kane brought up the need to care for aging parents and reiterated that employers must provide flexibility to keep employees happy.

Mentoring New Talent

As for the solution to gender disparities in leadership positions, Rapple argued that employers should factor gender disparity into hiring decisions. She and Cochran agreed on the necessity of giving staff practical experience in project management. Cochran emphasized the need to prepare women for more responsibility and taking on leadership positions when they become available. Organizations benefit from creating a job pool of qualified candidates to promote from within. Managers can identify people with talent and help foster that talent to build a qualified job pool.

A concern was raised that mentorship opportunities are available for early-career women, but similar support for mid- to late-career women is lacking. Rapple wondered if, because females are conditioned from such a young age not to aim for higher leadership positions, mid- to late-career women may have already chosen not to pursue leadership roles.

Cochran spoke about the field of civil engineering, echoing Heideman's remarks about meteorology: Women go to school for it, but many don't stay in the industry very long. Only about 18% of civil engineers are women. It has been assumed women are choosing instead to start families. In reality, women may leave the field because they are not given opportunities to gain the experience they would need to take leadership positions in their organizations. Cochran said she is often the only woman at the journals' editorial board meetings, and although engineers talk about "diversity," they mean different types of engineers, not always women or people of color.

More Women = Lower Pay?

An audience member brought up a recent *New York Times* article that addressed the fact that, as women begin to work in formerly male-dominated industries, salaries drop.[1] The question was whether salaries in publishing are low because it's a female-dominated profession. Kane enthusiastically responded that this is her current field of inquiry. She said the article's findings are not surprising, because early research into scholarly publishing organizations' financial data showed that women were paid about 80% as much as men. Page said that PLOS takes a proactive stance toward salary equity by using salary bands so they are more equitable. To women in the audience, she admonished, "Know your worth! You have to go out and find what a comparable salary will be at another organization." Kane agreed that women must advocate for themselves and consider moving on to other jobs to maximize their salary options.

One audience member mentioned that a lack of respect from colleagues affects the way women are treated by other staff members. Building on this comment, Rapple reiterated that, in her experience, women do not ask for raises. Men do ask for raises, and, unlike women, they feel comfortable expressing dissatisfaction with their salaries, and the gap only gets worse outside the scholarly publishing world. Rapple said at some events she attended with her staff, they were the only women present (other than the wait staff), and other attendees talked only to their male colleagues.

Publishing's Lack of Diversity

Finally, an audience member asked, "How do you address the fact that publishing is overwhelmingly white?" Cochran agreed that more should be done to attract an increasingly diverse workforce. For example, the American Society of Civil Engineers has a diversity council that addresses how to work together on teams and how to respect other cultures. She said it's important to embrace the diversity that does already exist and also to figure out how to attract a diverse pool of applicants. Organizations should put more efforts into diversifying racially and ethnically because everyone benefits from having a more diverse staff. Kane agreed: "The organizations that have a more diverse workforce will be the ones that thrive in the future."

Reference

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Communicating Science with Integrity, Effectiveness, Humor, and More: Some Highlights of the 2016 AAAS Annual Meeting

Christina B Sumners, Abdulaziz Tijjani Bako, Omar Fabian, Iveliz Martel, Roberto Molar-Candanosa, and Barbara Gastel

The 2016 annual meeting of the American Association for the Advancement of Science (AAAS), held 11–15 February in Washington, DC, included many sessions wholly or in part on communicating science. In keeping with the meeting theme, "Global Science Engagement," some emphasized communication spanning nationalities, disciplines, or sectors. The following are highlights of sessions that may especially interest science editors and those in related realms.

Using Humor to Address Serious Topics
By Iveliz Martel

People usually think of science humor as "corny jokes with bad delivery," said Amy Bree Becker of Loyola University. She explained, however, that coverage of science in political satire can help change that perception and spark interest in science. Research has shown that viewers of political satire programs such as *The Daily Show* and *The Colbert Report*—which include more science than traditional news broadcasts do—pay more attention to issues in science, technology, and the environment, she said. Becker also stated that coverage of climate change in political comedy, for example, is a useful source of climate education. "We need to encourage scientists to speak about science in comedy outlets," she concluded.

Brian Malow, curator at the North Carolina Museum of Natural Sciences and stand-up comedian, gave scientists tips on using humor when communicating science. "Be yourself, be human—and hopefully those are not mutually exclusive," he joked. "Be passionate, be present, and be prepared." Tools he identified for scientists to use in communicating science include analogies, quotations, slides with humor, and visual elements. But "do not try to be a comedian," he emphasized.

Chris Duffy, host of the show *You're the Expert* on Boston's National Public Radio station, WBUR, noted that he specifically asks scientists interviewed on his science humor program not to try to be funny. Making jokes is the role of the comedians on the show, who generate humor by asking scientists "dumb questions," Duffy stated. He said these questions may represent those of people in the audience who feel ashamed to ask things that may seem trivial. In contrast, "comedians don't fear people laughing at them, comedians want people laughing at them," he said. "I also tell scientists, 'We are not making fun of you. The joke is not how weird it is that you study this, the joke is how crazy it is that we don't know this.'"

Peer Review for Public Trust
By Abdulaziz Tijjani Bako

Compared with other fields, science is self-correcting and self-policing. Nevertheless, a lack of reproducibility and outright misrepresentations of scientific findings exist. One safeguard against these shortcomings is peer review. The speakers in this session explored the utility of peer review in maintaining quality, integrity, and trust in scientific findings.

Drummond Rennie, founder of the International Congress on Peer Review in Biomedical Publication, provided a historical overview of peer review. He noted that initially, the credibility of a scientific finding largely depended on the trustworthiness of its author. Later, science began assigning credibility based on peer review and reproducibility. Today, Rennie noted, "even a fake journal cannot exist without advertising its rigorous peer-review process." He further stated that in the face of growing enthusiasm for peer-review in the recent years, its future "is going to be completely fascinating." However, he cautioned that this enthusiasm

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will be worthless "unless peer review is studied, reported, and published."

To improve the peer-review process, Carole J. Lee of the University of Washington proposed that the scientific community promote a culture of credibility, openness, and transparency among authors. This "crowd mentality," she said, will mean that authors find it "increasingly costly not to conform to standards in the face of competitors who do."

Richard Nakamura, director of the Center for Scientific Review at the US National Institutes of Health, noted that despite the strengths, its peer-review process can benefit from improvement. He said any alternative to the current peer-review process must, among other things, be impervious to gaming, be unbiased, and demonstrate high levels of efficiency and performance.

Going Public: How Science Communicators Can Break Through the Noise
By Christina B Sumners

At this session, the panel offered perspectives on how to convey information in a world with increasingly competitive demands for audiences' attention. "For science to be effective, it has to be communicated," said Arthur Lupia, of the University of Michigan, "and the challenges to effective science communication are greater now than they've ever been." He suggested that speaking to people's core values or aspirations is a good way to get their attention.

Barbara Kline Pope, executive director of communications, National Academy of Sciences, discussed her experience creating narrative pamphlets about the value of the behavioral and social sciences. She emphasized the importance of considering the audiences' previous knowledge and experience. "We fail because brains aren't empty vessels waiting to be filled," she said. Research done to create the most effective pamphlets showed that three narrative elements—value, metaphor, and exemplar—are important for communicating science. More specifically, showing science as contributing to progress, innovation, and ingenuity (all concepts the audience already values) was very effective, as was framing the practice of science as creating maps and solving puzzles.

Marshall Shepherd, professor of atmospheric sciences, University of Georgia, said that too many scientists are comfortable only with the "ivory-tower" communication style of journal articles and scientific conferences. Although establishing one's scientific credibility through these channels is important, researchers also need to learn a different style to communicate with the public, he said. One of the most vital skills is getting to the point first, he said, instead of giving a long introduction as in a scientific paper.

Can Your Lifestyle Make You Older or Younger? Metaphors for Communicating Chronic Risks
By Christina B Sumners

David Spiegelhalter, professor for the public understanding of risk, Cambridge University, presented this lecture. He began by explaining that it is relatively easy to determine the risk of a specific, one-time activity—sky diving, for example. The *micromort* is a unit of acute risk that corresponds to a 1-in-a-million chance of sudden death, and it equals the risk of simply going through a day. Historical data show that about seven of every million tandem jumps end in fatality, meaning sky diving presents about a seven micromort risk. In other words, jumping out of a plane is only about as dangerous as living through the average week.

Chronic risks are more difficult to quantify. Using the recent example of the headlines when the World Health Organization's cancer agency classified processed meat as a carcinogen, Spiegelhalter critiqued media coverage of the risk. Many news articles confused absolute and relative risk, making the danger of eating bacon every morning seem far greater than it was.

Spiegelhalter suggested using metaphors that apply population risks to the individual to communicate chronic risk. For example, people respond to the metaphor of their "real age," which is their chronologic age adjusted for lifestyle choices, thus making them effectively "older" or "younger."

Another effective metaphor is losing or adding time. A risk associated with a 1% decrease in life expectancy could be equated with losing about 15 minutes every day. Such a metaphor is useful for conveying the severity of a risk because research shows that people care less about losing years off their lives than they care about losing minutes in their days.

Aligning Publishing Incentives with Research Transparency and Integrity
By Barbara Gastel

In science, the drive to publish can undermine rigor and transparency in research. For example, researchers sometimes publish only "exciting" results, providing a distorted view of the findings. Speakers at this session and a preceding news briefing discussed ways to counter this problem.

Brian Nosek, of the Center for Open Science (a nonprofit company), described software his company developed mainly to help scientists manage their workflow but that also can help make scientists' work more public. Nosek advocated preregistering various types of research much as clinical trials are now preregistered, so the full scope of research undertaken is known; he said his company will

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issue one thousand $1000 awards for publishing results of preregistered research. In closing, he called for "technology to enable change, training to enact change, and incentives to embrace change."

Marcia McNutt, editor-in-chief of *Science*, said that whereas some journal policies benefit readers and some benefit publishers, we are entering an era emphasizing policies that benefit science and the scientific community. She then focused on the TOP (Transparency and Openness Promotion) guidelines, which emerged from a 2014 workshop and which over 500 journals have endorsed. These guidelines, she noted, include eight standards, each of which have four levels of stringency.

Arthur Lupia, of the University of Michigan, commented that to maintain legitimacy and credibility, science must commit to greater transparency. Initiatives he noted in this regard included Data Access and Research Transparency in political science. Like Nosek, he called for better instruction and more incentives to promote transparency and integrity.

Fostering Integrity in Science: An Action Agenda
By Barbara Gastel

Copies of the newly released book *Doing Global Science: A Guide to Responsible Conduct in the Global Research Enterprise* greeted those arriving at this 8 AM Sunday session. The session then focused on this book and related themes.

Indira Nath, of India, who co-chaired the international committee that developed this book, spoke first. She explained that the book was a project of the InterAcademy Partnership, a recently established entity bridging some 130 academies of science from throughout the world. She said the book, which includes scenarios, is intended largely for use in education and training. In discussing ways to prevent irresponsible behavior, she said that "fostering mentorship is a key mitigation strategy."

The remaining three presentations dealt more broadly with fostering integrity in research and publication. Pieter Drenth, of the Netherlands, who also served on the committee that developed the book, discussed three theories of why people breach integrity norms in research: that of the bad apple, that of the bad barrel, and that of the bad barrel maker. He then identified countermeasures based on each. Robert M. Nerem, of the Georgia Institute of Technology, noted a forthcoming US National Academies report on integrity in science. He also discussed use of cases in teaching about this realm. C. K. Gunsalus, of the National Center for Professional and Research Ethics, listed sets of factors contributing to problems in research integrity. She called for a mindset that demands integrity rather than emphasizing winning.

Doing Global Science is available online at *www.interacademycouncil.net/24026/29429.aspx*. Print copies can be obtained from the Princeton University Press.

Geojournalism: Telling the Story of Science with Data, Maps, and Sensors
By Omar Fabian

A new kind of environmental journalism is rapidly emerging. Flourishing in the era of big data and data visualization, geojournalism is helping journalists tell stories about the impacts of environmental changes faster and on a much larger scale than ever before. "It's tremendously exciting," said James Fahn, executive director of the Internews Earth Journalism Network and moderator of this session. "We've come a long way."

Twenty years ago, when Fahn was reporting on air pollution in Thailand, he and his colleagues had almost no means of collecting air-quality data themselves. They found it difficult to discern environmental patterns in areas extending farther than they could physically reach. Today, with the help of the Internet, powerful computer processors, and commercially available electronic sensors, geojournalists such as Fahn can better overcome the problem of being unable to "see the forest for the trees." Quite literally in some cases.

Speaker Matt Hansen, a remote-sensing scientist at the University of Maryland, helped launch an interactive forest monitoring and alert system called Global Forest Watch. This online system enables users—journalists, scientists, and government agencies alike—to generate custom maps and analyze trends in forestation and deforestation in their local area or worldwide. Users can even sign up to receive near–real-time text alerts of forest disturbances. "The idea," Hansen said, "is to have journalists report on disturbances almost as soon as they happen—not in 1 or 2 years."

Another way this data-driven approach is transforming environmental journalism is by providing much-needed context. William Shubert, program officer, Earth Journalism Network, put it like this: In reporting on a forest fire, a journalist might feature a dramatic image of flames and smoke engulfing a woody landscape. Although arresting, the image doesn't tell the whole story. By aggregating data gathered on the ground and in the air, geojournalists can place their stories within the appropriate geographical and political contexts.

Effective Science Communication Strategies: Overcoming Your Expert Blind Spot
By Roberto Molar-Candanosa

Dennis Schatz, of the Pacific Science Center in Seattle, Washington, felt completely confident about his teaching skills when he taught college students. He used graphs with dots moving up and down to illustrate a star's lifecycle. But once a

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student came up to him, puzzled after failing to spot "moving" stars in the sky. "I went, 'Wow, here I am talking about an abstract point on a graph, and they have taken it [to mean] a physical movement,'" Schatz said. He had been teaching without paying much attention to how his students learned.

Suzanne Gurton, of the Astronomical Society of the Pacific, joined Schatz in helping scientists strengthen their communication skills at the session "Effective Science Communication Strategies: Overcoming Your Expert Blind Spot." Gurton and Schatz led exercises, dividing the audience into groups of two to play roles of students and teachers. The exercises involved "teachers" instructing "students" to draw abstract shapes on paper—no questions or feedback allowed from students. "This is kind of the worst-case scenario, where you are simply talking at your students," Gurton said.

During the exercise, the most helpful "teaching strategy" consisted of using analogies to describe the abstract shapes. Gurton emphasized, however, that scientists should use analogies that most readers will understand. A baseball analogy might not work for people who don't know about baseball, for example.

The "students'" inability to ask questions hindered communication, and the "teachers" found the lack of feedback troubling. Gurton said that when feedback is limited, scientists should observe body gestures. And if possible, they should ask questions, too.

The next AAAS annual meeting will take place 16–20 February 2017 in Boston, Massachusetts. The theme will be "Serving Science through Science Policy".

The Value of Copyediting: An (Un)Necessary Evil?

Jessica LaPointe

When it comes to copyediting in scholarly publishing, there are two main schools of thought:

1. It is an essential part of the publishing process that adds substantial value to the finished product.[1]
2. It is unnecessary and injects an unacceptable time lag into the publishing process.[2]

There is also a third opinion that splits the difference between the first two:

3. Copyediting does improve the quality of the finished product and is appreciated by some readers, but it is inessential and most readers (and authors) neither notice nor care whether an article has been copyedited.

Copyediting falls under the wide umbrella of "scholarly publishing activities" that encompasses many things the average author, reader, or member of the public takes for granted.[3] On the one hand, we editors like it that way: if a reader doesn't notice the quality of the copyediting in a given article, it means we have done our jobs. Copyediting is like air: it's not given much thought unless it is of poor quality or missing altogether (and sometimes not even then; see point 3 above). On the other hand, this invisibility makes it all too easy for the work that goes into copyediting to be dismissed and the value it adds to the finished published product to be denied.

> ***...if a reader doesn't notice the quality of the copyediting in a given article, it means we have done our jobs.***

All types of writing benefit from being checked by multiple sets of eyes. Most of us have had the startling experience of handing an article, white paper, or résumé over to a trusted friend or advisor for feedback only to get it back with corrections of errors we simply did not see.

JESSICA LAPOINTE is the managing copy editor at the American Meteorological Society. She is also the copy chief for *Science Editor*.

"I can't believe I missed that!" is a feeling most writers would recognize. It is not that every writer is sloppy or careless. A writer who has been working on a manuscript for a while stops noticing the little things. It takes a fresh pair of eyes (ideally belonging to someone who is not personally invested in the content or at the very least hasn't yet read the material) to catch the spelling, grammar, and punctuation mistakes that a writer cannot see. But when authors have already poured so much time and effort into their writing, they may have trouble seeing the value copyediting adds to their work.[4]

What Copyeditors Do

"The purpose of copy editing is not to detect serious flaws in theory, methodology, analysis or interpretation—that is the responsibility of peer review—but simply to make a paper more consistent and readable."[5]

In addition to editing for spelling, grammar, and punctuation, copyeditors apply the publisher's or the journal's house style, which is usually based on a combination of reputable dictionaries and style guides, and is often strongly influenced by tradition as well as the standards of the particular industry or discipline. Through proof queries and occasionally over email, copyeditors work with authors to make sure their writing fits the publisher's or the journal's style and includes all the necessary information readers rely on: citations, references, footnotes, and the like. Copyeditors enforce certain standards to ensure the material can be easily understood by its intended audience, which may include students and educated enthusiasts as well as professional scientists. They also help authors connect with their readers by enhancing the readability of published content: for some authors, English is not their native language, and copyeditors use their knowledge and experience to polish the text of a paper so it reads clearly and smoothly. High-quality copyediting ensures that published papers are easily readable and citable, while retaining the author's intended meaning.

Why it Matters

"Applying uniform style guides also aid[s] readers while occasionally revealing problems in a manuscript."[3]

As science editors, we know how crucial it is to maintain a reputation for accurate, authoritative information our readers can trust. Thorough copyediting makes for a consistent, first-rate experience for the reader. Consider

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the following sentence from a meteorologist's column on a major metropolitan news website: "The forecast for the rest of the month only gived southern New England about 25 percent of the normal rainfall we would expect."[6] The glaring spelling error detracts from the quality of the writing, and an otherwise informative article appears less authoritative as a result.

Scholarly publishers face tight budgets and ever-increasing pressure to publish more articles faster than ever, and copyediting is often one of the casualties when the ideals of high-quality publishing hit the hard realities of less time and less money. But copyediting adds substantial value for the authors, readers, and publishers. Fred Vultee's lab experiment[7] demonstrated that copyediting can improve an author's writing such that it appears "significantly more professional, more organized, and better written"[8] than unedited material. For readers, copyediting improves the clarity and readability of the material while ensuring all sources are properly cited so they can be easily found for further study. For publishers and journals, good copyediting helps uphold professional standards to maintain their reputation as an authoritative source for quality publications.

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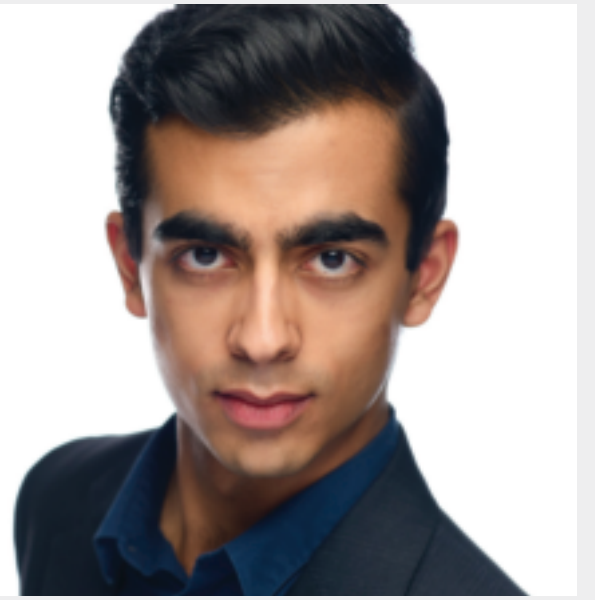
Member Profile: Rahul Arora, 2016 CSE Scholarship Recipient

By Erin Russell



Rahul Arora

Rahul Arora boasts an outstanding résumé as a science editor, scholar, and researcher, which is all the more impressive considering he only graduated high school a year ago. He is currently a student editor at the *STEM Fellowship Journal* (http://journal.stemfellowship.org/journal/sfj), which is dedicated to the publication of high school and undergraduate student research. Last March, when he first heard of the initiative, Arora contacted the journal's Editor-in-Chief, CSE member Dr. Sacha Noukhovitch, to see how he could contribute. The editorial team published their first issue in July 2015.

Although publishing is a relatively new interest for Arora, he has always been interested in science. He is currently enrolled in a bachelor of health sciences (honours) degree in biomedical sciences at the University of Calgary in Alberta, Canada, and is a member of the university's Scholars Academy. This summer, under the supervision of Dr. Tien Phan, he is conducting a retrospective review of inflammatory breast cancer patients in Alberta.

Arora is a passionate advocate for equal opportunity and the eradication of poverty. He has volunteered more than 500 hours to help Calgary's homeless. In high school, he served as a youth volunteer group leader for both the Salvation Army and the Calgary Drop-in & Rehab Centre Society.

Aside from studying, editing science, and generally making the world a better place, Arora is an avid reader. He has just finished reading Atul Gawande's *Better: A Surgeon's Notes on Performance*. When asked what advice he might offer someone interested in biomedical communication, Arora suggested those looking to enter the field seek out a mentor to help them navigate the publication landscape and inform them of opportunities (e.g., the CSE Scholarship). STEM Fellowship is looking to provide a formal mentorship program in the future, targeted at students interested in scholarly publishing, including both writing and editing. They recently offered an internship program at the University of British Columbia Pacific Centre for Isotopic and Geochemical Research.

Arora is grateful to CSE for the scholarship that allowed him to attend the 2016 annual meeting in Denver. CSE is equally fortunate to have him as a new member; he has some great ideas for how we could better connect to students, as evidenced by his presentation to the Membership Committee meeting in Denver.

Member Profile: Sheryl Vaz, 2016 CSE Scholarship Recipient

By Kuntan Dhanoya and Sheryl Vaz

KD: What is your educational history (for example, college major or minor)? Did you always want to work in publishing or science?

SV: I was born and brought up in Mumbai, India, and have completed my school and college education here. I earned my master's degree in geology from St. Xavier's College, Mumbai. After obtaining my degree, while I was looking for jobs I came across Crimson Interactive, where I applied for the position of a research editor. Since I did not have any background in the publishing industry, I did some research about the company before applying and found it to be very interesting. When I joined Crimson, I started off as an academic research editor and I haven't looked back since. This is the place where I began understanding the different functions of this industry, the different perspectives involved, and the magnitude of the scope of research.

KD: What is your current job title and responsibilities?

SV: I am a quality analyst with Crimson Interactive, and my main responsibilities involve monitoring the quality of in-house editors and training new editors. Additionally, I manage the quality of files delivered to the clients, ensuring that a high-quality output is delivered. In the case of client dissatisfaction, I also provide appropriate solutions and next steps to ensure quick redress of the issue and client delight.

KD: What career path led to your current position?

SV: I began my career in the field of research editing with Crimson as a research editor in 2013. I have worked and am working with some wonderful people who have helped me throughout my tenure as an editor. Quickly enough, I excelled in this role, so I moved on to work on my managerial skills. After being an editor for a year and a half, I was offered the role of a quality analyst at Crimson in 2015. This role has helped me stay in touch with my editing skills and impart the knowledge I have gained to my peers, along with developing newer skills like that of managing work, people, and time.

KD: What do you like most about your work and what challenges do you face?

Sheryl Vaz

SV: I love the dynamic environment. Every day presents new challenges and several learning opportunities. The senior management is very helpful. I have learned a great deal from my senior manager, Anupama Kapadia, and team manager, Shailesh Jain, who have mentored me in more ways than one. They have always encouraged me to look at the issues from multiple perspectives so that I can come up with the most appropriate solution. My teammates and peers from other teams have also played a vital role in my progress here at Crimson. I am really grateful for such a friendly work environment; it helps take the stress off things, considering that I work in such a fast-paced setting. I love helping other early-career professionals in the research editing industry by training them to become professional editors and reviewing their work. Furthermore, I enjoy conceiving various quality management techniques for these editors.

KD: What skills, abilities, and personal attributes are essential to success in your job/this field?

SV: Some skills are innate, while some I developed after joining Crimson. Some of the essential skills/personal attributes according to my experience are sincerity;

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readiness to accept feedback, good or bad; time management; stress management; understanding multiple perspectives; being a team player; being open to learning; good verbal and written communication skills; ownership; and keeping oneself up to date about industry standards.

KD: If you hadn't pursued work in scientific publication, what might you be doing?

SV: I would have surely pursued a career in the oil and gas industry as a petrographer or sedimentologist, if not publishing.

KD: Tell me about your non-work interests. Do you have any hobbies or belong to other organizations? What do you do outside the office?

SV: I am an avid reader and a trekking enthusiast. I enjoy doodling, singing, karaoke with friends, and dancing as well. I love traveling and visiting new places, and I am quite excited about my first international trip to the United States.

KD: What are you currently reading or watching that you would recommend?

SV: Recently I read some of the works of P.G. Wodehouse and enjoyed them immensely. I am currently reading *The Hitchhiker's Guide to the Galaxy*. When it comes to what I am watching, I am a big fan of hand-to-hand combat and so I love watching the miniseries *Daredevil*, although I haven't read the comics. I recently finished watching season 2 of the series and would recommend it to those who are hand-to-hand combat fans.

Member Profile: Julie Vo, 2016 CSE Scholarship Recipient

By Kuntan Dhanoya

Julie Vo

An English-language instructor and an international traveler, Julie Vo brings years of experience in language and communication to her current role as the editorial coordinator of the *STEM CELLS* journal at AlphaMed Press. She currently manages the preproduction process from submission to peer review to file exportation and works with the lineups, press releases, ethical concerns, and author queries.

After graduating from Colorado College with a bachelor's degree in history (and a focus in premedicine studies) and a minor in Asian studies, Vo lived abroad for five years teaching English as a second language to children, college students, and adults in South Korea, China, and Turkey. On asking Vo what career path led her to the STM industry, she answered, "While I didn't always know I wanted to work as a science editor, I guess you could say my educational background in science and the humanities did lead me here. I also was a student editor for a departmental newsletter; the interest in publishing began there on campus."

Shortly after moving to Durham, North Carolina, Vo joined AlphaMed Press as the editorial assistant for *The Oncologist*, where she worked on the editorial team and learned about the peer-review process. About a year later, she was promoted to editorial coordinator for *STEM CELLS*. "I really enjoy working with authors around the world in helping to get their important work expertly reviewed, published, and shared in our international forum on stem cell research and development. Each accepted article adds to the ever-growing literature on this rapidly advancing field, with novel findings working to treat disease." The challenges Vo faces in her role relate to balancing her time between day-to-day tasks to keep the journal running smoothly and staying up to date with new mandates, policies, and guidelines in her field to maintain research integrity.

She advises beginners in the field to be detail oriented, organized, and good team players. "While I am still a newcomer to biomedical communication, what has worked for me is to take chances and to be a team player to make the most of any given experience. I have learned a lot from my colleagues simply by helping with different projects. Being exposed to the different facets of publishing has helped me find my own professional interests."

Vo is thankful to CSE for the scholarship. "I felt very appreciative and became motivated to learn more about the organization. Having just returned from an informative first annual meeting, I can only speak of the helpful sessions and great new colleagues I met—thank you for exchanging stories and cases from your day jobs, as it has instilled confidence in what I'm doing as a newcomer to the field."

Her non-work interests include traveling, photography, hiking, gardening, volunteering, reading in Chick Lit Book Club, and playing kickball. As far as recommending what to read or watch, Vo exclaimed, "Well, isn't everyone already watching and/or reading *Game of Thrones*?"