

## Networks for Thinking in Cliques?

London—While some researchers dream of the seamless electronic collaborations of the future (see main text), many scientists are already working together over computer networks, circulating ideas at an ever-increasing rate. The basic technology is run-of-the-mill electronic mail, but you might expect these new communication habits to raise some of the same issues that will attend the “virtual publications” of the future. Has anyone stopped to take a look at what is happening out on the networks?

Not very often, it seems. In 1981 Britain’s Royal Society was the first to try to create an overall picture of the “scientific information system” and predict what needed to be done. Ten years later, the Royal Society is preparing to try again. Judging by a just-completed “Preliminary Study of the Scientific Information System in the UK,” it’s high time for a new look. The survey makes it clear that, along with speeding and easing communication, information technology has created an informal system of publication that flouts many of the conventions of scientific publication, including peer review. This development has many scientists thinking ahead to the effects, good and bad, of full-scale electronic journals.

New data for the report come from face-to-face interviews with close to a hundred British scientists and information specialists, conducted by Jack Meadows, professor of library and information science at Loughborough University. “People feel the scientific information system has got so complicated that they can no longer present a clear snapshot of what is happening,” he says, but in spite of the difficulties he has tried to map out all the key issues relevant to scientific communication—from the effect of e-mail to the increasing cost and diversity of conventional printed journals.

One striking result: The informal information flow created by the e-mail networks is transforming some of the traditional functions of print. One researcher summed up the new view of communication by saying he now uses “informal communication for innovation and the formal system for background.”

For researchers within the informal network, ideas circulate with exhilarating speed. But for researchers left outside it, apparently, it’s a less happy arrangement. Many respondents believe that informal communication circles are now turning into electronic “information cliques.” That, writes Meadows, does not affect senior scientists, who are drawn into such cliques automatically, but “others have problems in knowing that such cliques exist, let alone in gaining access to their electronic discussions.”

Another concern turned up by the survey was the quality of the material that circulates on the networks. E-mail, researchers say, carries no check on the “validity of the material transmitted.” As a result, the report notes, many biochemists are using nucleic acid sequence data circulated electronically, even though “the quality of the information is unknown.” And in a more extreme example, researchers complain that “some of the less-likely theories concerning AIDS have circulated only by e-mail.” From there they have gone into the public domain.

The growing power and importance of informal communication has not escaped the notice of British science policy experts, many of whom were consulted during the writing of the report. What do they think is going to be the future relation between the

informal system and the “formal” one of open journal publication?

One place they are looking for a glimpse of the future is among those most at ease with electronic mail—telecommunication researchers. These researchers, notes Christopher Leamy, head of the library and information services division at the government Office of Arts and Libraries, “don’t communicate with one another except by electronic mail or teleconferencing; articles that get published are really historical things—if you are not in that particular network you are not really going to know what is going on.”

Beyond electronic networks comes, of course, the electronic journal—a long-awaited development about which many of those interviewed commented but which few have yet experienced. British experts in the field are already skeptical—at least of personalized electronic journals created by pulling together continually updated electronic “papers” that match the scientific profile of the individual reader.

“Science publishing is not just a matter of information—it’s a matter of reputation,” says the Royal Society’s Peter Cooper, who is helping to plan the full-scale investigation of the science information system. “A reason for the success of journals is that scientists all have to make their mark in life by publishing. It’s hard to see how electronic publishing is

going to take over that role without the refereeing system of a conventional journal.”

Personalized electronic journals will neglect another vital social function of conventional journals, says Peter Healey, co-chairman of the independent Science Policy Support Group (SPSG). “The fact that you’re reading roughly the same journals is a kind of glue for a research community and fulfills all kinds of wider functions than a targeted electronic search can,” he says.

John Ziman, a former professor of physics at the University of Bristol and cochairman of SPSG, points to yet another function of a traditional paper: “It provides a moment when a piece of scientific knowledge is frozen so that it can be criticized. If you’re always trying to hit a moving target you don’t get anywhere.” For him, the continual updating of information about which proponents of electronic journals enthuse is a fatal flaw. What’s more, Ziman predicts that if electronic journals try to carry an unchecked flow of circulating information, they will follow the fate of earlier, pre-electronic attempts to set up centralized schemes for exchanging preprints—they’ll be overwhelmed by the flood of continually changing information and in the end will transform themselves into conventional journals, complete with referees, editorial policy, and sub-editors to improve people’s English.

But that is an expert’s view. To get the view of uninitiated researchers, Meadows wants part of the full-scale Royal Society survey to look at “whether electronic journals are actually becoming acceptable to researchers and if so, under what conditions.” The Royal Society will decide how to proceed with its survey in the next few weeks. The only thing that is certain is that the society will have to run fast to catch the scientific information system. “It’s all in flux,” says the Royal Society’s Cooper. “We’re afraid the system is going to metamorphose as we’re actually watching it.”

■ ALUN ANDERSON

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