Timelines provides perspectives on HCI history, glancing back at a road that sometimes took unexpected branches and turns. History is not a dry list of events; it is about points of view and differing interpretations.

Jonathan Grudin, Editor

Journal-Conference Interaction and the Competitive Exclusion Principle

Jonathan Grudin
Microsoft Research | jgrudin@microsoft.com

Each biological species occupies a unique ecological niche—usually. Occasionally one species invades another's niche, arriving as a stowaway on a boat, in a tourist's luggage, floating on a log, or crawling across a newly formed land bridge. What happens when two species occupy the same niche? Biologists agree: One is soon gone.

We are witnessing such a struggle. Not among the organizational creatures called disciplines, but among their watering holes, research communication channels. Digital technology has introduced many new species, new avenues for disseminating research results. In the past, disciplines relied on a mix of monographs, journals, conferences, and portfolios. Today these have been joined by YouTube videos, TED talks, online and print mass-media articles, specialized workshops, Gladwell-esque books, blogs, and microblogs.

In this essay, I focus on the two central communication channels of the science and engineering disciplines: journals and conferences. Dozens of *Communications of the ACM* articles have proclaimed a crisis in the conference/journal ecology or addressed aspects of it [1]. Understanding this is a key step in getting a handle on the broader issues affecting our publication culture. I also consider the proliferation of specialized workshops and speculate about a different species that could emerge to fill a niche that has been vacated.

Two Essential Niches for Any Discipline

Two critical activities for any field are to produce work that is respected and to build and maintain a professional community. Communication is central to both. As noted here, a wealth of channels is available, including books, journals, conferences, and professional magazines such as *interactions*.

We will use the metaphor of ecological niches to identify the places where quality research is identified and where community building takes place. Different channels occupy these niches in different fields. In the humanities, such as history, a book is considered the pinnacle of high-quality research. The arts emphasize portfolio and reputation. Most science and engineering disciplines favor journal publication.

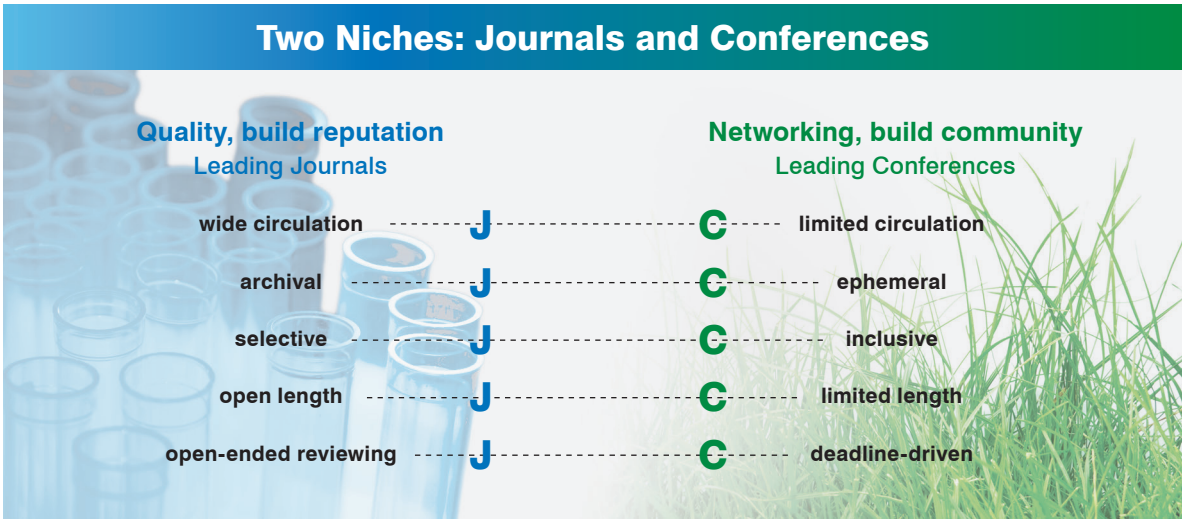
Each discipline and subdiscipline settles on a range of specific venues to achieve its purposes, creating a unique ecosystem. The ecosystems are complex. The list

of channels could be refined to include leading journals, lower-tier journals, and journal special issues; international, regional, and lower-tier conferences; newsletters and professional magazines; a broad array of symposia and workshops; and a variety of invited talks and tutorials. Results are also communicated through academic and professional tutorials and courses, in review processes, including grant reviewing, and in informal discussions around meetings and over the Internet.

Fields of computer science such as AI and human-computer interaction have more avenues for making an impact; because everyone is affected by the ever-broadening symbiotic relationship of people and their digital creations, everyone has an opinion. A TED talk or YouTube demo can draw a million viewers; should this divert us from producing articles that are cited by a dozen people? Mainstream-media citations appear more prominently in our CVs. Research issues from other areas of computer science are less tractable to the public, but serious professionals in all fields put effort into blogs and social media postings; massive open online courses (MOOCs) are another avenue for amplifying one's impact.

Here, I set aside the broader issue of how we might strive to

Photograph from the decoded conference



have an impact and focus on journal and conference publication. The ecological niche metaphor helps capture the changes that have come about in their roles and the consequences of these changes.

The figure above identifies factors that have long defined and delineated critical niches of scientific activity. Over a century ago, journals were invented to circulate results widely and archive them. The existing scientific meetings and correspondences did not achieve these goals. Conferences could establish that a field had formed, but conference content was shared only with those present at the event. An 1896 address to the British Library Association noted, "Periodicals exist to disseminate information; but they also exist to record it."

Many early journals were not much more than pamphlets. Reviewing was generally absent, even in the British Royal Society's *Philosophical Transactions*, arguably the first modern journal. "Philosophical robbery," now called plagiarism, was rampant. Over time, selectivity through reviewing became standard for leading journals. This is the third item in the figure above that distinguishes the journal niche from the conference niche: Conferences were—and in many fields still are—highly inclusive, creating opportunities to congregate and hear about work not yet ready for journal publication. Conferences assembled and extended a community.

In pursuit of quality, journal article length was not tightly controlled, and journal review processes were generally open-ended. In contrast, conferences placed limits on the length of presentations, and on the length of written contributions when they were included. Conferences were subject to deadlines; journals typically supported less deadline-oriented reviewing. This completes our contrast of the two niches at the heart of the sciences and engineering. This also describes computer science through the 1970s. Then things changed.

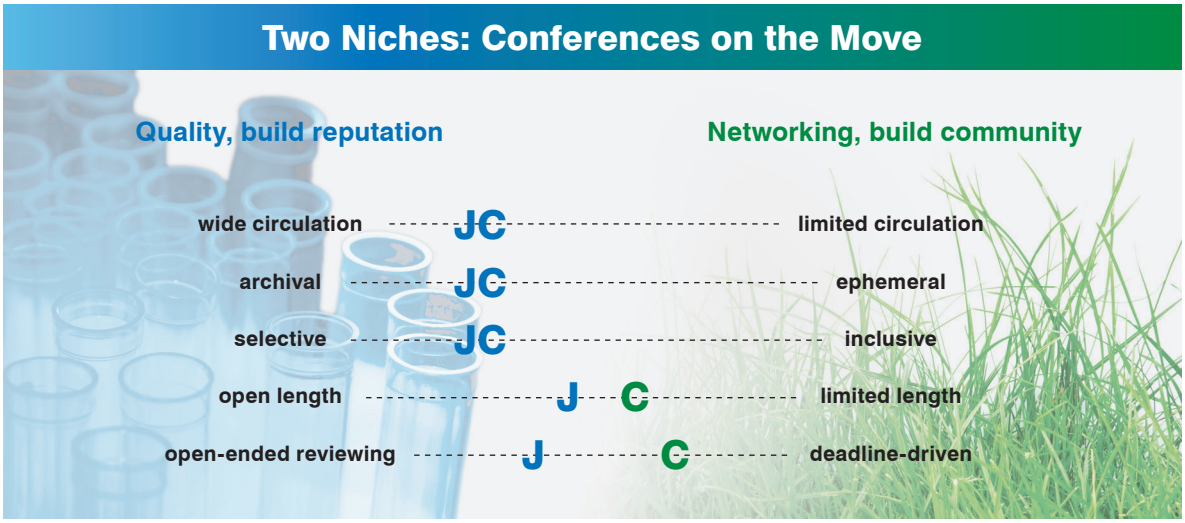
Journal-Conference Interaction in Computer Science

In 1999, three senior American computer scientists published a two-page memo in *Computing Research News* titled "Evaluating Computer Scientists and Engineers for Promotion and Tenure" [2]. They noted that experimental computer scientists preferred to publish in selective conferences rather than journals, "at variance with conventional academic publication traditions." Rapid turnaround outweighed the disadvantages of "significant page limitations and limited time to polish the paper," they wrote, concluding that "conference publication is both rigorous and prestigious."

This essay certified a change that had already occurred. U.S. computer scientists had been shifting their focus to selective conferences since the 1980s. By the end of the millennium, graduate students with no journal publications were hired as faculty at top universities. As editor of the journal *ACM Transactions on Computer-Human Interaction* at the time, I frequently heard from colleagues that "journals are irrelevant."

Rapid turnaround was not the fundamental reason for the shift. Other sciences with equally fierce time pressures did not shift to conferences as a repository of quality research results. Nor did computer science in Europe or Asia. For decades, the conference orientation remained a North American phenomenon. Only now are selective computer science conference papers achieving significant status in other countries and some other disciplines.

What caused the change in the U.S.? By the early 1980s, computer scientists had text editors or word processors. Proceedings of decent production quality could be assembled at relatively low cost prior to a conference. ACM saw an opportunity to market proceedings to libraries and ran off more copies than were needed by attendees.



Surplus copies were available by mail order at very low prices—essentially at cost. This continued through the 1980s and 1990s. In 1997, the ACM Digital Library was launched and quickly expanded to include all past conference proceedings as well as journal issues.

The journal monopoly on wide circulation and archival status was broken! The first two characteristics of journals—which had led to their invention in the first place—were suddenly met by selective conferences in the mid-1980s. Outside North America, with no ACM equivalent, proceedings were not archived, and authors had to retain a journal orientation.

Dominoes began to fall. To manage the cost of producing proceedings, and to make them more marketable to libraries, pressure grew to be more selective and increase quality. Selectivity was promoted in other ways. Computer science burgeoned throughout the 1990s; researchers who were fond of small, single-track conferences used selectivity to avoid or limit the need for parallel sessions at conferences, thereby retaining a shared-conference feel in the face of increasing submissions.

Recognition of the rise of conferences was signaled in the late 1980s, when both ACM and IEEE dropped a long-standing policy: Until then, conference papers could be republished verbatim in journals. Once both conferences and journals were widely disseminated and archived, republication seemed to be "self-plagiarism" and an unnecessary expense. By barring republication, ACM and IEEE elevated conferences to equal footing with journals. This also discouraged publication of less-polished work in conferences, since minor enhancement would not be enough to merit journal republication.

Rejection rates increased. Pressure grew to be fair, to review rigorously, and to provide feedback. Today, some selective conferences have lower acceptance rates than the leading journals in their field. *The third feature distinguishing journals and conferences was gone!* Neither was inclusive.

As indicated in the figure above, the remaining distinctions are also eroding. Conference papers lengthened as fonts shrank and page lengths increased. The UIST (User Interface Software and Technology) and CSCW (Computer-Supported Cooperative Work) conferences recently followed the example of SIGGRAPH by eliminating page limits altogether. Journals are under pressure to limit article length to reduce reviewing effort and production cost, and to increase readership in a world where people have more demands on their time. A series of articles have commented on the resulting "bite-size science" [3]. Journals strive to decrease reviewing time. Conferences are experimenting with full revision cycles and other approaches in the direction of open-ended reviewing, some of which are discussed below.

The Competitive Exclusion Principle

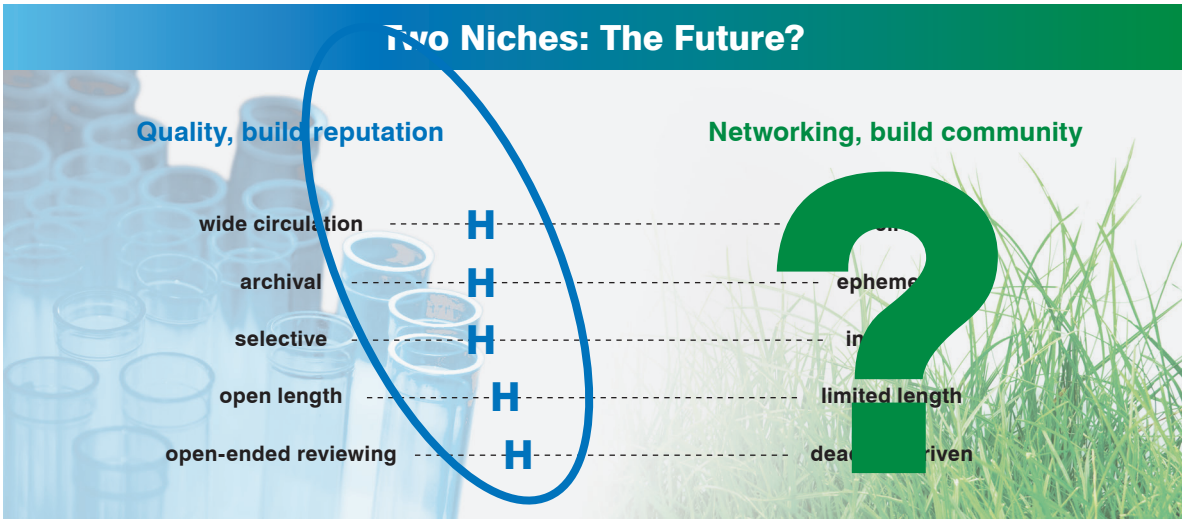
"No two species can occupy the same niche in the same environment for a long time. One will always overcome the other, leading to either the extinction of this competitor or an evolutionary or behavioral shift toward a different ecological niche. *Complete competitors cannot coexist*" [4].

The above figure shows the extent to which conferences have invaded the journal space. Conferences and journals are complete competitors. Sounds of the struggle are recorded on the pages of *Communications of the ACM* as well as in blogs and Facebook discussions in our community.

What happens when a species invades another's niche? Ecologists describe two outcomes, to which we can add a third:

- Extinction of one competitor.

Journals are at greatest risk. They are already considered irrelevant by many computer scientists. When North America recognized conferences, journals came to be dominated by authors from elsewhere. As conference publication



gains acceptability elsewhere, journals could fade away, although they remain useful for researchers without travel funding.

• **One competitor is driven to another niche**. Some senior computer scientists hope to drive conferences back to their traditional niche—to downgrade conferences [5]. Last June, ACM enacted a policy to prohibit the elevation of conference proceedings to journal status, declaring journals to be "the gold standard" [6].

• **Emergence of a hybrid**. In the animal kingdom, competitors can rarely mate to create a new species (although some branches of *Homo sapiens*, including mine, were recently found to contain traces of Neanderthal DNA). However, we have more control over our creations, and recent years have seen a range of experiments mixing journal and conference DNA.

A startling number of hybrid experiments have been undertaken in computer science subdisciplines, most generally unaware of each other. A few examples follow; more are described in Grudin et al. [7].

Journal articles are presented in conferences. Conferences such as CHI and IUI (Intelligent User Interfaces) include presentations of recently published relevant journal articles. This reveals how much is now required to progress a conference paper to journal publication; otherwise the same work could be presented twice at a conference.

Journal acceptance precedes conference presentation. Further standing on its head the concept of conferences as the rapid turnaround venue, conferences such as VLDB (Very Large Databases) and HiPEAC (High Performance and Embedded Architecture and Compilation) present only work that has been accepted for journal publication. This approach is endorsed in the new ACM policy statement. Some consider it to be a step toward returning journals to their former preeminence.

Conferences introduce a single full revision cycle. Used by CSCW, SIGMOD, and ITS (Interactive Tabletops and Surfaces), this resembles journal special issues that also force a second-round decision to remain on schedule.

Hybrid solutions are more promising than rolling back the tide to devalue the conferences on which many midlevel researchers have built their careers. The forces that drove conferences into the journal niche have not disappeared. The last niche illustration shows the occupation of the quality production niche by a hypothetical hybrid species.

Will the hybrid be designed through further experimentation—quasi-random mutations and natural selection—or should an intelligent design effort be undertaken? This question was posed to the audience of a panel at the biennial Computing Research Association conference at Snowbird last July. The audience voted that change was needed. They also voted that now is not the time to organize an effort to work on it. Mutation and natural selection have more time to work.

What Species Will Occupy the Uninhabited Community-Building Niche?

The ecologists tell us a new species will evolve to occupy a niche that can support life. Rather than waiting for nature to fill the vacuum, though, we should actively engage in community building. Consider the chart here showing ACM Special Interest Group (SIG) membership. As conferences became less inclusive, participation plateaued or fell in many conferences and declined in the SIGs that drive many of them. Newsletters have declined. The Web is not the culprit: The strongest decline was from 1990 to 1995. The situation is much worse when you consider that the number of computer science students, faculty, and professionals increased by an order of magnitude over the past 25 years. Our communities have not attracted them. Because researchers need their work validated, submissions increase—the quality production

SIG	1990	1995	2000	2005	2012
PLAN	12,335	6,574	4,362	2,765	2,217
GRAPH	11,811	6,986	6,298	7,902	6,949
SOFT	10,824	6,389	3,313	2,916	2,297
ART	8,955	3,707	1,917	1,559	977
OPS	6,801	4,154	2,356	1,793	1,637
CHI	5,023	5,186	4,950	4,409	4,060
ARCH	4,685	3,035	1,730	1,454	1,450
ADA	4,089	1,867	685	391	244
MOD	3,952	2,959	2,941	2,317	1,916
MIS	3,082	1,442	755	636	388
(all 30+)	103,489	65,689	47,042	44,600	39,886

▸ Membership, 10 largest special interest groups (1990). Today only two of 37 SIGs have 3,000 members.

function—but attendance by nonpresenters has ebbed.

The community-building niche will be occupied. If the existing communities are not rejuvenated, younger professionals will form new associations. Predicting the future is not a high-yield activity, but new forms of interaction are likely to be highly distributed and mediated by technology. Being copresent helps build affect and community, but not everyone need be in one place. I can imagine very large high-resolution curved screens and spatialized audio supporting informal synchronous events that link multiple sites with shared presentations and social events, enabling researchers who have the stamina to brush aside time-zone differences to reduce expense, travel time, and carbon footprint.

Postscript: A Third Niche

The late social psychologist Joseph McGrath observed that all groups or teams continually organize activities in support of three goals [8]. The most obvious is the production goal—the group must act in furtherance of the purpose for which it assembled. For the sciences, the production goal is delivering high-quality research, the niche traditionally occupied by journals that is now being contested by conferences.

The second critical goal is to ensure team well-being. McGrath argued that prosperity requires constant activity directed at group well-being or community building. A team of highly talented individuals may fail if they cannot work together. A great but dysfunctional rock band may break up. Establishing and maintaining group health or a vibrant sense of community require a different set of activities than simply doing the work. In the sciences, inclusive conferences generally occupy this second niche; they are places for networking and building cohesion.

The third set of activities addresses member support: ensuring that each contributor gets what is needed to continue participating. A volunteer nonprofit organization may do great work and all get along fantastically, but if some people do not get what they need—compensation, recognition, and so on—it may dissolve. In our field, small workshops that provide members with feedback on work in progress occupy this niche. So do award ceremonies of different kinds, at conferences and elsewhere.

McGrath's typology of group activity can be an effective lens for discerning the effects of technology on groups and organizations. It can require conscious attention, because as social animals we may take member support and team health for granted, not noticing until too late when one of the functions has been neglected. Too often we focus on production alone and operate unconsciously in the other niches. When there is stress, such as that felt today in many fields of computer science, we may not understand its origins or know what to do about it.

ENDNOTES:

1. An index with links to *Communications* and other relevant resources is maintained at http://research.microsoft.com/~jgrudin/CACMviews.pdf

2. Patterson, D., Snyder. L., and Ullman, J. Evaluating computer scientists and engineers for promotion and tenure. *Computing Research News* (September 1999), A-B.

3. Haslam, N. Bite-size science: Relative impact of short article formats. *Perspectives on Psychological Science 5,* 3 (2010), 263-264; http://pps.sagepub.com/content/5/3/263.abstract

4. Hardin, G. The Competitive Exclusion Principle. *Science 131,* (1960), 1292-1297. Wording is adapted from Hardin and Wikipedia entries.

5. E.g., Birman, K. and Schneider, F.B. Program committee overload in systems. *Comm. of the ACM 52,* 5 (2009), 34-37.

6. http://www.acm.org/sigs/volunteer_resources/conference_manual/acm-policy-on-the-publication-of-conference-proceedings-in-acm-journals

7. Grudin, J., Mark, G., and Riedl, J. Conference-journal hybrids. *Comm. of the ACM 56*, 1 (2013).

8. McGrath, J.E. Time, interaction, and performance (TIP): A theory of groups. *Small Group Research 22*, 2 (1991), 147-174.

ABOUT THE AUTHOR

Jonathan Grudin (http://research.microsoft.com/~jgrudin) is a principal researcher in the Natural Interaction Group at Microsoft Research. He has long been active in journal editing and conference organizing and is a fan of both. His experience with evolutionary biology is more limited.

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