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THE POSTGUTENBERG GALAXY: HOW TO GET THERE FROM HERE

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Introduction

It is time to stop making apocalyptic predictions about the coming of the electropublication era and to start providing concrete strategies for hastening the day. But before proposing anything, I have to describe in some detail an important parting of ways that will be taking place as the literature is launched into cyberspace: The "trade" literature (for want of a better word, though Shakespeare was hardly a tradesman) will go one way, whereas the "esoteric" literature (of specialised scholarly and scientific research) will go another. This esoteric/trade distinction must be clearly understood and kept in mind or none of what follows will make any sense.

The trade literature includes all texts that are written to be sold: Trade authors wish to sell their words, and readers wish to buy them. The trade literature includes everything from poetry and fiction to journalism and entertainment. And little or nothing I say here will be relevant to its publication in the electronic era, for my proposal applies only to the esoteric literature, in fact, still more narrowly, only to that subset of the esoteric literature that is published in learned periodicals. The story for specialised scholarly monographs and conference proceedings will be a similar one, but that will not be the focus here either.

It is important not to misunderstand the term "esoteric" publication, which really just means "written only for a small number of fellow experts": Scientific and scholarly research has become increasingly specialised. There are few individuals with the expertise or interest to follow and understand what is being published in any given subspecialty. Yet it is the pursuit of this specialised expertise that has brought us all the benefits of science and scholarship: These esoteric pursuits are what are revealing the mysteries of the atom, the gene, the cancer cell, our language, our past, and human nature itself.

And although the readership of any particular esoteric article is tiny, the size of the esoteric serial literature as a whole is quite substantial: First, there are the 6500 journals indexed by the Institute for Scientific Information in Philadelphia. These include the core learned journals in science and engineering and a good portion of the ones in the arts and humanities as well. Extending this estimate to include the full esoteric serial literature in all disciplines worldwide, one can probably append one more 0 to this figure and double it (i.e., about 130,000 periodicals).

This total will include a few wide-circulation learned periodicals, such as *Science*, *Nature*, and the *American Scholar*, and these should perhaps not be treated as esoteric, but the vast majority of it fits the criteria for esoteric literature, namely, that (1) the authors are not paid for their texts and (2) the "market," in terms of individual readers per article, is infinitesimally small. To this, one might add that esoteric authors not only do not expect or want to be paid for their words, but they are so eager to reach the eyes and minds of their tiny fellow-specialist readership that (3) they are often willing to *pay* to do so, by purchasing and mailing reprints of their articles to those who request copies (and some who do not); in some fields they also pay page charges to accelerate the publication of their work.

Why are esoteric authors prepared to go to such lengths? Because for them publication is a means to a much more indirect end than remuneration for their words. The scholarly/scientific reward structure looks more like this: (a) Publish a lot. (This pressure for quantity is somewhat at odds with the real objective, which is to do and report work of high quality, significant contributions to knowledge.) (b) Publish work that makes an impact. (How often it is read and cited is again a quantitative measure of that impact, but the real objective is to make an impact on the minds of active fellow-scholars, on their work, and hence on the future course of learned

inquiry itself, to the benefit of humanity as a whole.) (a) and (b) will then help advance your career. And scholars and scientists, it must be recalled, are not looking *only* to advance their careers: They wish to make a contribution to human knowledge, and this depends not only on having their work noticed, but on having it followed up and built upon by their fellow-scholars. All this by way of explaining why they would publish their words for free, and even pay to have them distributed all the more widely and quickly.

The first step in getting the word to one's peers, however, is to publish it at all, and in the Gutenberg age the only way to do this was through the mediation of the slow and expensive medium of printing and paper distribution. It was because of the high cost of this, the only means of making one's ideas and findings public at all, that esoteric authors have stood ready to go even farther than what has been mentioned so far: They have been willing to make the "Faustian" bargain of trading the copyright for their words in exchange for having them published. From the publishers' standpoint, the bargain was eminently fair: They asked for nothing more than they asked from trade authors, which was the right to protect the product from theft, so costs could be recovered and both author and publisher could make a fair profit. For the trade author, this bargain was not Faustian, because both he and his publisher stood to gain from it -- and to lose from theft. But the need to pay a ticket at the door was the last thing a esoteric author would have wanted to impose by way of a deterrent for his already minuscule potential readership.

So for the esoteric author, there was always a conflict of interest built into the act of publishing: One wants to get the words out there to everyone who might be interested, but one agrees to erect a price-tag as a barrier, to cover the costs (not one's own, but those of the publisher) and a fair return (again not to oneself, but to the publisher who had incurred the costs).

Now that all this has been spelled out, the news: With the advent of electronic publication, the Faustian era for esoteric authors is now over. The reason is that the per-page cost -- if one reckons it properly -- is so much lower for purely electronic publication that it no longer makes sense to recover it on the subscriber model of trade publication. It makes much more sense -- and matches much better the indirect reward structure I've just described -- to recover those costs (and a fair proportionate return) from those who actually gain from the much broader scope of electronic scholarly publication: authors, or, more specifically, (1) their universities, who benefit in many ways from the the publications of their staff (in the UK not least in the form of their rankings in the Research Assessment Exercises that determine their level of funding), (2) their research funding bodies, who fund the research not only so that it should be performed, but so that it should be publicly reported, (3) learned societies, who collectively benefit, both as authors and readers (as does society as a whole), from a freely available learned literature, and (4) university libraries, whose budgets will be perhaps the greatest immediate financial beneficiaries of the end of the Faustian era, for they, as much as the author, have been held tight in the grip of the inelastic demand for the intellectual product of what had been the sole means of production and distribution of esoteric knowledge in the Gutenberg/Faust era.

What will be the true per-page saving in the PostGutenberg era of purely electronic publication? Paper publishers have been estimating that it will only be 10-30% lower than paper-page costs, but their figures are based on reckoning only what electronic processing can save if one continues to do things as one did them in paper. Most categories of expenses (e.g., not just paper, printing and distribution, but marketing, advertising and fulfillment) vanish with purely electronic publication (and of course overhead from lingering paper operations should not be reckoned in either). The only inherent expenses of purely electronic publication are those of (1) peer review (which requires only editorial administration, because the peers [i.e., us] have

always reviewed for free) and (2) editing (including formatting, mark-up and archiving). My own estimate (based on experience from editing both a paper journal, [<http://cogsci.ecs.soton.ac.uk/~harnad/bbs.html>] *Behavioral & Brain Sciences* (BBS), published by [<http://www.cup.cam.ac.uk/>] Cambridge University Press, and a purely electronic one, [<http://cogsci.ecs.soton.ac.uk/~harnad/psyc.html>] *PSYCOLOQUY*, sponsored by the [<http://www.apa.org/>] American Psychological Association, a large learned society) is that the savings would be more like 70-90%. Translated into annual page charges for even the most prolific author, it makes much more sense to recover these costs in advance from some strategic combination of the four sources mentioned earlier, particularly in view of the enormous added value of the electronic medium compared to the paper one.

It remains only to tally up these

PostGutenberg[<ftp://cogsci.ecs.soton.ac.uk/pub/harnad/Harnad/harnad91.postgutenberg>] values:

If the world's esoteric scholarly/scientific literature were available to everyone for free in electronic form, the first benefit to the author would be the great increase in the visibility, accessibility and hence the potential impact of his work (1). This would of course also be a benefit to all scholars when they are wearing their readers' rather than their authors' hats (2).

Some fear that such a literature would be overwhelming and un-navigable, but stop and think:

How do we currently manage it in paper? If the entire corpus were transferred to the Net, instead of our eyes and fingers and feet doing the walking to get to the papers or to get the papers to us, electronic directories containing everything could be searched using the kinds of keyword search already used today in searching electronic databases that contain the titles and abstracts (but not the articles) in the paper literature. Then, one more click, and you have the paper itself! Or clever "knowbots" (automatic search programmes) could be designed to go out instead of us and look for papers fitting our profile of interests, leaving us even more time to actually read what we want and to do our research, rather than running after the literature.

Apart from free availability to all, there would be an advantage in terms of speed (3), because although peer review and editing probably cannot be speeded up much beyond their present rates, the time it takes for an accepted, edited paper actually to go to press, appear, and reach all the eyes and minds it is intended for is extremely slow owing to of the very nature of the paper medium and its means of distribution. Hand in hand with the greater speed of publication would go its increase in scope (4): At its moment of publication a new article in [<http://cogsci.ecs.soton.ac.uk/~harnad/psyc.html>] <I> PSYCOLOQUY</I>

is instantly available everywhere in the world, to everyone with access to the Net. Electronic searchability of the entire scholarly literature, hypertext links allowing readers to jump to other relevant papers, and other electronic enhancements will add still further value (5).

And, as always, necessity will be the mother of invention: The savings in library budgets, plus other sources of support, can be used to increase the already growing global access to the Net even in poorer universities and countries: As with the minimal page charges to authors, the benefits from the relatively small investment needed to provide adequate access for scholars and scientists vastly outweighs the costs. (UNESCO, under the guidance of Nobel Laureate Joshua Lederberg, and other similar initiatives are underway to ensure global electronic access to esoteric knowledge on a scale that the economics of paper had made unthinkable.) And the general public, which is likewise gaining greater access to the Net, also stands to benefit from the free availability of the scholarly literature, especially in the biomedical area.

But perhaps the greatest added value of the electronic medium has not yet been mentioned: [<http://cogsci.ecs.soton.ac.uk/pub/harnad/Harnad/harnad92.interactivpub>" >

Interactive publication. The paper journal I edit, [<http://cogsci.ecs.soton.ac.uk/~harnad/bbs.html>] *Behavioral & Brain Sciences* (BBS), has an extremely high impact factor (citation ratio) because, besides publishing articles, it also publishes commentaries -- sometimes as many as 20 - 30 per article -- from specialists across disciplines and around the world, analysing, amplifying, criticising and supplementing the target article. The author responds to all the commentaries in the same issue. It is this "open peer commentary" feature that has not only given [<http://cogsci.ecs.soton.ac.uk/~harnad/bbs.html>] BBS. Its impact with its readership, but that has made it such a sought after place to publish for authors. The reason is that this interactive dimension is missing from conventional publication, even though it is a natural and important aspect of learned inquiry. We write to influence our fellow-scholars, and to be influenced in turn by them.

Peer commentary is expensive to provide in paper; nor does every article merit that much attention. That's partly what peer review is meant to do for [<http://cogsci.ecs.soton.ac.uk/~harnad/bbs.html>] BBS: to pick out that work for which all this attention will be beneficial to the field as a whole, as well as to the author. One of the critical features of peer commentary is that it must be timely. One must strike while the iron is hot, otherwise the author has moved on to other things. So in a paper journal, *serial* peer commentary, appearing in issue after issue, would not be a possibility, because the turnaround time would be too slow. [<http://cogsci.ecs.soton.ac.uk/~harnad/bbs.html>] BBS circulates the article to 100 commentators as soon as it is accepted (formerly this was done by paper and mail exclusively; increasingly it is being done electronically), and then the article, commentaries and response, with tight deadlines, are all published in the same issue.

But is it only the 12-15 articles per year that [<http://cogsci.ecs.soton.ac.uk/~harnad/bbs.html>] *BBS* publishes that would benefit from peer commentary?

[<http://cogsci.ecs.soton.ac.uk/~harnad/bbs.html>] *BBS*'s electronic counterpart, *PSYCOLOQUY* [<http://cogsci.ecs.soton.ac.uk/~harnad/psyc.html>] *PSYCOLOQUY*, offers peer commentary for ALL articles. Once peer-reviewed, accepted, and published, all articles are open to commentary, and the commentaries (and responses) are published rapidly, to keep the momentum up. (And [<http://cogsci.ecs.soton.ac.uk/~harnad/psyc.html>] *PSYCOLOQUY*, thanks to an annual subsidy from the [<http://www.apa.org/>] American Psychological Association, is free for all.)

This sort of rapid electronic interaction -- which I have dubbed [<ftp://cogsci.ecs.soton.ac.uk/pub/harnad/Harnad/harnad90.skywriting>] "scholarly skywriting" -- can be implemented in many different ways; a peer reviewed journal is only one of them. But skywriting is perhaps the most revolutionary feature of electronic publication (6). It allows authors to interact directly with their peers at a tempo that keeps pace with the speed of thought (paper publication being hopelessly slow for it, and spontaneous speech, as in a live symposium, being perhaps too fast: the reflection and discipline of refereed Skywriting may well be optimal, a form of scholarly interaction that was not possible before the PostGutenberg era).

So what is the strategy for ushering in this era? It is a simple subversive proposal that I would make to all scholars and scientists right now: If from this day forward, everyone were to make available on the Net, in publicly accessible archives on the World Wide Web, the texts of all their current papers (and whichever past ones are still sitting on their word processors' disks) then the transition to the PostGutenberg Galaxy

[<ftp://cogsci.ecs.soton.ac.uk/pub/harnad/Harnad/harnad91.postgutenberg>]

would happen virtually overnight

[<ftp://cogsci.ecs.soton.ac.uk/pub/harnad/Psycoloquy/Subversive.Proposal/>]. Here is how this would bring the current paper house of cards come tumbling down: (1) Readers would quickly form the habit of accessing the free, globally available electronic versions of articles, rather than the late, remote, expensive paper ones. Having formed those habits and expectations, they would never relinquish them again. (2) Publishers would be encouraged to restructure themselves for the transfer of cost-recovery to the much lower advance page-charge model rather than the subscription model.

(Currently, publishers tend to experiment with what I think is a doomed hybrid model, offering paper subscribers a paper plus an electronic subscription for a bit more than the paper-alone subscription price, or an electronic-only subscription for somewhat less than the paper price; the hope is that this will provide a gradual transition to electronic-only publication, if and when demand dictates it, but always retaining the subscription model. I hope I have already given some reasons why this scenario is not in the best interests of scholars, the pursuit of knowledge, or the public, but if my subversive proposal were followed, the inevitable would be fast-forwarded, the conflict of interest at the core of the hybrid proposal (the now obsolete Faustian bargain) would become immediately apparent, and publishers would already feel the incentive to adapt in a more auspicious direction. Otherwise, there is a danger that authors, editors and peer reviewers may bolt and take matters into their own hands, creating electronic-only journals unencumbered by the old trade model.)

Something like this is already happening in the Physics community, where in four years one man, Paul Ginsparg at the Los Alamos National Laboratory, has managed to bring all this to

pass. Starting in 1991 with a proposal to exchange preprints electronically among 100 fellow high-energy physicists, [<http://xxx.lanl.gov/>] the remarkable global archive he created

has already grown to encompass virtually the entire current literature of high energy physics, general relativity, condensed matter theory, nuclear theory, and astrophysics; this is now past the half-way mark for the physics literature as a whole, and there seems to be no turning back.

25,000 physicists worldwide are accessing the archive 45,000 times a day, with 350 new papers deposited per week. This is truly revolutionary, and when the PostGutenberg history is written, Paul Ginsparg will be duly credited with having set the inevitable firmly in motion. The Physics literature still faces some potential crises, however, because all those papers in Ginsparg's archive eventually appear in paper journals. It is the paper publishers who pay for the peer review and the editing. Something clearly has to be done to keep the Invisible Hand of peer review intact, to preserve the quality of the literature. Perhaps when the library revenue begins to show signs of dwindling, the publishers will begin to recognise the virtues of the electronic-only, page-charge model over the hybrid one...

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