This is Not a Paper*

NICHOLAS CONSTANTINE BURBULES

BERTRAM C. BRUCE

University of Illinois, Urbana/Champaign

The rapid spread of electronic mail, listservs, and bulletin boards operating over the Internet has already had marked effects on how scholars communicate ideas with one another.1 Beyond exchanging informal messages through these new media, scholars can now circulate scholarly work in various stages of completion, either by sending an electronic version to a group of colleagues (active dissemination), or by putting it on a computer server accessible through gopher or the World Wide Web (WWW), which makes it available to any interested reader with Internet access (passive dissemination). Additionally, electronic journals and newsletters of various kinds have come upon the scene to provide new opportunities for the publication of scholarly material.

 These new forms of distribution radically affect the speed with which ideas can be shared, the costs of widespread distribution, the ease of modification of texts, the forms of archiving, and other parameters of publication. Thus, although they often have analogues in the familiar print world, they raise new questions about the nature of scholarly publishing and even what constitutes a publication - the making public of a person's or group's scholarly efforts. In this essay we introduce these issues and explore some of their implications for educational researchers and journal editors.2

 It is striking that only three years ago Karen Maloney found, in a survey of journal editors in education, little enthusiasm for the idea of creating electronic versions of their publications, and in some cases strong antipathy - an antipathy not always based on accurate information:

> "Publishers who quickly discounted electronic formats routinely viewed electronic publishing as too expensive and too daunting a project, even though many had not seriously investigated the costs involved or even had a clear idea of what publishing in an electronic format would entail."3

At first, the potential of electronic publishing seems merely a matter of medium: of technical capacities for distribution and storage of electronic text (which for most scholars these days is the form in which their work is produced anyway). Whether a text exists as ink on paper, or as electronic data on a storage disk, does not seem to alter the content of what an article has to say. Whether one sends a text through the mail, or over a computer network, seems similarly trivial. Whether one reads a text printed on pages in a bound journal while one sits in an office or library reading room, or reads from a computer screen, or from pages printed by a local printer after downloading a file, seems largely a matter of convenience.

 But such views abstract the question of content from the pragmatics of scholarly

production. Just as a computer with a word processor is not just a fancy typewriter, and just as new technical methods do influence the style and content of writing, the capacities of electronic networks for storage, retrieval, and dissemination are altering the way scholars produce writings and their intellectual relations to one another.

Some recent examples of changing ideas about what constitutes a publication. In the journal Educational Foundations, Peter McLaren, Patti Lather, Svi Shapiro and others published an academic chain letter they had written back and forth between them.[4] Gene Glass maintains a listserv, EDPOLYAN, which contains daily exchanges from a number of contributors on various educational policy issues; he also maintains an electronic journal, EDPOLYAR, an archive of essays written, reviewed, and published electronically. Recently, he saved and edited a series of messages from EDPOLYAN, mostly written to and from Herbert Gintis, covering various aspects of the choice debate in education.[5] One of the present authors participated in a co-authored AERA presentation, since revised into a published essay, composed originally of electronic mail correspondence; and while the final version of the essay is considerably revised and expanded from the original presentation, it retains the original dialogical structure of the electronic exchange[6]

Now, an imaginary example. An author produces a draft manuscript, then sends it electronically to a few colleagues (a half dozen? a hundred?), soliciting feedback. She receives from several people extensive replies, including in some cases suggested additions and changes to her original text (a few of which she cuts and pastes directly into the original, with due credit). The subsequent version of the essay is markedly different from the first, and she repeats the process, sending it back to several of the original commentators for additional feedback. Eventually she sends the text to an electronic journal, where it is peer reviewed, revised further, then eventually published under her name; the reviewers and audience for this journal, of course, may substantially overlap with the circle of colleagues to whom she had sent the essay in the process of developing it. Following publication, she receives praise and criticism from several readers of the journal (through electronic mail, naturally), as a result of which she rethinks her arguments and begins another essay....

Questions immediately arise: When was this project published? When was it finished? Who deserves credit as author? Who were the reviewers and who were the audience? In certain technically sophisticated fields of inquiry, such as artificial intelligence, essays have been developed in this way for many years. For example, over twenty years ago, Marvin Minsky's frames paper was distributed over the ARPANET, extensively discussed, and repeatedly revised, long before it was published.[7] Today, these information tools have become much more powerful, easier to use, and more widely available to the educational research community.

These examples suggest that familiar distinctions between correspondence and scholarly writing, between personal and professional interchange, and between revisable works in progress and final published articles, need to be rethought as electronic forms of production and distribution of text take hold in scholarly circles.[8] Current postmodern theoretical trends reinforce this changing view of texts and authorship.[9] Yet our ordinary ways of speaking about and evaluating educational research have yet to catch up with these changing conditions. What, for example, do these changes portend for tenure decisions? Why do we value refereed journal publication as the common coin of academic evaluation, when other forms of scholarly interchange (such as posting a series of arguments or research results on an electronic bulletin board) might in fact reach and

influence the ideas of a far greater number of colleagues?10 What meaning and value do our conventional understandings of copyright, intellectual property, and plagiarism hold in an environment in which the continuous production, distribution, revision, and development of ideas in text is occurring even more seamlessly than before? What significance do these changes have for educational scholarship, which engages multidisciplinary communities in research and has less sharply defined scholarly traditions?11

In our view, it is not that electronic publication is a panacea or an obviously superior form of scholarly communication across the board; it is that these technologies are already upon us, they are for better or worse in increasing use, and they confront us with issues and choices we need to reflect upon.

Our central question in this essay is, What do these changes mean for the future of scholarly journals, particularly those in education? Despite an increase in the number of scholarly journals over recent years, more than one observer already foresees the demise of journals as we know them.12 An increasing number of paper publications produce parallel electronic editions, available via gopher and the Web, and several new journals have arisen that exist only in electronic form.13 A legitimate question can be raised whether any journals will exist in paper form within a decade or two. Or, will they survive, just as the traditional office has failed to give way to the paperless office? Publication on paper may afford unique advantages, in terms of aesthetics, portability, and easy scanning. But preferring a paper form of presentation is now a matter of choice rather than a given; and other forms of representation may have their own discrete benefits as well.

Like the universities that typically house them, scholarly libraries are encountering severe constraints on resources and escalating costs; and one of the areas in which they have seen the sharpest rise of expenses is serials acquisition. As many journal titles are taken over by large, profit-oriented companies, and as they increase their subscription rates, especially for journals in areas such as law, business, and scientific/technical studies, it is not unusual to see libraries having to pay annual subscription rates for individual journals in the hundreds and even thousands of dollars. Yet because top-rank scholarship depends on access to the most current and prestigious research publications, many libraries are compelled to pay whatever publishers might charge for these journals. The potential of electronic publication to lower the production and distribution costs of journals (some estimates say by about 30%; others say by much, much, more14) might result in lower costs to consumers, either individual subscribers or institutions. Digital libraries also would not incur the substantial storage and preservation costs associated with paper.

On the other hand, when certain publications are only available digitally, lacking technological resources or skills will exclude certain audiences from access to that information (whereas now most physical libraries are open to the public). Such equity considerations for access to and participation in the on-line universe have not received adequate attention, in our view. This argument swings both ways, however, because technological access may better serve clients who for reasons of distance, time, or disability cannot travel to physical library locations.

Furthermore, electronic publication makes possible a much faster turnaround time from an article's first writing to its availability to readers. In many scientific and technical areas, the development of new information is so rapid, and the non-journal dissemination

avenues so widespread, that many important research articles are obsolete by the time they appear in printed, bound form. On the other hand, in other areas of scholarship a quick turnaround time may not be desirable, and it may encourage the rushing of undeveloped and incomplete information into circulation.

Electronic publishing has provided an opportunity for the birth of new journals in areas where there might not be a sufficiently large market to support a paper-published operation, as well as the emergence of many more experimental forms of publication. For example, professional academics have always had an advantage in gaining space in most journals; but in a field such as education, where practitioners, parents, and even students may have worthwhile insights to offer, the possibility of self-publishing, or publishing electronic newsletters that are inexpensive to produce but can reach a large audience over the Internet, may substantially increase the opportunity for new voices to gain a hearing. Yet, as we will explore later, such an increasing volume of published material creates a problem of credibility in choosing what is worth reading and placing confidence in.

Finally, electronic texts are searchable using a variety of programs which allow a highly customized and extremely rapid search through very large volumes of material: for every instance of a particular name, for a specific term or phrase, for the conjuncture of two or more topics appearing in the same text, and so on. Such powerful scholarly tools make the availability of electronic editions of books and journals, even if in parallel with paper editions, virtually inevitable.

At the same time, as we have suggested, there are also potential drawbacks with an exclusive reliance on electronic publishing. In order to begin to analyze these further, some important distinctions need to be made between different forms of electronic publishing (forms which, by the way, can and probably will co-exist).

The first of these is an expanded form of self-publishing, or what John Franks calls an electronic version of a vanity press.15 It is currently possible for a writer to make a virtually unlimited number of electronic copies of a manuscript and send them out directly to individual colleagues, to group lists, or to preprint archives, all as a way of distributing her views and/or soliciting feedback on a work in progress (including preliminary drafts of grant proposals16). Because the text has no official or definitive status, it is repeatedly revisable. A related form of self-publishing is to establish one's own computer as a file server, accessible through ftp (file transfer protocol), gopher, or Web browsers such as Mosaic or Netscape; interested users elsewhere on the Internet can search for such manuscripts and download, read, copy, or print them out at their own discretion. Imagine having the entire corpus of a researcher, including draft versions of current work, all available on-line (if that person chooses to make them so) at virtually no cost to the reader. Nor is access to such publishing opportunities limited to university faculty, as noted previously. This vision of publishing is the most decentralized and would promote the widest availability of textual materials with the least intervention by reviewers, editors, and the various scholarly filtering mechanisms that currently determine what is or is not sanctioned research in a field. Indeed, this avenue could mean the eventual elimination of journals, or their relegation to only a small proportion of the total published work available on the Internet.

Yet this fork in the road would also lead into uncharted paths. Is it useful to have access to tens of thousands of documents, with no reliable way of culling the few dozen that one could actually have time to read? Widespread self-publishing would put all authors and

all texts at the same level of formality, with no practical way to differentiate the original from the derivative, the credible from the crank, the substantive from the hackneyed - since no one could possibly read or evaluate them all.17 We are reminded of Jorge Luis Borges's library of Babel, which contains all possible books: "The impious assert that absurdities are the norm in the Library and that anything reasonable (even humble and pure coherence) is an almost miraculous exception."18

Don't we in fact depend on some quality control mechanism, however imperfect and subject to abuse, to allow us to get any work done at all? While one might propose different filtering mechanisms from current systems of peer review and editorial screening, there seems no feasible scholarly future that does not have some such system in place. Even when individual scholars can put their collected works on open access, therefore, people will want some way of sorting through those most worthy of their attention and those less so.

Hence, a second approach to electronic publishing is the electronic journal (whether there is a parallel paper version or not): a peer-reviewed and edited document that solicits manuscripts, evaluates them, encourages authorial revision, then selects a set of papers for each issue. Such a journal is the aptly titled Postmodern Culture, edited by Eyal Amiran and John Unsworth.20 Aside from the medium of production and distribution, some claim that there is no essential difference between electronic and paper editions of such journals.21 The peer review, revision, and editorial processes can be achieved as fully with electronic documents as with paper documents. In fact, the line between electronic and paper editions is already blurring, because many paper journals solicit papers in electronic form, collect reviews through e-mail, and perform their editing directly on the electronic version. Electronic journals can exercise the same forms of quality control or certification; they can establish a definitive version of the text; and they are archivable in an electronic form that might be even more lasting than paper.22 Since a reader can print out a paper copy of any article, all that seems to be lost is a certain fineness of page design, layout, and type quality - and to an extent these are already recreateable in electronic documents (using pdf - portable document format).

As noted the reduced costs of electronic production and distribution can in principle be passed along to consumers: individual subscribers or libraries. But here we begin to encounter more issues. While there are already problems associated with unauthorized copying and distribution of paper texts and with plagiarism, there is something about the tangible existence of a bound paper version of a manuscript that provides it some authority, integrity, and finality. Whatever one might say about the equivalence in principle of electronic and paper texts, there can be little doubt that the practice of textual use will change with the availability of electronic versions that can be reprinted, copied, cut and pasted, altered, and redistributed beyond any originally intended purpose and scope of distribution. While any of this can, in principle, be done also with paper versions, the relative difficulty of doing so, and the relatively finite number of avenues for distribution, makes informal processes of self-policing within a community of inquiry more or less dependable. Such protections will be much more difficult to enforce when the avenues of distribution increase and the authority of a definitive text becomes compromised by the tenuity of electronic existence.23

Related to such issues are technical concerns about the actual mechanisms of distribution and availability for electronic publications and corresponding financial questions about payment for access.24 Without reviewing these in detail, one possible avenue is to

distinguish the current model of subscription, in which one purchases and hence owns a copy of a text that can be kept even after the subscription is canceled, to one of licensing, in which one purchases access to electronic texts, which can be read in libraries or from one's computer screen, but an access that may lapse if the licensing payment is ever canceled.25 It is not yet clear what forms of commercialization the Internet will adopt; but one can be fairly certain that some mechanisms of restricted access for certain kinds of publications will be put in place in order to ensure that the costs of production are covered.

 Such concerns have led many interested in the potential of electronic publishing to propose a third, more visionary approach to scholarly journals. On this model, publishing should no longer be regarded as a commercial venture in the academic context, where the interest of scholars, as both producers and readers of research, is in ensuring the easiest and widest distribution of ideas possible (while preserving the value added of the journal review and editorial process). In this view, journal production costs should be covered by universities, professional organizations, or individuals who have an interest in sponsoring and preserving forums for publication in certain areas; once the journal is produced, any proprietary interest in restricting access or garnering revenues is forsworn, and unlimited access, duplication, and redistribution (with attribution) are actively encouraged. This model has no better solution to the dangers of plagiarism, discussed previously, but short of that any attributed copying and distribution of texts is regarded as a benefit to all concerned. As a result, current conventional notions of copyright would need to be profoundly rethought.

 And there is even a further step along this continuum: what Stevan Harnad calls interactive publication or scholarly skywriting.26 This fourth model undoes the very idea of a journal as a unidirectional avenue for dissemination of textual information, to the creation of an electronic virtual community of scholarship in which the collegial working out of ideas is a continuous, seamless process. Harnad's journal Psycoloquy offers one model for this process:

> "Psycoloquy is explicitly devoted to scholarly skywriting, the radically new form of communication made possible by the Net, in which authors post to Psycoloquy a brief account of current ideas and findings on which they wish to elicit feedback from fellow specialists as well as experts from related disciplines the world over."27

Psycoloquy is a publication in which original work is presented, along with commentary and rebuttals, in an ongoing, iterative manner.28 Such approaches to scholarship, Harnad argues, begin to exploit the unique potential of electronic media, with their capacity for rapid, direct, interactive communication, rather than simply creating electronic proxies of traditional paper-based forms of publication.29

 Harnad does not argue that interactive publication should completely replace other forms of journal publishing. It appears that what may emerge over time, then, are at least two branches for scholarship. The first, which might be called a more dialogical model, engages scholars in a highly collaborative construction of knowledge, through forums such as EDPOLYAN or journals such as Psycoloquy, which take advantage of the capacity of electronic networks to allow frequent and rapid iterations of publication and response. In

such a context, notions of authorship, intellectual ownership, protections of copyright, and so forth, may become somewhat irrelevant.30 The second branch includes journals that still solicit and produce articles of a set, finished form: works that are reviewed, revised, and published as considered representations of a person's (or group's) arguments and point of view. Publications in this latter category may take either paper or electronic form; but there is nothing in them that requires the unique potential of the electronic medium. As Julie Foertsch puts it:

"The potential of electronic discourse is not being fully realized if e-journals become nothing more than a clone of printed publications....Rather than trying to compete with the established reputations and fancy formatting of print journals as the final destination for scholarly work, e-journals should focus on opening up the avenues of scholarly communication at a much earlier stage."31

The value of making this sort of distinction is that it helps us recognize the discrete virtues of different forms of publication, and helps to clarify cases in which a particular kind of publication is working within versus working against the characteristics of the medium it occupies. Electronic publication makes possible the sort of scholarly skywriting that Harnad envisions. It also makes possible the production of hypertexts, scholarly artifacts that contain as part of themselves electronic cross-references to other textual sources (including different media sources).32 Hypertext editions of Shakespeare's plays, for example, have been completed that include excerpts from actual film and stage productions of the plays, as well as commentary, historical material, and other relevant ancillary material. The text being produced is the particular combination and juxtaposition of resources cross-referenced within it, guided of course, by a framework for selection and interpretation: no text is neutral or all-encompassing. These sorts of texts, including hypertexts, can only be created effectively in electronic form - although there have been rudimentary hypertexts published as books.33

On the other hand, the care and precision of proofreading, revision, editing, designing, and typesetting manuscripts to create an authoritative (and aesthetically appealing) version of an author or authors' document has traditionally been linked with the finality of creating a printed, bound version that will be archived as such for perpetuity. Both the producer of the text and its editor and publisher have a common interest in seeing it be as complete, persuasive, and carefully written as possible, since there is a sense in which, once published, there is no taking it back. The printed medium, therefore, also has distinct benefits.

Now, as noted previously, there is no a priori reason why such care and attention cannot be taken with electronically published texts as well, but it works against the spontaneity, speed, and revisability of electronic media to impose such discipline on the writing and editing process across the board. Texts are so easily modified, amplified, or erased electronically that the insistence on any electronic version being the final one seems artificial; this helps explain why the most common forms of electronic publication still remain those that are preparatory to publication in a printed form - real publication, in the minds of many - and why some electronic journals, such as Postmodern Culture, have initiated print versions as well.

In addition to this point, it is striking in any review of the literature on this subject how much of the advocacy for electronic publishing comes from authors in mathematics and other scientific/technical areas. Part of this is explained by the growing need for more rapid and extensive dissemination of research results and information in these areas, as discussed previously. But note that the view of knowledge or information entailed here, and the model of dissemination it invokes, assumes a kind of published text that is data-rich and that has a relatively homogenous form. Such texts can be produced relatively quickly; can be edited, reviewed, and prepared for electronic publication more easily; and can be screened rapidly by readers for salient information, in part because they exist within disciplines having a highly standardized article structure (though such drives for standardization exist in the social sciences and in education as well.34

But when an essay's form is closely linked in design as well as in substance with the expression of a distinctive point of view; when it has an aesthetic quality that cannot be hurried or rushed into preparation for print; when an author's voice and style depend on saying things in just this way and no other, then the rapid turnaround and fungibility of electronic media do nothing to help, and might in practice hinder, the preservation of a form of writing and publishing that cannot be reduced to an information dissemination model. And while such essays can certainly be copied and sent out electronically, there is a sense in which they are ineluctably written for print, whatever medium they might happen to occupy. For this reason, printed journals and books are not likely to disappear any time soon - and if they do, they will take with them, almost certainly, a particular style and aesthetics of writing.

Nevertheless, electronic publishing, of various sorts, is going to become more prevalent as an accepted part of our scholarly work. Authors will circulate their writing in various prepublication forms in order to solicit feedback; and may, depending on copyright determinations, use post-publication electronic distribution as the preferred alternative to reprints. Scholarly networks, from listservs and bulletin boards to interactive journals, may create an entirely new niche of collaborative publishing, in which the distribution, revision, and continuous co-construction of knowledge can no longer be attributed to individual authors; scholarly texts would be seamless dialogues, not discrete units of publication. Finally, hypertextual documents will allow for publications that include not only written texts, but voice, image, and other forms of representation; in fact, in the near future, the very distinction between written essays and a-v presentations will begin to blur.

It is tempting, given the potential of such new forms, to assume that they will supersede any forms of scholarly writing and publication that have come before. But we see no reason to assume this; for the foreseeable future, there will be, and should be, alternative paths for publication, in different media best suited to the different types of text scholars want to produce and readers want to read. Some of these will require the conventions of traditional scholarly journals. Whether these journals take print form, electronic form, or both, depends on a number of questions that have yet to be answered by professional organizations, publishers, libraries, and the individual producers and readers of scholarship. We introduce them here with the hope of contributing to such a conversation within the field of educational research and publishing.

Some questions concern the financing of journals:

- Will education journals continue to be sold for profit, with the restricted access that requires, or will they be subsidized to cover production expenses, then distributed

through the widest avenues possible?

- Will universities, professional organizations, or individuals be prepared to pay such subsidies in the interest of creating and maintaining forums for scholarly interchange in certain areas?
- If education journals are still supported through subscriptions from consumers, will these take the form of purchases or licensing agreements?

Some questions concern the relative acceptance of print versus electronic publication:

- Will the producers and readers of educational scholarship continue to insist upon the unique benefits that print publication supports, while taking advantage of the conveniences that electronic distribution provides?
- What will be the relative volume and influence given over to electronic publications that can be accessed only on-line, versus those that can be accessed through printed editions?
- How significant will hypertext, scholarly skywriting, and other innovative forms of writing and publishing become to the work educational scholars do?

Finally, some questions reach to the core of scholarly practice:

- How pertinent will the research article, the essay, and other traditional forms of text be to the ways in which knowledge is constructed and represented in educational research?
- How will scholars judge publications that come from readily-identifiable individuals or small collaborative groups, as opposed to co-constructed texts that may extend across many participants and contributors - particularly when high-stakes academic evaluations, such as tenure, are concerned?
- How will the shifting possibilities of publication, of finality, and of intellectual ownership affect new definitions of copyright or intellectual property?

As should be clear, then, decisions about electronic publication - decisions that will be made by the readers and publishers of this journal among others - are actually debates about views of knowledge, views of writing, views concerning the kind of scholarly community one wishes to establish and maintain, and the deeply embedded value questions that are implied by these. Such decisions, therefore, will not be made easily, nor will there be unanimity about their results. But we do urge that these decisions be made actively, and with full appreciation of their consequences. The greatest dangers of new technologies is when their possible adoption is regarded solely as a question of convenience or efficiency; which is certainly a possibility in this case.

Educational research may be affected more significantly than other fields by these changes. The high priority placed on collaboration, particularly across institutional boundaries, may be well-served by new modes of information exchange if they accommodate the special needs of those in different settings. Moreover, the inherently multidisciplinary nature of much of educational inquiry may be well-suited to new formats and media. On the other hand, these very features of educational research may result in a dispersion and lack of coherence that will make the task of understanding and evaluating research immeasurably more complex.

Maloney concludes her essay on electronic journals with the quite reasonable prediction that because scientific and technical fields have the greatest stake in the development of

electronic forms of information dissemination, and because their members have the greatest knowledge of, access to, and facility with these new technologies, their decisions concerning new forms of electronic publication will establish the precedents for other fields, such as education, to follow.35 But given the views of knowledge and information dissemination in these scientific and technical fields, the models of electronic publication they generate might not be adequate to the range of scholarly work produced by educational researchers. In education, we should make our own decisions about the issues raised above, and establish and maintain forms of publication suited to the kinds of texts we want to write, and the sort we want to read.

 References
* This essay has existed almost exclusively in electronic form. A previous version was originally put on line by Jim Levin for his Ed Psych 387 class. This essay represents a revision of two presentations by the authors at the 1994 meeting of the American Educational Research Association. Nearly all of the sources cited here were accessed through the Internet, and have been linked where possible directly to the original source. The authors are grateful to Robert Blomeyer, Gene Glass, Robert Alun Jones, Jean Pierce, Eugenie Potter, Eugene Provenzo, Ralph Page, John Schmitz, Evelyn Shapiro, and members of the Digital Library Initiative at the University of Illinois for comments and encouragement that contributed to this project.

 1 Jacques Leslie, "Mail bonding," Wired, Vol. 2 No. 3 (1993); Kenneth Arnold, "The body in the virtual library: Rethinking scholarly communication," Journal of Electronic Publishing (1995). For more background on this issue, see articles in the on-line publications Journal of Electronic Publishing and Journal of Computer-mediated Communication. See also Charles W. Bailey, Jr., "Network-based electronic publishing of scholarly works: A selective bibliography," The Public-Access Computer Systems Review, Vol. 6, No. 1 (1995). And see Richard Lanham's The Electronic Word: Democracy, Technology, and the Arts (University of Chicago Press, 1993).

 2 As Ralph Page has pointed out to us, by focusing on the side of this issue concerned with sending textual materials and making them available, we do not mean to reduce the role of readers simply to one of access; there are many important issues to be explored with how readers use electronic and paper texts, and these too will have implications for the forms in which they should be published.

 3 Karen Maloney, "Electronic journals: A scholarly publisher's perspective." Paper presented at the 1992 meeting of the American Educational Research Association.

 4 Lawrence Stott, Patti Lather, Svi Shapiro, Peter McLaren, and Rhonda Hammer, "An academic chain-letter on postmodernism and education," Educational Foundations, Vol. 4 No. 3 (1990).

 5 Gene Glass, ed., "School Choice: A Discussion with Herbert Gintis," Educational Policy Analysis Archives, Vol. 2 No. 6. (1994).

 6 Nicholas C. Burbules and Thomas A. Callister, "Knowledge at the crossroads: Alternative futures of hypertext learning environments"; also Colin Lankshear and Michael Peters, "Critical literacy and digital texts," forthcoming, Educational Theory.

 7 Marvin Minsky (1974, June). A framework for representing knowledge (Artificial

Intelligence Memo No. 36). Cambridge, MA: Massachusetts Institute of Technology, Artificial Intelligence Laboratory.

8 Such issues surrounding electronic publication have also gained attention in the more popular press: see, for example, D.T. Max, "The end of the Book?" Atlantic Monthly (Sept 1994), 61-71; Sarah Lyall, "Are these books, or what? CD-ROM and the literary industry," New York Times Book Review (August 14, 1994), 3, 20-21; and Jacques Leslie, "Goodbye Gutenberg," Wired , Vol 2 No. 10 (1994), 68-71.

9 Burbules and Callister, "Knowledge at the crossroads."

10 We know of at least one case : A faculty member successfully presented his work as moderator of an electronic mail discussion group as evidence for his scholarly production. Participants in the e-mail group sent messages in support of his case, arguing that the scholarly value of the e-mail discussions, and his role in promoting these, were at least as valuable as traditional journal articles.

11 Douglas A. Brent, "Information technology and the breakdown of 'places' of knowledge," Ejournal, Vol. 4 No. 4 (1994).

12 Andrew M. Odlyzko, "Tragic loss or good riddance? The impending demise of traditional scholarly journals." Notices of the American Mathematical Society (1995); for for full text click here.

13 A recent listing of electronic journals can be found in Ann Okerson, et al., eds., Directory of Electronic Journals, Newsletters, and Academic Discussion Lists (Association of Research Libraries, 1994).

14 John Franks, "The impact of electronic publication on scholarly journals," Notices of the American Mathematical Society Vol. 40 No. 9 (1993) 1200-1202; Odlyzko, "Tragic loss or good riddance?"; Stevan Harnad, "Implementing peer review on the Net: Scientific quality control in scholarly electronic journals," Peek, R. & Newby, G. (Eds.) Electronic Publishing Confronts Academia: The Agenda for the Year 2000 (Cambridge MA: MIT Press 1995).

15 John Franks, "What is an electronic journal?"

16 Robert K. Lindsay, "Electronic journals of proposed research," EJournal, Vol. 1 No. 1 (1991).

17 The information available on the Internet is now measured in terms of terabytes - trillions of characters - or the equivalent of millions of books. True, much of this information is in the form of large data sets, video, audio, or images, rather than scholarly articles. Nevertheless, the growth in textual resources has been extraordinary. The widespread sharing of the new media forms is another aspect of the changing landscape for scholarly publishing, one we can only mention in this essay.

18 Jorge Luis Borges, "The library of Babel" in Labyrinths (NY: New Directions, 1964).

19 A related concern is that the identity of professional fields and organizations is often associated with the publications they sponsor, and vice versa. But when new journals can be started up by anyone with access to the technical resources, will this lead to a

balkanization or fragmentation of professional communities, or an opening up of academic discourse to diverse and previously disenfranchised voices?

20 Postmodern Culture.

21 Harnad, "Implementing peer review."

22 Ibid.; Franks, "What is an electronic journal?"; Gregory E. Rawlins, "The new publishing technology's impact on the publishing industry over the next decade," Public-Access Computer Systems Review, Vol. 3 No. 8 (1992) 5-63.

23 See, for example, Doug Brent, "Oral knowledge, typographic knowledge, electronic knowledge: Speculations on the history of ownership," EJournal, Vol. 1 No. 3 (1991) and John Dilworth, "Credit, compensation, and copyright: Owning knowledge and electronic networks," EJournal, Vol. 1 No. 3-2 (1992).

24 An excellent review of these issues can be found in Ann Okerson, "The electronic journal: What, whence, and when?" Public-Access Computer Systems Review, Vol. 2 No. 1 (1991) 5-24, and Franks, "The impact of electronic publication."

25 For example, the difference between purchasing a prerecorded VCR cassette, which one owns, from watching the same film on cable television.

26 Stevan Harnad, "Scholarly skywriting and the prepublication continuum of scientific inquiry," Psychological Science, No. 1 (1990) 343-343.

27 Stevan Harnad, "Post-Gutenberg galaxy: The fourth revolution in the means of production of knowledge," Public-Access Computer Systems Review, Vol. 2 No. 1 (1991) 39-53.

28 Psycoloquy.

29 For a skeptical view of Harnad's vision, see an exchange between Harnad and Steve Fuller, originally published in the Times Higher Education Supplement (May 12, 1995). See also Douglas A. Brent, "Stevan Harnad's 'Subversive proposal': Kick-starting electronic scholarship," Ejournal, Vol. 5 No. 1 (1995).

30 A point of view expressed especially strongly by John Perry Barlow in "The economy of ideas," Wired, Vol. 2 No. 3 (1993).

31 Julie Foertsch, "The impact of electronic networks on scholarly communication: Avenues for research," Discourse Processes, Vol. 19 No. 2 (1995), 301-328.

32 Burbules and Callister, "Knowledge at the crossroads."

33 Several examples are discussed in Burbules and Callister, "Knowledge at the crossroads."

34 Charles Bazerman, "Codifying the social scientific style: The APA Publication Manual as a Behaviorist Rhetoric," in J.S. Nelson, A. Megill, and D.N. McCloskey, eds., The Rhetoric of the Human Sciences (Madison: University of Wisconsin Press, 1977), pp. 125-144.

35 Maloney, "Electronic journals."