Guest Editor

by Barbara Meyers

Ch-ch-changin'

Change is not a new concept, so my thoughts may be considered the products of a "Joanie-come-lately". But they reflect 30 years of intense personal and professional awareness of change as much more than a constant brought up to make some point in a conversation. Like our colleagues in evolutionary biology, I believe that change is as essential to life as air and water—that change needs to permeate the organizations of the world as well as its organisms.

My involvement in scholarly communication dates back to the early 1970s. By 1976, I was working at Capital Systems Group just outside Washington, DC, on a multi-year National Science Foundation–sponsored project: a looseleaf publication titled *Improving the Dissemination of Scientific and Technical Information: A Practitioner's Guide to Innovation*. Affectionately called "The Innovation Guide" or "The Blue Book", because it was distributed in a deep blue binder, it was intended to report through irregular updates on the cutting-edge advances in communication from writing to reading. I arrived at the start of the second round of interviews with the major players in the industry.

Thus, I had the privilege of meeting and interviewing the change agents of scholarly communication at that time, such as Peter Adams, Richard Belknap, Michael Bowen, Lawrence Buckland, Mark Carroll, Robert Day, Anita DeVivo, Elwood Gannett, Jack Goellner, Karl Heumann, Wilfried Lancaster, Ethel Langlois, Rita Lerner, James Lufkin, Paul and Royce Mack, Robert Marks, Kenneth Metzner, Fred Spilhaus, David Staiger, Seldon Terrant, George Trigg, and Paul Zurkowski. These were the people who moved production from hot metal to cold type, who developed the first major abstracting and indexing services, and who were the first wave of managers to address the challenge of the impact that computers would have on the full range of functions in the publishing process.

A *new* challenging aspect to coping with change today is related to the pace—the tempo—the speed at which change occurs. The slower change is, the easier it is to adapt to and accept. Originally, changes in how people communicated moved so slowly that thousands of years elapsed between milestones. Then about 500 years or so ago, the pace picked up, and there were just hundreds of years between major advancements. That coincided with the invention of movable type; the first printed book was followed only 200 years later by the first journals. Then change accelerated to only decades between major advancements. Roughly 50 years ago, it quickened from decades to mere years. Dramatic innovations were occurring annually, and now, as Seth Godin comments in his latest book, *Survival Is Not Enough*, "change is the new normal."[1]

To appreciate the speed of change we now encounter, we need to stop and take a breath. We must recognize that in just 3 decades, a mere 30 years of the nearly 4500 since papyrus was used in 2400 BC, we have moved from a world of merely atoms (the single medium based on a paper format) to a world of atoms and bits. Our current age embraces many media—paper, digital, audio, video—and who knows what's next and when?

Let us focus on the move in publication and other communication from a world of merely "atoms" (ink on paper) to a universe of "atoms and bits" (as noted by Nicholas Negroponte of the MIT Media Laboratory in *Being Digital*[2]). Wilf Lancaster in his article "The Evolution of Electronic Publishing" noted that "electronic publishing can be considered to have evolved gradually over a period of about 30 years, passing through the following stages:

1. Use of computers to generate conventional print-on-paper publications
2. The distribution of text in electronic form, where the electronic version is the exact equivalent of a paper version and may have been used to generate the paper version
3. Distribution in electronic form only but with the publication being little more than print on paper displayed electronically. Nevertheless, it may have various 'value added' features . . .
4. The generation of completely new publi-

cations that exploit the true capabilities of electronics."[3]

Please think of publications you work with or use as you review Lancaster's list. The "value-added" features that he refers to in stage 3 include searching, data manipulation, and alerting (through profile matching) capabilities. In stage 4, Lancaster includes hypertext and hypermedia, electronic analogue models, motion, and sound as complete exploitation of electronic capabilities.

As Lancaster notes, the "actual evolution is not easy to depict since all of the steps now coexist (that is, the fourth phase of the evolution is already in place, but the first phase has not disappeared.)" In fact, that is a major reason that the management of changes in scholarly publishing is so challenging.

Linda Beebe and I noted in our white paper "The Future of the Print Journal"[4] that the consensus is that to serve the entire global marketplace in the near term, scholarly publishers must provide their information in all available formats. That will continue to be a strain for many years, not just in terms of current information, but for archiving efforts as well.

As they begin to join to manage change, publishers, editors, librarians, booksellers, subscription agents, and aggregators all recognize the need for a "duality of print and electronic products" for the foreseeable future. How many years the "foreseeable future" covers is debatable. Many of us expect it to span the remainder of our careers.

In 1981 I wrote an article espousing the concept of "a new mindset for new media".[5] In it I reviewed the elements and issues involved in our decision-making about electronic publishing. For many of you this list should be familiar; it includes the following

- appropriateness of subject matter
- timeliness
- culture of your discipline (degree of comfort with technology)
- volume (amount of information)
- scope (editorial coverage)
- function (How will the information be used?)
- discipline (What factors are peculiar to each discipline's use of information?)
- frequency of use
- importance of browsability and serendipity
- format enhancements
- marketing
- user education
- new vendors and new partners
- pricing
- new mindset

When asked to update that article for *Internet Publishing News* in 1996,[6] I changed little, because little had really changed—not in technology, but in how publishers viewed information and their business. Now, at the beginning of the 21st century, publishers are beginning to recognize that we are not in the business of just making books or journals. Those are containers. We are in the business of creating information and knowledge. And we distribute that information—via atoms or bits.

A way to help shift one's mindset about the new technologies is to recognize the need to internalize change and accommodate innovation. Clayton Christensen wrote a book called *The Innovator's Dilemma*[7] that describes how good companies fail, not because of bad management but because of the inability to deal with innovation that doesn't follow a traditional path. These are what Christensen calls "disruptive innovations".

For the scholarly and scientific communication communities, the invention of the computer—and its application to publishing, which necessitated the move from merely ink on paper into the current paper-plus-digital age—has been the ultimate disruptive innovation. By comparison, Gutenberg was a lightweight.

We had less than 2 years of warning before the World Wide Web altered our view of the world, how we communicate with each other, and how we go about retrieving information. Are you ready for the next change? It may come tomorrow.

References

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Selected Dates in Scientific Publishing and Related Realms

1665	First scientific journals published: *Journal des Scavans* in France and the *Philosophical Transactions of the Royal Society* in England.
1743	First learned society established in the United States: American Philosophical Society.
1836	Library of the Army Surgeon General (forerunner of the National Library of Medicine) established.
1838	First US peer-reviewed journal, *Proceedings of the American Philosophical Society*, published (quarterly).
Late 1880s	IMRAD (introduction, methods, results, and discussion) format for journal articles initiated.
1887	Hygiene Laboratory (forerunner of the National Institutes of Health) begun.
1937	National Cancer Institute, the first modern NIH institute, established.
1946	ENIAC (first digital computer) invented.
Late 1940s	Growth in scientific journals explodes after World War II.
1957	First professional society for science editors in the world, the Conference of Biological Editors, created by an initiative of the National Science Foundation and the American Institute of Biological Sciences.
1958	Institute for Scientific Information (ISI) founded by Eugene Garfield.
1969	Internet born.
1971	MEDLINE established.
1972	ANSI Z39.16 IMRAD standard ratified.
1985	*Psycoloquy*, first online peer-reviewed journal in the social sciences, begun as the *PsycNET Newsletter* in April 1985.
1989	First international biomedical peer-review congress held.
1990	First online preprint Web site in the sciences (originally *xxx.lanl.gov*) created by Paul Ginsparg.
1997	PubMed created at NIH.
1999	PubMedCentral established.