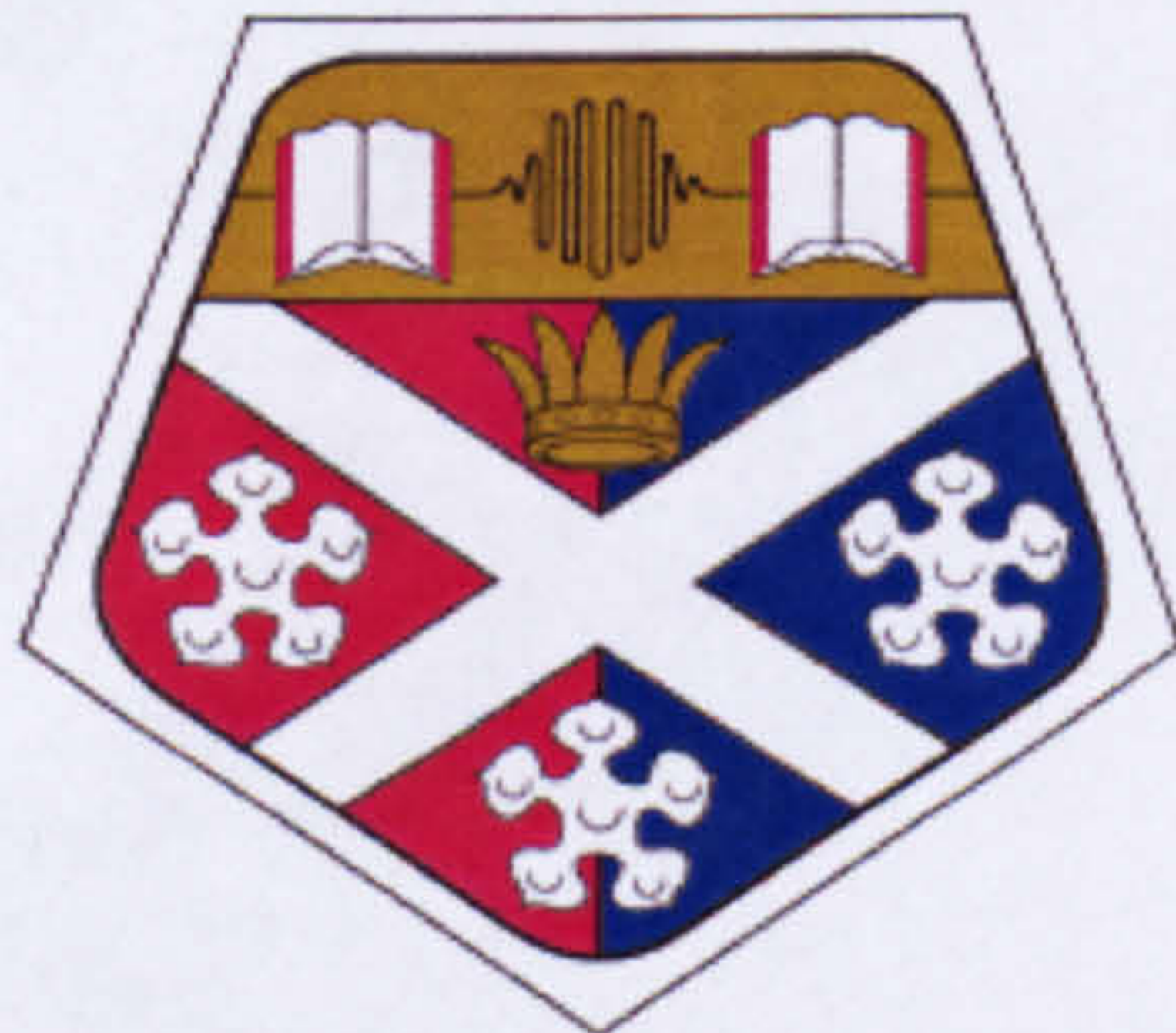


E-JOURNAL PUBLISHING IN ACADEMIC ENVIRONMENTS

**A STUDY OF E-JOURNAL PUBLISHING PROJECTS
AND OPERATIONS IN ACADEMIC DEPARTMENTS
AND RESEARCH LIBRARIES**

A thesis submitted in accordance with the requirements
for the degree of Doctor of Philosophy



Glen Campbell

Department of Computer and Information Sciences

University of Strathclyde

December 2004

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Acknowledgements

I would like to thank my academic supervisor, Dr Monica Landoni, for the guidance and encouragement given to me over a prolonged period of time.

I am greatly indebted to Dr Henry Hagedorn for giving me so much assistance during my visit to Tucson, Arizona. He made me believe that I was doing something worthwhile. I also have good reason to be grateful to the library staff at the University of Arizona, particularly Adam Engelsjerd and Eulalia Roel.

Lastly, I wish to offer my profound thanks to the Economic and Social Research Council for its financial support, without which I would have been unable to embark on doctoral research.

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Abstract

The primary objective of this thesis is to study the viability of e-journal publishing in academic environments, which includes academic departments and university libraries. These journals, which are sometimes still in the project stage, but in others are already well-established publications, are now beginning to challenge the hegemony of the commercial publishing houses.

The advent of information technology, and in particular the Internet, has enabled members of the academic community to bypass the main players in the publishing game, and to disseminate research findings themselves. This thesis is a snapshot of a publishing sector that is in a pronounced state of flux. Correspondingly, there are a number of questions addressed therein that hardly permit of definitive answers.

The mode of research is in the main qualitative. The research investigates the motivation and sentiment of editorial teams, in addition to their administrative structures, and these are not subject to statistical-cum-mathematical analysis and manipulation. Nonetheless, some degree of statistical evidence is provided in respect of e-journal use and usage.

These academe-based e-journal publishers will not completely undermine large publishing houses, but in the fullness of time they will play a part in lessening their influence. The thesis emphasises how important open access is to the success of these small academe-based publishers, though a number of very different business models are to be found. There are marked differences between these small-scale publishing operations and university presses, and not just of scale. These differences are discussed in light of ongoing developments.

The findings of this research describe the development of academe's response to the financial crisis related to journal provision. There is evidence provided that academe has led the way in developing the e-journal, and that in many ways academe-based publishers provide a better service than their commercial counterparts.

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CHAPTER ONE

Introduction

1.1 Context

This thesis presents an argument in support of the publication of scholarly e-journals in academic environments. The criteria most suitably employed to assay the efficacy of such an argument are not *a priori* and abstract, but *a posteriori* and concrete. Hence, the argument should not be judged by any preconceived abstract principle not directly related to the everyday realities of the publishing process, but rather by its overriding purpose, which is the need to persuade those employed in academe to participate actively in the development and improvement of publishing services, as indeed they did in earlier times.

The argument must meet a twofold test, which is in essence empirical and pragmatic. Firstly, do the facts, as I perceive them to be, lend themselves to the interpretation that I have placed upon them? Secondly, does the conclusion at which my argument arrives follow with logical necessity from the premise? The evidence presented must be verifiable; the arguments must be internally consistent.

The thesis is not presented as a comprehensive investigation of the entire field of academe-based e-journal publishing, for such an undertaking would be monumental in scope and ambition. Instead, an examination of a subset of that process has been carried out, which primarily entails case studies of a number of e-journals in the areas of archaeology, biology, information science, economics, and mathematics. The case studies are no mere assortment of facts and figures, but collectively form an examination of how the culture of each academic discipline manifests itself in regard to the publication of research findings, and the role of information technology in changing those cultures. It should be emphasised that these fields have not been chosen randomly, but for sound rational and empirical reasons,

all of which are explored in the case studies. There is a logical progression in the thesis as it moves from *kennen*, which is knowledge of verifiable facts, to *wissen*, which is a grasp of the evolutionary processes involved, and their attendant consequences.

The scientific method is essentially empirical. Scientific theories result when observation confirms tentative hypotheses, which can subsequently be evaluated and repeated. (The term 'scholarly communication' is used interchangeably with 'scientific communication' throughout the thesis. The term 'science' is employed in the manner of the German term '*Wissenschaft*', which is an appellation commonly accorded to any branch of academic knowledge studied in a systematic manner.) Yet, science comprises a diverse set of activities that cannot be understood simply by applying the formulaic scientific method. Indeed, the everyday practice of scientific research is somewhat more problematical, and on occasion haphazard.

The qualitative methodology brought into play is founded on a series of in-depth interviews, for it is principally editors who set the agendas for the proliferating academe-based e-journal publishing projects. Learned societies publish journals, but these are the products of institutional endeavour and not of individuals. It is up to individual scientists to feel as much at home in the informational domain as they do in the scientific one, otherwise there is a risk that a rift will appear between e-publishing specialists who devise, improve, and maintain services, and the scientists who actually use those services.

The commercial publishing houses, which are now widely regarded by the academic community as the *fons et origo* of all that is wrong with scholarly communication, have themselves created a rift with their customer base. Therefore, to borrow Lenin's lapidary phrase in respect of revolutionary change, what is to be done? The issue that this thesis addresses ultimately concerns the nature of all scholarly publishing, even though such an all-encompassing approach lies outside the remit of this thesis. However, it cannot be gainsaid that e-publishing has met with most success in the area of serial publications.

To be sure, the e-journal has not been created in a vacuum; it is the product of a successful interaction between social change, technological innovation, and commercial vision. The paper journal is an engaging metaphor to employ when publishing an electronic one, but the e-journal is evolving into a medium that differs vastly in focus, depth, quality, and functionality.

Nonetheless, the e-journal is part and parcel of traditional scientific publishing, and the emerging interactive communications and publishing market, though the line between scholarly communication and scholarly publication is now consciously being blurred by a number of not-for-profit publishing operations. The academe-based publishing projects, particularly those of the open access movement, could well present a serious challenge to the *status quo*. The growth of such projects presents a threat to the business model of commercial publishing houses, and also of some learned societies. There have been, concurrent with developments in information technology, profound changes in the scholarly publishing arena.

A diffusion of ownership, and the attendant diffusion of power and influence, would promote a healthier economic climate in the academic library sector, and a healthier intellectual climate in academe *in toto*. Yet, the complex interaction between market forces and technological innovation precludes an accurate forecast of the way in which e-journal publishing will develop over the long term.

1.2 Hypotheses

The central hypothesis of this thesis is whether academe-based e-journal publishing projects can supply a more efficient service to the academic community than that provided by the commercial publishing houses. The term 'efficiency' is, in this context, predicated on cost, speed of publication, technical innovation, citation, and the prestige that is a corollary of citation.

There are a number of publishing models that could be adopted as alternatives to the print journal model. For example, field-wide e-print repositories, which is a

model that is associated with Steven Harnad. [1] There is the peer-reviewed, dedicated e-journal advocated by Thomas Walker. [2] There is the model of authors publishing papers on their own home pages, which Ann Okerson has supported in a number of articles. [3] Lastly, the model favoured by commercial publishers is parallel publishing, which is a hybrid electronic-cum-paper journal, or e-p-journal, which offers online facsimiles of print journals.

Publishing lies at the heart of the scientific effort; it is the very mortar that binds the scientific community together. This is without doubt one reason why change is proving so painful. Web publishing and e-print libraries have no direct precursor in the traditional publishing model. At the time of writing, the dominant model is the e-p-journal. However, this model faces a number of challenges from small, academe-based publishers. There are, in addition, a number of ancillary hypotheses.

- As it is the case that by far most journal articles originate from universities in the West, and that by far most journals are purchased by those selfsame institutions, it would be in the interests of academe as a whole, Western and otherwise, to publish their own research work. This would in effect universalise the availability of scholarly research findings.
- The Web has transformed the scholarly publishing metaphor. The journal was once a static artefact in a library, now it is a dynamic one on a desktop. There are many who believe the paper journal to be obsolescent. Librarians are ideally placed to become publishers, and compete against those who have ill-served them, and the rest of the academic community, for so long.
- Journals published by the not-for-profit sector are demonstrably cheaper, sometimes very much cheaper, than those originating from the commercial sector. The money that institutions could save by refusing to do business with commercial publishers, as is now beginning to happen on a wide scale in North America, could be used to fund their own publishing systems.
- Commercial publishers have been nowhere near as technologically innovative as the small academe-based publishing projects. It is perhaps the case that the commercial publishing houses' migration to online publishing has been more imitative than innovative. The library profession has a tradition of embracing

technological change, and the mindset, if not yet the wherewithal, exists to include publishing in the profession's remit.

- It is, for the most part, the editors of scholarly journals who have become the collective driving force in the conflict with commercial publishers. They are highly motivated individuals who have been outraged, and in some cases sued, by commercial journal publishers. A number of these publishing projects are, if not quite one-man bands, over-reliant on these individuals, and this may have consequences for the future development of these publications.

Academe-based e-journal publishing operations are as yet statistically insignificant, but this does not detract from the coherence and validity of the argument that a paradigm shift may not be far distant. A relatively small number of academe-based e-journals have become highly cited, yet there remains a lingering degree of scepticism among certain sections of the scientific community as to whether such a system is viable in a universal sense.

However, as such e-journals proliferate, the sceptics' arguments may tend over time to subside. For example, aeronautical engineers have claimed that, according to the theory of aerodynamics, the bumblebee should be unable to take to the air in unassisted flight. Nevertheless, bumblebees are demonstrably airborne. It is not necessarily the case that scientists are the best arbiters of the everyday practicalities of scientific publishing.

1.3 Original Contribution

The aspect of this thesis that may be deemed to be original is primarily in regard to the proven viability of academe-based e-journal publishing, and secondarily the manner in which the nature of an academic discipline determines the method of publishing, and arguably *vice versa*. First of all, there is a subjective element in the interpretation of the following exegesis of the current state of academe-based e-journal publishing. There is evolution *versus* revolution; a gradualist perspective *versus* that of a punctuated equilibrium. However, it is hoped to open a new vista on

this development by explaining how both models can be valid in particular circumstances. Indeed, sometimes both models can be valid in understanding the publishing policies of a single publication, and this discursive shift ramifies with a period of profound change in the socio-economic organisation of academe as a whole.

The nascent e-journals projects in academe are best understood as discrete bodies, each of which provides a publishing outlet for just one body in a constellation of disciplines, albeit in addition to its satellite subdisciplines. In this attempted reorganisation of the scholarly communication system fragmentation of effort is seen by those involved in the field as a positive quality. The case studies indicate that each and every discipline has its own culture, and also subcultures, and that each one takes a different approach to the publication of research findings. It is possible to extrapolate from this intellectually blinkered approach that small, flexible, and very highly motivated publishing teams can offer a better standard of service to their disciplines than that which is presently provided by a monolithic publishing industry.

A key feature of these case studies is the level of interaction between authors and academe-based publishers. There are those who see scholarly publishing as an end in itself, which is the diffusion of research material, and those who view it as a means to an end, which is financial aggrandisement. The ethos of commercialism permeated the growth of scholarly journal publishing during the course of the latter half of the century passed. It is the fervent wish of academe-based e-journal publishers to return scientific publishing to the scientific community and that, on an as yet limited scale, is what they have indeed done.

The thesis contains ample and irrefutable evidence that academe-based e-journal publishing is a viable, and indeed desirable, alternative to the services offered by the commercial publishing houses, and that it is furthermore a fillip to the scientific community in general. There seems to be a consensus in scholarly publishing that it is far easier to adopt a new technology than it is to adapt to its potential. The e-journal is still at an embryonic stage of development.

1.4 Methodology

There was an extensive literature review carried out in order to provide a framework for discussion. The review provides background knowledge to the economic, social, and technological foundations of academe-based e-journal publishing operations. A considerable number of exploratory interviews were carried out. The purpose of this approach was essentially heuristic, which is to say that they were not much concerned with facts and statistics, but had rather more to do with concepts and the setting of research hypotheses. The interviews were for the most part conducted in an informal manner; earlier experience having proved question-and-answer sessions to be less productive than desired. The main purpose of this conversational style was to encourage interviewees to respond in a spontaneous fashion.

Chapter Two is an exposition of the methodological approach adopted. There are details provided of how data was collected. The strategy of data triangulation is employed and explained. Chapter Three is a survey of the administrative and technological aspects of e-journal production, marketing, and dissemination. Chapter Four contains a comparative case study of biology e-journals, in addition to comments pertinent to the central issue made by a number of people associated with these publications. Chapter Five is a case study of an archaeology e-journal, discussing some of the technological challenges that the publishers have faced.

Chapter Six is a case study of an information science journal that pursues a policy of experimentation, and that works in tandem with a commercial publisher. Chapter Seven contains a number of case studies in the field of economics, one of which is an attempt to found an academe-based publishing house that is not based on the university press model. Chapter Eight examines mathematical journals, and the unique problems they face. These chapters explore the traditions of these academic disciplines and their epistemic cultures, and also comment on related disciplines. The following points are important in understanding the broader aspects of scholarly publishing.

- There are socio-cognitive differences existing that range across disciplines.

- Modes of communication and publication differ, sometimes markedly, between disciplines.
- Genres of academic writing, and also discursive conventions, vary greatly.
- Rules, guidelines, and institutional conventions related to the publishing process are by no means uniform.
- Researchers' material shapes, and in turn is being shaped, by the use of information and communication technologies.

All of the above factors have impacted to some degree on the development of academe-based e-journal publishing. The thesis also demonstrates that in future librarians will have to compete with a number of players in order to retain their hitherto unchallenged pre-eminence in academe as information specialists. Librarians can easily adjust to the paperless journal environment, but there is a case to be made that the best way to do this is to become publishers themselves.

The editors of academe-based e-journals are without exception highly motivated individuals, who exhibit different strengths and weaknesses, different talents and shortcomings, different levels of experience, and different perceptions of the publishing process. Those involved are not individual actors seeking to improve their economic position. The growth of academe-based e-journal publishing is the result of the efforts of many individuals who work in partnership for the benefit of their own disciplines, research libraries, and indeed academe as a whole. Yet, it is a small body of e-journal editors who are the primary inspiration and driving-force behind this phenomenon. This thesis is in part an exploration of their collective role.

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CHAPTER TWO

Methodology

2.1 Introduction

The purpose of this chapter is to present the methodology that has been used in the thesis, in addition to explaining the reason why such a methodology was adopted in the first place. Methodology is a collective noun for a set of techniques through which a researcher is able to organise, and thereby accomplish, an objective inquiry into an area of academic interest. The literature review is central to the thesis, for the academe-based e-journal publishing movement is primarily driven by sentiment, and this is given full voice in the scholarly publishing, and the scholarly communication, systems. The choice of research design and methodology is predicated on the research objectives explained below.

It would be somewhat optimistic, if not indeed unrealistic, to entertain the possibility of establishing the practice of scientific publishing as a science, either exact or inexact, based on the presupposition that the market for recondite publications has a rational structure, and that the relations factors bear to each other within this structure can be discerned in entirety by recourse to rational and logical deduction. Nonetheless, a process of deduction was employed, commonly called the hypothetico-deductive method, to assist in the generalisation of the characteristics, attitudes, and expressed beliefs of those involved in e-journal publishing in academe. The conclusions follow from the premises, which are the requirements of deductive validity.

However, the occasional inductive leap has had to be made. Basically, induction refers to a mode of enquiry that derives general conclusions from particular instances. There would surely be no meaningful hypotheses to examine if researchers never attempted to generalise beyond the immediate scope of their data.

In a number of ways publishing and science make strange bedfellows; publishing is really about enterprise and trade-offs, but science is mainly concerned with verifiable evidence and its interpretations. Publishing is a commercial operation, and the not-for-profit sector is encompassed within that proposition. Indeed, in the manner of dye cast into water, commercial assumptions, tacit and otherwise, colour academe-based e-journal publishing operations of every stamp. This phenomenon needs to be studied in the context of the intellectual debate regarding the kind of problems to which these e-journals, and their editors, prescribe a remedy. As a consequence, the methodology has been tempered to suit a number of disparate factors.

2.2 Interviews

Interviewing requires skills that are markedly different from most others exercised in the course of doctoral research. A number of exploratory interviews were carried out. Almost all of those interviewed were editors of academe-based e-journals, for they are in the main the prime movers. All of them were recorded, with the interviewees' prior permissions, and transcribed at a later date.

Each transcribed interview was e-mailed to the interviewee for confirmation of its authenticity. On one occasion only were deletions made at the request of an interviewee, there being reason to believe in hindsight that some pronouncements were factually inaccurate. The emended version was subsequently given approval by the interviewee.

There are generally considered to be three types of interview.

- *Structured*

This has a number of predetermined questions with fixed wording, which are set in a predetermined order. It is formal in nature, and is almost in the form of an oral questionnaire.

- *Semi-structured*

This also has predetermined questions, but the wording and order may be modified in accordance with the interviewer's perception of what is most appropriate to the situation.

- *Unstructured*

This is the least formal approach to the process of interviewing. A general area of interest and concern is explored, with the interviewer allowing the conversation to follow its natural course.

The interviews were planned to be semi-structured, but sometimes became unstructured as interviewees extemporised on questions related to the subject that the interviewer had not thought to ask. However, this was more often than not a positive development, and led to a fuller understanding of the topics under discussion.

The interviews purposefully explored the model of e-journal publishing in academe as a social practice, though the thesis is not only a study of the motivational factors involved in the process of publishing, but also a study of the technological and administrative means employed. The long-term viability of academe-based e-journal publishing is also assessed. The intended ends of such a publishing process are highly dependent on the oft-multifaceted cultures of each individual discipline.

Unstructured in-depth interviews are time-consuming. Long journeys, sometimes overseas, must be undertaken to visit institutions of higher education in which particular e-journal publishing operations are based. Transcribing such interviews can be problematic. A tolerance of repetition and linguistic redundancies must be cultivated, though not emulated. A verbatim transcription does not always flatter the speaker when it appears on the printed page. Therefore, repetition, false starts to sentences, and such like are edited out.

The transcribed interviews were e-mailed to the interviewees for approval prior to being quoted in the thesis. One interviewee asked for some minor deletions to be made. Four interviewees made no response. All others consented without demur

for excerpts from the transcriptions of their interviews to be used in the thesis. A relatively large number of interviews were carried out, but quality, rather than quantity, was the essential determinant of those chosen to be interviewed. All of the editors who were interviewed are well known for their interest in e-journal publishing.

Initial contact was established with potential interviewees by e-mail. It was explained to those involved that the interviews would take around an hour, or perhaps slightly longer, and that while the questions would certainly focus on their own publications, their opinions on other aspects of scholarly communication would be solicited. If the respondent agreed on a time and place for an interview, a provisional list of questions was sent as an attachment to an e-mail that expressed gratitude for their cooperation.

It was invariably made clear that the interview would be more of a recorded conversation than a structured question-and-answer session. These questions were to be seen as suggested topics for discussion. It was thought a matter of no little import that interviewees should be fully cognisant of the interviewer's objectives. Interviewees could give voice to positions that had been carefully thought out, and doubtless did, but in the ebb and flow of conversation spontaneous reactions were also sought. The setting for the interview was without exception the interviewee's own office.

The primary purpose of these in-depth interviews was to collect and compare percepts and concepts, and to develop, and it was hoped improve, the conceptualisation of the research topic. A number of factual questions relevant to the editor's own publications were asked. However, there were also a number of questions pertaining to rival journals, particularly those in the commercial sector. The first question asked of all participants in these recorded interviews was to give a definition of an e-journal. Surprisingly, or perhaps not, these definitions varied greatly.

Questions related to the scholarly communication system, and the scholarly publishing system to which it is so closely related, and is oftentimes conflated, were kept as open, and indeed as projective, as possible. The mode of questioning was

more oblique than direct, as over a period of time this was found to be more fruitful. The interviewer learned much from the careful study of these recorded interviews. It was found that interviewees impart more information when they feel that they are in control of the interview, and are not being pressured in any fashion.

The interviewer listened to the recording of the interview as soon as possible. It was very often the case that more was learned from the interview in retrospect than at the time of recording. The significance of a great deal of what was said during the interview was not fully recognised at the time. However, the subsequent listening sessions more often than not proved instructive, providing useful information on which to base further research.

Now, this style of interviewing is not appropriate to every situation, but all participants in the study were cooperative and supportive from the outset, though some much more than others. The interviewer learned over time that the frame of mind evinced by those being interviewed is an essential guide to how the interview should progress, and flexibility of response is key. Broadly, interviewees were more willing to talk about what they had done in the past, in addition to what they were doing at present. However, subsequent events were to prove that interviewees could not be expected to reveal future courses of action. Sadly, there is not perforce any meaningful congruence between interviewees' avowals and their planned courses of action.

Academe-based e-journal publishing is still in embryonic form, but underlying its ostensibly amorphous growth it is possible to discern a pattern of sorts. The editorial teams differ profoundly as to what actually constitutes an e-journal, and their means of funding their publications is diverse and protean. If they have anything in common it is their hostility toward the *status quo*. Indeed, this is very much the mortar that binds them together. A plethora of quotations inserted throughout the thesis not only serve to illustrate each project studied, but also the economic and social conditions that have galvanised the academic community to grapple with the development of scholarly resources in the digital environment in the first place.

2.3 Case Studies

A number of case studies were carried out in order to obtain empirical data on the contemporary situation. In general, case studies are the most effective strategy in assessing the viability of academe-based e-journal publishing projects and operations. They are contemporary phenomena, within real-life contexts, which require a number of approaches. It is hoped that the case studies succeed in being explanatory, exploratory, and descriptive in equal measure. There are a small number of corresponding prescriptions made by the researcher, though these are almost always tentative in nature.

The interviews were crucial in obtaining detailed, intensive knowledge of each individual case. The case studies are supported by judiciously selected quotations from the interviews. Indeed, some case studies rely heavily on such quotations to explain the ethos of these journals, and the publishing cultures of the disciplines that they serve. The main driving force behind such journals is usually the editor, though occasionally it is a small team. The editor's story is inextricably entwined with the journal's story. The editors' view is the insider's view of the journal, which complements the researcher's view of the journal from the perspective of an outsider, though it is hoped that the latter view is the more objective.

- Chapter Five contains the first case study, which contains observation, interview, and documentary analysis. The editorial office of *Internet Archaeology* was visited, and an interview of one hour and forty minutes in duration was recorded with the editor. A number of others involved in the publishing process also gave their opinions on how *Internet Archaeology* was developing. In addition, there was the opportunity to observe editorial duties being carried out. A considerable volume of hard copy was obtained containing data on a wide range of topics.
- Chapter Six contains the lengthiest and most detailed case study. This is a comparative case study of two biology e-journals that are published in the same department at the same institution. It was carried out during a five-week

visit to the University of Arizona, during which time entire days were spent working alongside members of the publishing team, which is based in the university library. A number of staff meetings were attended, and recordings of these were made with a Dictaphone. Nine interviews were recorded, two of which were over two hours in duration. In addition, a number of notes were taken during informal conversations with other staff members. A large volume of hard data related to technological issues was collected. A comparison is made between the journals' very different approaches to publishing. One of these publishing teams was markedly more helpful than the other.

- Chapter Seven explores the *raison d'être* of the *Journal of Digital Information (JoDI)*, and compares it with other approaches to publishing in the field of information science. *JoDI* has an almost *avant garde* approach to e-journal publishing, with the editor espousing a policy of experimentation. The editor was interviewed, and a review of the journal archive was undertaken.
- Chapter Eight is a comparative case study of economics journals published in academe, and also a study of an attempt to found a publishing house based in an academic department. This project should not be confused with a university press. Two interviews were recorded. The first interview was two hours in duration, and was done face-to-face. The second took place by telephone with an academic economist based at Vanderbilt University, Tennessee, and lasted one hour. Vanderbilt very kindly met the telephone charges. A learned society using the services of a university press to publish its journal is also studied in order to compare it with academe-based publishing projects. In addition, another American academe-based publishing venture, this one funded by venture capital, is also considered, though this is a quasi-commercial publishing house. All four are very different, and serve as good examples of the different directions from which publishing can be approached.
- Chapter Nine is a comparative case study of mathematics journals. This is a discipline that has had a number of problems associated with the accurately represented formatting of its research findings due to the incompatibility of

fonts. Two interviews were carried out, one being recorded at Warwick, and the other at Bielefeld, Germany.

Each case study examines the sustainability of the e-journal published. Firstly, it is essential to be tightly focussed on the definition and needs of users in the development of an e-journal. Secondly, positioning the editorial policy of the publication in relation to similar e-journals is extremely important. Thirdly, an e-journal is an enduring resource, and it therefore has to be safely archived. Fourthly, there must be a sustainable business plan over the long term. The case studies address each of these points in turn.

There is a pronounced geographical bias in the case studies. The United States has led the way in e-journal publishing, and Western Europe has not been far behind. However, academe-based publishing projects in other parts of the world seem to be following the paths they have trodden. Some institutions in Eastern Europe seem to regard it as a mark of institutional prestige to publish an open access journal. The Chinese academic journal market is arcane, even to those working within it, and has many problems related to translation, citation, and prestige. The South American academe-based e-journal projects also have problems related to prestige, for there are many Hispanic authors who much prefer to have their papers published in journals based in the United States. Western dominance in science and technology is reflected in the desire of scientists in every part of the world to publish in Western journals. This is, of course, an oversimplification of a complex phenomenon, but one that would require another, very different, thesis to investigate fully.

2.4 Literature Review

The literature review is necessarily lengthy and wide-ranging. The views of many authors are compared and contrasted. On the one hand, the comparative technique of analogy is employed to compare academe-based e-journal publishing with other forms of scholarly journal publications. This can assist in creating a common point of reference. On the other hand, homology is employed to examine one context in the

terms of another very different one. A homologous relationship exists between two separate entities, and homology is based on the idea that individual or group behaviour can be explicated to some degree by reference to the social structure.

It is, of course, essential to be familiar with the views espoused by all participants in the scholarly publishing process. The thesis is not primarily concerned with the commercial publishing sector, but the literature pertaining to it must be read, understood, and placed in context. The academic response to commercial publisher's pricing policies, and to the publish-or-perish system, which is discussed in Chapter Three, must be understood, for opposition to these iniquities underpin the rise of academe-based e-journal publishing.

Therefore, the review provides examples of similarities and dissimilarities of theory and practice that are discussed in the scholarly publishing system. The current research and debate on this topic is voluminous. Yet, it must be explored, and comprehended, in order to form the foundation for the research proper. Everything from books and print journals, to e-mail communications and e-journals, has been read and digested. The net has been cast wide, but that is not indicative of a lack of focus. Every academic discipline has its own publishing culture, and it is crucial to become acquainted with as many of them as possible in order to obtain sufficient background knowledge to place developments in context.

CHAPTER THREE

Literature Review

3.1 Introduction

There follows a review of informed opinion on the subject of the e-journal publishing industry, and how it relates to e-journal publishing projects based in academic departments and research libraries. The question of how scholarly communication and scholarly publishing can be differentiated is brought into focus. In recent years, there has been an upsurge in the number of academics who wish to challenge the *status quo* in journal publishing. It is hoped that the following pages will explain what it is exactly they are challenging.

The salient issues of the scholarly communication system are explored and mapped; an understanding of these may serve as a guide to the greater part of the following thesis. In short, it shows that different publishers have very different needs, as indeed do all the various participants in the publishing process. At present, e-journal publishing projects in academic environments are still viewed by many researchers as something that is still in the experimental stages. However, a review of current literature in the field indicates that they are now perceived by some, and hoped by others, to be an embryonic threat to the market dominance of the commercial publishing houses. It is, in the main, scientists who are driving these changes, and the reasons for this will be explained in the following section.

3.2 Scientific research and scientific communication

The scientific journal, or periodical, is a publication that is customarily made available to its readership at fixed and regular intervals; it is comprised of volumes that are divided up in to issues bearing ISS numbering, and a chronological

designation. A scholarly journal has no predetermined conclusion. The intervals at which a journal is issued can be daily, weekly, monthly, or annually. Online journals are sometimes published, or updated, on an irregular basis. There are original, and customarily refereed, papers presented, which are each authored, individually or collectively, by persons active and competent in their particular disciplines. These conventions are of some import to those who use journals. The title is also of significance, for it indicates the nature of the research and commentary contained between its covers. It is the quality of the articles accepted for publication by a journal that is the central concern of readers. It is clear that a considerable number of publications, described by some as scientific journals, do not fit this somewhat narrow definition. However, as it is the case that circumscription is inherent in any given definition, it would perhaps be pragmatic to employ the term 'journal' in a generic sense. There are trade scientific publications that are accessible to the informed layman, but most scientific journals, containing information of a singularly recondite nature as they do, have perforce a limited readership.

Aristotle was of a mind that in order to define something, to have a fundamental understanding of it, one must have firm knowledge of four signal points: its matter, its form, its power, and its purpose. [55] A contingent definition of a traditional print journal: its matter is that of which it is composed, which is paper; its form is its pattern, which is a folioed collection of onymous papers; its power is what brings it into being, which is print technology; its purpose is to circulate research results and informed comment, which is promoting the advancement of knowledge.

The journal system is a marketplace for concepts and practices within the scientific community. The efficient dissemination of primary academic research material is required in order to fuel the research process itself. [179] Library-based publishers are among a number of new traders in this burgeoning information market. A scientific journal serves as a conduit through which researchers and practitioners in a particular field may exchange research findings with each other, offer informed comment, and improve personal levels of knowledge and understanding.

Unfortunately, the greater part of the journal system is at present a seller's market. The present journal system is an impediment to the circulation of scientific

knowledge, insofar as it presents fiscal barriers, sometimes of an insurmountable nature, to the ability of the library profession to store and provide research findings in a comprehensive fashion. [176] The publishing of electronic journals by research library staffs can be seen as one way to resolve this issue. The electronic journal has, of course, a good deal in common with the paper journal that predates it, while at the very same time possessing the potential to transcend the limitations of the printed page. The notion of a scholarly journal as an intellectually coherent, though individually differentiated, assemblage of refereed papers remains central. It can be seen, therefore, that the key functions of a scientific e-journal are the commissioning, editing, collation, and dissemination of papers to meet the perceived needs of research communities. The journal metaphor shall remain fundamental to formal scientific communication. Scholarly journals are published by a number of sources.

- Learned societies
- Trade publishers
- University presses
- Academic libraries
- Faculties

The very concept of a journal, however, is being transformed by an amalgam of commercial pressures and technological innovations. The journal, however it may be defined, is an indispensable part of the scientific communication system. The dividing line between journal and monograph is in the process of blurring, but nevertheless seems set to remain for the foreseeable future, and so it should, for the distinction is an important one. The journal paper is sometimes an excerpt from a more substantial piece of research that is in press. Correlatively, the spatial limitations of the journal format render it unsuitable as an arena for lengthy discourses. Occasionally, special editions of journals are published as monographs, and quite commonly these are in scientific subject areas. There is a commonly held view among researchers that the journal is possessed of four signal functions. [31] [32] [33] [34]

- Registration
- Validation/certification

- Dissemination
- Archiving

The publication of a paper in a scientific journal may serve to register a scholar's intellectual property rights, and position the research findings in a readily identifiable timescale. It also serves to validate a paper as an original contribution to the body of knowledge that constitutes a scientific discipline. Originality, however defined, has long been regarded as a distinguishing feature of *echt* scholarship. The scholar's reputation may be enhanced by publication of a paper in a journal of professional repute, each paper published in a scientific journal having been given a stamp of authenticity by the exercise of peer review. The journal has, over the years, developed into a sort of combined standards and patents office for scientific methods and theories.

Researchers know, or at least have good reason to believe, that a journal offers a continuing supply of catalogued intellectual resources that are utilisable and easily accessible. The guiding purpose of this system is to furnish readers with ideas on which to base yet further research, and to assist in the avoidance of duplicated effort by raising awareness of research projects in similar areas. The fact that most scientific journals can now be accessed online means that logistical problems have been largely overcome, and that constraints on dissemination are now primarily related to economic factors. Scientific journals are, of course, archives in the making. It is axiomatic that each and every journal is a unique collection of research papers with attributes in common. They evidence the intellectual growth of an academic discipline, and record the contributions made by practitioners to its continuing development. [168] The archival function gives order to comprehensive corpora of scientific texts, which otherwise would be collected in a fragmentary manner, if indeed at all. There are five significant functions that information contained in journals serves in academic and other research environments, and it is of some importance to differentiate between them. [94] [95] [98] [99] [100]

- *The fact-finding function.* Researchers may look upon journals as an encyclopaedic resource from which they are able to derive solutions to

problems found at the cutting edge of their disciplines. Journals, particularly electronic ones, contain the very latest research output. Some refereed papers are published online within a month of them being submitted for publication. The need to find information fast in order to solve pressing problems is more commonly associated with practitioners than academics.

- *The current awareness function.* Researchers in some disciplines, particularly in dynamic areas such as information and communication technology, feel compelled to be constantly updated on the latest developments. Academics and practitioners may differ in how they use journals to keep abreast of research and events. The former may be more concerned with theory as opposed to practice, and concern themselves more with minutiae. The latter may read less, and have more interest in the broader picture. There is an ever-increasing need for librarians to filter and grade information in order to facilitate searches by researchers. The increasing volume of scientific publications makes it difficult to keep up to speed. [59] [60]
- *The research function.* Academics and practitioners involved in research have, by definition, a significant interest in documentary information systems. Research work can prove singularly time consuming, but the use of the Internet and e-journals makes it possible to delegate many search tasks to assistants. It is easier and faster to search archives now that they are online. However, it does not do to confuse fact-finding with research, for the researcher must be able to interpret facts and place them in a wider context. It is, therefore, advantageous to possess relevant background knowledge.
- *The briefing function.* The research community does not really have a need for a superficial overview of a subject area. However, this function could be of use to those who wish to have an overview of their discipline. There is sometimes such a degree of overspecialisation that researchers can lose track of what is happening in the mainstream of their respective disciplines. A search with a global orientation, as opposed to one with a more precise profile, can offer valuable insights into the general development of an academic discipline.
- *The stimulus function.* Researchers can be stimulated to investigating different areas by perusing the literature. Usually, researchers know roughly what they

are looking for, but every so often they chance upon items of interest that fall within their research parameters. It would not do to underestimate the role of serendipity in literature searches. The ability to make comprehensive searches of very large e-archives makes it all the more likely that researchers will find research results that are of use to them.

Members of the scientific community are, with the exception of those involved in commercially sensitive research, primarily concerned with sharing their research results among their peers. The benefits that scientists receive from the publication of their work are for the most part indirect. It is almost unknown for scientists to receive cash payment for permission to publish their work in journals. Moreover, scientists are sometimes asked, and this is particularly true in the biological sciences, to pay page charges in order to have their work published. Scientists have a vested interest in furthering scholarly communication, and in the past they have pursued this end by banding together to form learned societies. [98] The very practice of research may be changing due to the added dimensions of online multimedia. In addition, there is a growing recognition of the differences between scholarly communication and scholarly publishing, though it is sometimes difficult to differentiate. The manner in which technological change is influencing the means by which members of the research communities interact and access information are many and varied. Nonetheless, there are still a good many researchers who resist, or at least try to ignore, the changes going on around them. [101]

A lot of publishing houses are private concerns, and are therefore not subject to the rules and regulations of publicly listed companies. There is a great deal of complex, and sometimes overlapping, data available on the publishing industry as a whole, but there is a dearth of coherent data associated with the e-journal publishing industry, irredeemably fragmented as it is. [207] (The five largest publishing houses produce almost 50 per cent of journals, but the remainder are produced by over two thousand others.) [96] In a recent survey of 275 journal publishers it was reported that 83 *per cent* of STM titles were available online. [143] However, the top five STM publishers account for 37 *per cent* of all STM articles published. Elsevier alone accounts for around 18 *per cent* of published articles, but has a market share of 28.2 *per cent*. [171] The chart below shows how the journal market is segmented. [204]

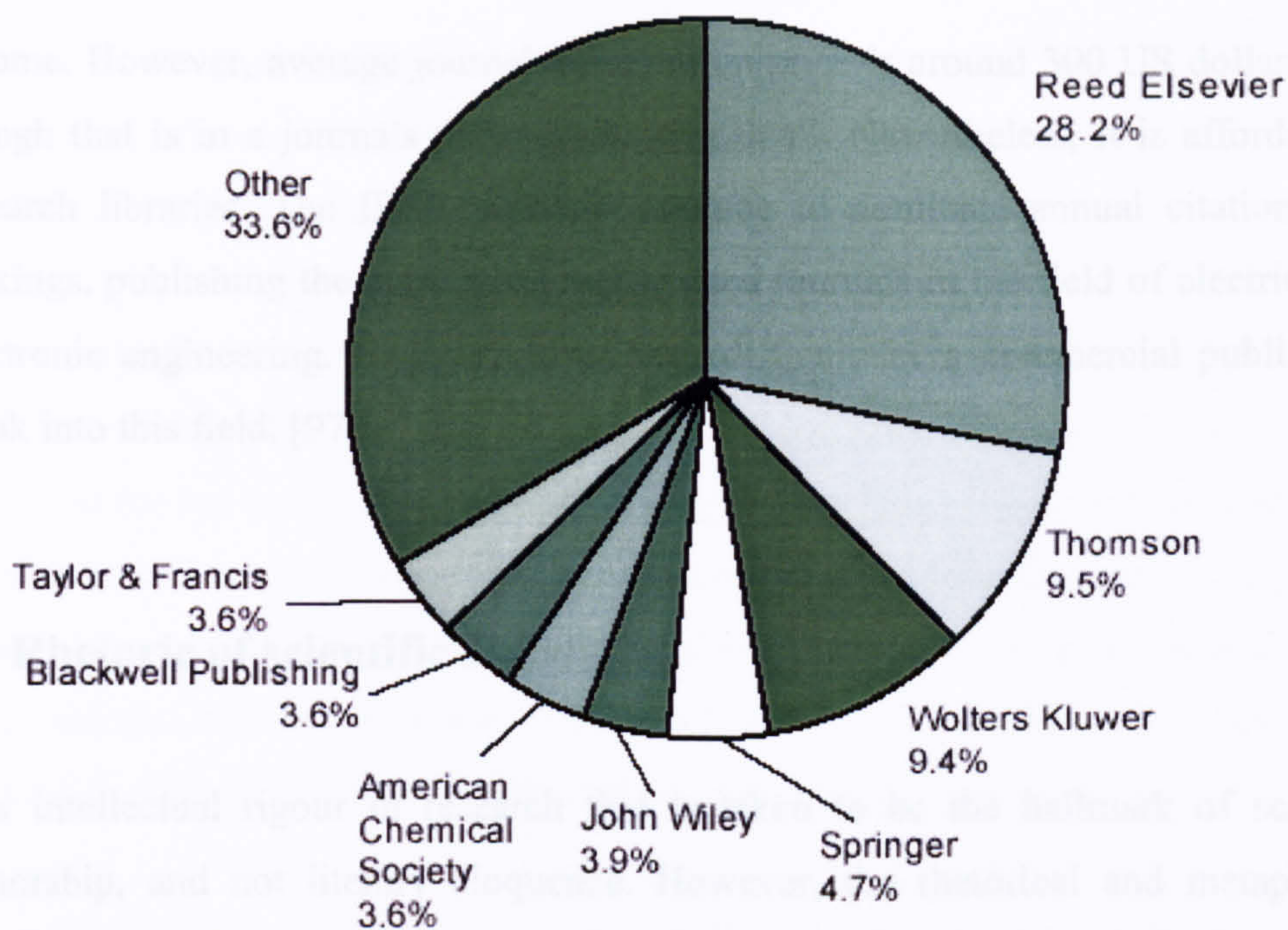


Figure 3.1: *Global Market Shares of STM Publishers, 2003*

The size and nature of the scholarly journal customer base varies significantly. First World countries obviously purchase a greater number of journals, and the proportion of individual subscriptions to institutional subscriptions in such countries is also higher. On the whole, humanities journals have a markedly higher proportion of individual subscriptions than those in the STM field, but they are usually much cheaper, and consequently more affordable to their readership. However, the number of individual subscriptions has fallen in every discipline as readers rely more on institutions to satisfy their research requirements. The so-called ‘serials crisis’, the exponential rise in cover prices, is undoubtedly the reason for this. The fact that just three companies, Taylor & Francis, Wolters Kluwer, and Reed Elsevier publish more than 60 per cent of the journals in the leading citation index, ISI Web of Science, means that there is not quite a free market. [102]

Learned societies often include the cost of a journal in the annual membership fee, and offer other journals in their stable at a relatively favourable rate. The largest of the learned society publishers is The Institute of Electrical and Electronic Engineers, which publishes over 100 journals. According to ISI data this makes it the ninth largest publisher of STM journals, producing around 30 *per cent* of the literature in this field. Journal publishing accounts for around 50 *per cent* of the IEEE’s annual

income. However, average journal subscription price is around 300 US dollars each, though that is in a journals package, or 'big deal'. Nevertheless, it is affordable to research libraries. The IEEE journals continue to dominate annual citation study rankings, publishing the eight most highly cited journals in the field of electrical and electronic engineering. It would prove very difficult for a commercial publisher to break into this field. [97]

3.3 Rhetoric of scientific serials

It is intellectual rigour in research that is taken to be the hallmark of scientific authorship, and not literary eloquence. However, the rhetorical and metaphorical devices that are commonplace in humanistic discourse are not entirely absent in scientific papers. The literary mode of discourse is primarily aesthetic, whereas the scientific is distinctly utilitarian. [44] [45] Indeed, it is characteristic of scientific reports that they are written in the passive voice, and that they are correlatively impersonal in nature. [43] It is intended that they be essentially didactic, reporting a series of objective procedures, and that they eschew ambiguity and polemic. [46]

It is this prose style that is mirrored in esoteric scientific journals, though trade publications aimed at a wider market sometimes present their reports in a livelier, more persuasive, style. There is, of course, a subjective element in the writing of a report, as indeed there is in the reading of it, but the intellectual rigours of a scientific education do much to instil a preference for logically consistent argument, and verifiable evidence on which to base a premise. [103] Nevertheless, there are definitely some members of the scientific community who are more adept at promoting their work, and by association themselves, than others. [35] Yes, indeed, rhetoric as the handmaiden of science.

However, that is by no means to slight such persons, for rhetoric is not only a communicative process, but is also an epistemic one. As a rule, science is a separate domain of thought, but it is not wholly irrelevant to the humanities. [48] Scientists do, on occasion, conjoin these differing visions of rationality, all the better to explicate

their work, and thereby influence their peers. [43] A literary embellishment, a figure in a carpet, placed in a paragraph of a scientific paper does not detract from the intellectually rigorous nature of its content.

Antoine Lavoisier, who is held by some to be the father of modern chemistry, was renowned for his dedication to the scientific method. However, he was equally renowned for his work on the role of language in the theory and practice of scientific investigation. Lavoisier placed great emphasis on precision in the use of language in respect of terminology and nomenclature, believing the fusion of thinking and writing to be essential to effective scientific communication. Lavoisier began the introduction to his collected works with the following passage. [178]

The impossibility of isolating language from science, and science from language, comes from the fact that every natural science is necessarily made of three things: the series of facts that constitute the science; the ideas that bring these facts to mind; and the words in which facts are expressed. The word must bring out the idea; the idea must represent the fact: they are three impressions of the same stamp. [43]

Indeed, it can hardly be denied that clarity and concision are attributes, and indeed virtues, of the scientific mode of discourse, and that the fundamental aim thereof is to improve comprehension. Readability is a somewhat elusive concept, but there is a proven link between grammatical structure and comprehension. [23] However, that being said, readers can comprehend words and sentences in a number of different ways; it therefore follows that it is not always desirable, or indeed possible, to limn research findings. There are precious few scientists whose syntax is so crystal clear that readers can unerringly grasp every nuance of a paper written on a recondite subject area.

The English language is ordinarily the *lingua franca* of the scientific community, and non-textual data, characteristically universal in application, serves a similar function in the presentation of a scientific paper. [47] Yet, the hegemonic position assumed by the English language is now threatening the very existence of some national journals. [208] The following table illustrates this phenomenon.

	1980	1990	2000
English	84.5%	90.5%	95.9%
French	3.8%	1.9%	1.0%
German	5.1%	2.5%	1.1%
Spanish	0.7%	0.4%	0.3%
Japanese	0.7%	0.5%	0.3%
Total Number of Documents	554,598	689,629	956,533

Table 3.1: *Annual percentage distribution of publications by language, as covered in the Science Citation Index Expanded (Web of Science).*

The investigation of hypotheses, and of their evidential groundings, may be presented both graphically and statistically, or by the use of symbolic logic, thereby employing concepts in a shape and form unencumbered by the psychological baggage that is perforce carried by natural language. There are, moreover, problems of interdisciplinary communication in the sciences that have as much to do with conceptual and social aspects as with the misuse, and consequent misunderstanding, of terminology. [18] The semantic underpinnings of key terms are by no means self-evident. It can be seen, therefore, that the difficulties are not merely in regard of stylistic accessibility, but in the process of scientific investigation itself. It was T. S. Eliot who remarked *apropos* of the difficulties experienced by many in communicating information:

Where is the wisdom we have lost in knowledge?

Where is the knowledge we have lost in information? [57]

The nature of scholarly communication is made all the more difficult by the need sometimes to communicate across disciplines that often have widely varying traditions. For example, it would be impolitic simply to take as read that persons working in other, even though closely related, areas of research are employing terminology in the same, or even a similar, manner. There are, it must be said, certain academic disciplines that have acquired a not undeserved reputation for rejoicing in jargon simply for its own sake.

In addition, it cannot be assumed that scientists have a grasp of the controversies, far less their attendant nuances, that enliven the discourse of disciplines

other than their own. [19] However, there are occasions when authors may feel the need to aim a paper at more than one type of readership. They may write primarily for a small, narrowly specialised group of people, while simultaneously being aware of the need to explicate their research findings to those working in related disciplines, and find themselves caught between esoteric Scylla and exoteric Charybdis. Naturally, all those who submit research papers to scientific journals are cognisant of the need for clarity of exposition, but complexities inherent in the subject matter, coupled with unwarranted assumptions made by the author in regard to the prerequisite level of knowledge possessed by any prospective readership, can make this aim unattainable. There is some evidence to suggest that researchers who submit papers that are difficult to read find it harder to be published. [22] A paper that is badly written, or illogically organised, is much less likely to be useful to the scientific community, and consequently less likely to be cited.

A number of formulae for testing readability have been devised, some of which are manual, and some electronic. These commonly focus on questions of syntax and morphology that are related to length of sentence and complexity of vocabulary. These are two features of import that can be adjusted to better the speed and accuracy of reading. The Fog Index is possibly the most widely known formula of this type in the English language. [172]

COMPUTING THE FOG INDEX

The Fog Index uses two factors in measuring readability.

1. Average number of words in a sentence (AWS).
2. Percentage of words that are three syllables or longer. (%DW)

In order to compute the Fog Index, append the average number of words in a sentence to the percentage of words that contain three or more syllables. Next, multiply this sum by 0.4 for an estimate of the grade level at which the text can be read.

$0.4 \times (AWS + \%DW) = \text{Grade level at which text can be read.}$

Figure 3.2: *Computing the Fog Index*

The printed page acquires readability from a combination of verbal, organisational, and typographical factors, and not simply by carrying out a numerical calculation according to a given formula. Readers evince variable levels of motivation, and some will apply themselves conscientiously to prose that is almost impossibly abstruse. However, a readability component is usually included with word-processing packages.

The essence of information is the communication of knowledge. [36] Writers are not writing for themselves; they write in order to be read by others. These functions are deeply embedded in scholarly practice, and are of the utmost importance to the triumvirate of writer, publisher, and reader who collectively determine the shape and form of every kind of scientific publication. There are many who regard formal publication in a prestigious journal as the acme of scientific communication, and perhaps with some justification, for it does serve to validate original thought and research. The editors of such journals, in their interconnected roles of gatekeepers and go-betweens, may on occasion find themselves in a quandary, for authors and referees sometimes set themselves at cross-purposes. Moreover, writers, editors, referees, and readers, though part of a social contract, can nevertheless have divergent requirements that must first be reconciled if scientific knowledge is to be published at all.

For example, the same individuals often occupy the roles of both writer and referee, yet when reviewing another's paper they may proceed at their own leisure, while much preferring to have their own paper reviewed without delay. The Berkeley Electronic Press has an interesting approach to this vexed question, which allows them to work on the basis of a ten-week turnaround schedule from submission of a paper to its publication. The economists who use his publishing service find it satisfactory, but the publishers realise that other disciplines may find such a system inappropriate.

We have something called the Authors and Reviewers' Bank. When you submit an article, you get some reviews. Over a period of time, we'll ask you to clear those debits and supply us with reviews. Reviews must be turned around very quickly, usually in about three weeks. We take a credit card number, and if the review isn't completed in the time allotted, we bill the card.

The amount is set by the journal editors. In our two economic journals, the fee is \$500, which might sound high, but that's what it costs us to purchase a review from a good scholar in a couple of days. [42]

However, informal modes of communication such as e-mail, or preprints, are often essential precursors to the submittal of a paper to a journal for peer review of a formal nature, and subsequent publication. Informal contacts, and the advice and guidance that flows from them, lay the foundations for publication proper, and arguably promote clarity in the exposition of scientific concepts, for the very act of explaining ideas to others often helps to clarify those selfsame ideas in our own minds. Communication, it can be seen, is a fundamental and integral element of the scientific method; it is therefore incumbent on those participating in the circulation of scientific knowledge to publish in a methodical manner.

The analysis, and correlative evaluation, of a scientific manuscript by a referee should be contingent on the scrupulous application of predetermined criteria regarding the originality of its content and the soundness of its structure. It is relatively common for publishers to issue guidelines to their referees, and these can assist a referee in deciding whether a paper is suitable for publication in a particular journal. [111] The right and proper role of an academic referee has been defined by one author as the provision of answers to the following questions. [114]

- Does the main section of the paper provide new facts, observations, or ideas? Where this is not so, the referee should give citations to the previously published research.
- Has the published literature been treated fairly? In other words, has the author given due credit to any previous work?
- Can the data reported be obtained with the methods used? Forscher points out that detailed knowledge is needed by the referee to ascertain this, as readers unfamiliar with a certain method may be more easily led astray when interpreting results.
- Can the observations be accounted for by one or more interpretations in addition to those provided by the author?

- Do the observations support the conclusions presented absolutely, strongly, reasonably, or inadequately?

It is not part of a referee's role to accept or reject a paper. The responsibility for such a decision should lie squarely with the editor, and should not be delegated.

3.4 The development of paper journals

The limitations of cursive script as a vehicle for the systematic dissemination of scholarly, scientific, and intellectual knowledge being plain, given the sizeable number of potential recipients, a method of producing multiple copies in a timely manner had to be found, and it was the printing press that provided the necessary engine of change. The nascent learned societies could thereafter publish journals of proceedings in a formal, formulaic, and periodic manner with relative ease. The circulation of same, meanwhile, remained logistically intractable and fiscally onerous. Hence, the necessity of an effective system by which to expedite the rapid dissemination of knowledge and informed opinion among the scholarly community has been the principle *raison d'être* of the scientific journal since its inception. [104]

Forty years after Gutenberg converted an old winepress into a printing machine with movable type, there were presses in 110 cities in six different countries. Fifty years after the press was invented, more than eight million books had been printed, almost all of them filled with information that previously been unavailable to the average person. [56]

It was to be but a short step, comparatively speaking, from the publication of learned books to the publication of learned journals. Indeed, the development of scientific journals has been closely associated with the establishment and growth of learned societies and professional institutions. A new journal was more likely to cease publication if it were not sponsored by a learned society. [31]

Learned societies began to publish proceedings and journals in the seventeenth century. The first publication of a scientific society's proceedings was *Gesta Lynceorum*, which the *Academia dei Lincei*, based in Rome, published in 1609. However, it was not until January 5, 1665, when *Journal des Sçavans* was published in Paris, followed in March 6 of that year by *Philosophical Transactions of the Royal Society of London*, that scholarly journal publishing as we know and understand it today really got off the ground. *Giornali di Letterati* was published in 1668, and imitated the format of the *Journal des Sçavans*. Early journals were commonly published in Latin, that being the *lingua franca* of the scholarly community, though published works in the vernacular gradually became intellectually fashionable in the course of the seventeenth century. [105] [106]

Denis de Sallo's *Journal des Sçavans*, and Henry Oldenburg's *Philosophical Transactions of the Royal Society of London*, were destined to serve as exemplars of good practice for many years to come. *Journal des Sçavans* was primarily an abstracting journal rather than one publishing original research, and was issued on a weekly basis. On the other hand, *Philosophical Transactions of the Royal Society of London* mainly reported the results of original research work, and was issued monthly. The Royal Society of London assumed financial responsibility for *Philosophical Transactions* in 1753, and thereafter instituted a system to vet manuscripts prior to publication. The Royal Society issued a statement saying that a Committee on Papers could employ:

...any other members of the Society who are knowing and well skilled in that particular branch of science that shall happen to be the subject matter of any paper which shall be then to come under their deliberations. [135]

This is the first recorded instance of a refereeing system for scholarly papers. However, perhaps surprisingly, this system did not become widespread until the years following the Second World War. [134] Indeed, this period was a watershed in scholarly publishing, as in so much else. As far back as 1939 there were scientists complaining about the volume of papers being published, and the manifold difficulties of sorting the wheat from the chaff. There was plainly a need for more effective abstracting and indexing services.

In the old ideal of science, communications were the only link between scientists. Now the very quantity of scientific information has made its diffusion an enormous problem, with which the existing machinery has utterly failed to cope. The present mode of scientific publication is predominantly through the 33,000 odd scientific journals. It is, as we have already shown, incredibly cumbersome and wasteful, and is in danger of breaking down on account of expense. [173]



The first abstracts journals appeared in the mid-nineteenth century, and there are now major abstracting and indexing services for each academic discipline, and also for each cross-disciplinary field, most of which are produced by learned societies and governmental agencies. Eugene Garfield (right), the founder and chairman emeritus of the Institute for Scientific Information (ISI), says that researchers are not always conscious of citation indexing *per se*. [170] Online abstracting and indexing services have made the task of carrying out literature searches infinitely easier. However, in sites such as HighWire it is explicitly stated that users can be linked to the cited references within an article, in addition to the citing papers, by direct links to the Scientific Citation Index, which is within the ISI Web of Science

These groundbreaking developments in scientific communication, and myriad projects of a similar nature conceived in imitation of them, foreshadowed the shift of emphasis from book to journal in the publication of research results. The comparative tardiness of book production not lending itself to discourses that seek critical responses and informed comment within a reasonable time frame, the journal quickly became the most favoured platform for scholarly communication, and so it has remained till the present day. The e-journal can certainly be disseminated more rapidly than its print counterpart, but it is for the most part an addition to, and not as yet a substitute for, the printed journal. [110]

Over the past two centuries there has been a very significant increase in the number of journals being published, and this has been due to the ever-increasing specialisation and diversification of scientific research, allied to advancements in

paper chemistry and print technology. The literature on the development of the journal as a form of publication, and as a subject in librarianship and documentation, is a bibliographic pigeonhole, albeit an increasingly capacious one. [108] [109]

3.5 The future of paper journals

There are those who believe that the traditional paper journal is becoming outmoded. It is a belief, however, that cannot be substantiated by extrapolation from any verifiable data. Print journals still contain the greater part of serials-based information delivered in most research libraries. Indeed, it is all too easy to waffle on about paperless journals; there was a time when similarly minded folk used to waffle on about paperless offices.

There is user resistance, of varying kind and degree, to electronic media, much of which is related to the citation hierarchy. Moreover, there are perhaps those who use print-based media as a form of escape from an increasingly electronic environment. [189] The e-journal system is really more of a radical change in distribution than in publishing. Readers find and skim papers electronically, but they actually read from hard copy; e-journals are more often consulted than read.

The paper journal is easily portable, and has random access capability to its contents. In addition, it commonly benefits from the facility of a comprehensive index. It contains information that is easily read by the naked eye, and requires no other artefact to enable access to the contents. The following advantages of paper over screen have been noted. [25]

- It allows flexible navigation through documents
- It facilitates cross-referencing of more than one document at a time
- It allows easy annotation
- It allows interweaving of reading and writing

To be sure, electronic and paper media are not perforce mutually exclusive; there is, in a general sense, no either/or decision to be taken. It is a common practice to transmute e-journal papers into p-journal papers by the simple process of downloading to a printer. If any given edition of an e-journal is downloaded in its entirety, printed on both sides of each sheet of paper, stapled together, and thereafter skimmed and annotated in the manner of a p-journal, it could be perceived as an electronic-cum-paper journal, or e-p-journal. However, that being said, the functionality of the two media is so markedly different that the ongoing transition from one to the other is causing a paradigm shift in user attitudes and behaviour. [107]

It can be seen, therefore, that the relationship between electronic and paper journals is of a distinctly symbiotic nature. There is an interaction between print and digital technologies, and it is perhaps a necessary one. The contest between e-journal and p-journal for the hearts and minds of academe is, for the time being at least, too evenly balanced to allow resolution. It goes without saying, of course, that a refereed scientific research paper has an irreducible intellectual value regardless of the medium in which it is published.

Those involved in commerce know how beneficial it is to the bottom line to give their customers what they want, when and where they want it. Readers want paper journals, and/or PDF files that replicate the page design of a printed edition. [2] Indeed, Zinio Systems now offer digital technology magazines online which have the ability to mimic the sound of a turning page, and in addition have a virtual turned page corner. [37] [38] Such enhancements may seem a little frivolous to some, and perhaps they are, but it does give e-publications a comforting, if somewhat disconnected, sense of familiarity.

The paper journal still has a future, both as a metaphor for online scholarly communication and in its own right. [6] The typographical integrity of the printed page must be maintained in order to maintain legibility, and indeed facilitate overall comprehension while scanning. Furthermore, it is unimaginable that large-circulation scientific journals should cease to appear in print, for the business economics of an extended print run is closer to the magazine model than that of the scholarly journal. The trade magazine publishers have no reason to lose sleep.

Paper journals are in some ways more user friendly than their electronic counterparts. It is considerably easier on the eyes to scan up and down a number of pages laid flat on a desktop than to scroll through a file displayed on a monitor. Of course, Windows™ print preview does offer a codex format facility with the a folioed verso and recto display, but the font is markedly less sharp than print.

In addition, Adobe™ PDF files offer what they term a ‘continuous—facing’ option, but again there is a qualitative difference in legibility that is in favour of the printed page. Display technology has improved considerably, but it still cannot compete with the standard of readability or legibility offered by print. Indeed, a printed page of paper can contain anything up to fifty per cent more readable data than the same page size displayed on a monitor. [39]

Readability is taken to mean the ease with which the semantic content of any given text may be understood, and legibility is taken to mean the ease with which the individual characters and words may be recognised. [20] Naturally, there is a correlation between legibility and readability, though the act of reading does involve the employment of additional conceptual skills.

3.6 Research and e-journals

The exponential growth of scientific, technological, and medical knowledge has been the principal dynamic element driving the growth of journal publishing over the past five decades or so. Indeed, it has become somewhat hackneyed to pass comment on this topic in print. There has, nevertheless, been much improved access to research papers over the past few years and, while information and communication technologies have certainly been factors, much has been made possible by social networks comprising universities, publishers, and kindred institutions working in unison. The intellectual and social *milieu*, and the institutional background in which scientific knowledge is generated and disseminated, influence the form and direction of research. A selection of comments on the state of scholarly publishing may be found in Appendix One.

Bibliographic Information Services pioneered the e-journal in 1982, issuing the first electronic edition of the *Harvard Business Review*. It is now published by Harvard Business School Publishing. Two decades later the majority of scholarly journals were offering electronic versions, and in excess of a thousand peer-reviewed journals were being published solely in an electronic format. [136] The concept of academic institutions, as opposed to university presses, publishing learned journals is in no way new.

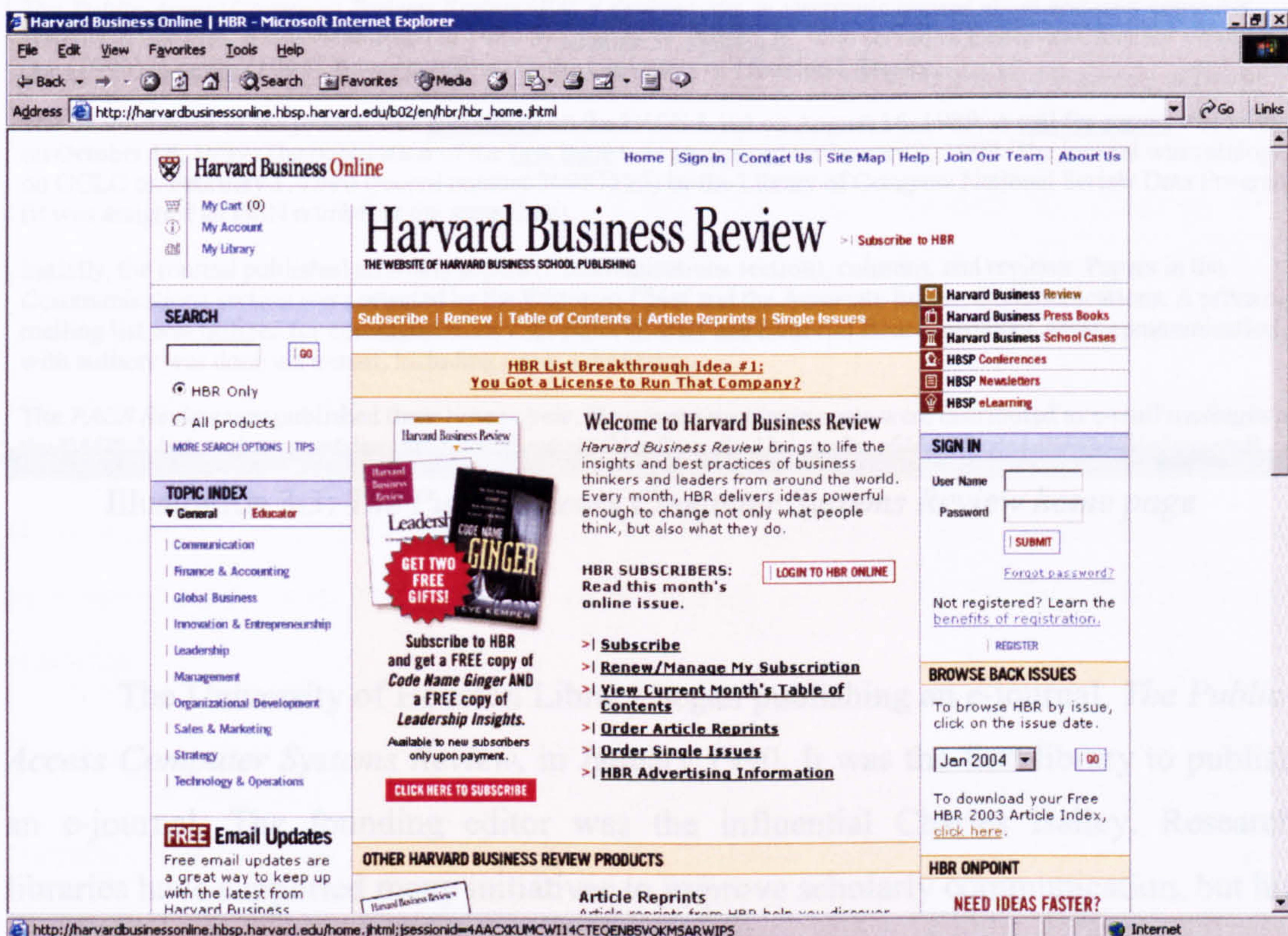


Illustration 3.2: *Harvard Business Review* home page

In fact, as far back as 1987 the Syracuse University Kellogg Project, based in the Social Science faculty, published *New Horizons in Adult Education*. This was the first peer-reviewed journal distributed over the Internet. It was a free journal, published in ASCII text. It was transmitted to subscribers around the world, with no payment required, through the Adult Education Network (AEDNET), which is accessible through Bitnet and the Internet. However, a printed version can be despatched by mail to those unable to access the journal online. It is now jointly published with the Nova SouthEastern University Program for Higher Education.

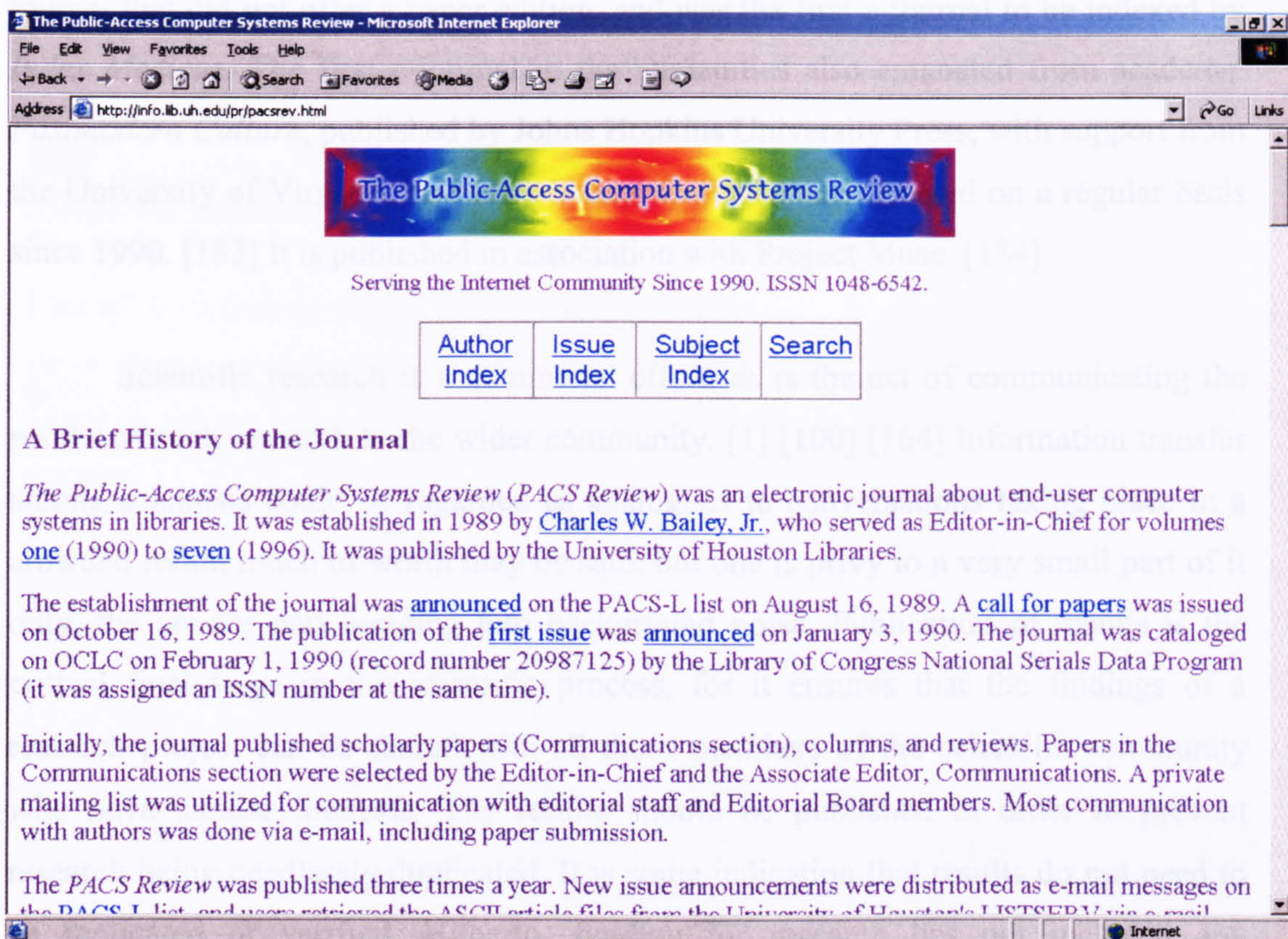


Illustration 3.3: *The Public-Access Computer Systems Review* home page

The University of Houston Library began publishing an e-journal, *The Public-Access Computer Systems Review*, in January 1990. It was the first library to publish an e-journal. The founding editor was the influential Charles Bailey. Research libraries have supported many initiatives to improve scholarly communication, but his was a groundbreaking project. Commercial publishers have followed such initiatives with interest, adopting and adapting them if and when they have proved successful. Generally, the commercial publishers have been more imitative than innovative in regard to the e-journal. It may be worth noting that the first journal to post its contents on the Internet in PDF format was *Florida Entomologist*, published by the Florida Entomological Society. The Florida Center (*sic*) for Library Automation, which is housed at the University of Florida, hosts their files *gratis*.

The first peer-reviewed, full-text e-journal to include graphics was *The Online Journal of Current Clinical Trials*, published by the Online Computer Library Center (OCLC), which was formerly based at Ohio State University. This was an electronic

journal that did not offer a paper edition, and was the first e-journal to be indexed by *Index Medicus*. The first e-journal in the humanities also emanated from academe. *Postmodern Culture*, published by Johns Hopkins University Press, with support from the University of Virginia, and from Vassar College, has appeared on a regular basis since 1990. [183] It is published in association with Project Muse. [184]

Scientific research is a communal effort, as is the act of communicating the results of such research to the wider community. [1] [100] [164] Information transfer among scientists could be regarded as analogous to conversations taking place in a crowded room; much of worth may be said, but one is privy to a very small part of it only, the greater part merging into background noise. Publication of results is the critical final stage in the scientific process, for it ensures that the findings of a research project can be shared with all those members of the scientific community who have similar interests. The results should be published in order to prevent research being needlessly duplicated. It is some indication that results do not need to be replicated or verified. Hitherto, funding for research has not included any supplement to cover publication costs, but the ongoing success of the open access movement may lead to a radical restructuring of funding models for scientific research.

The scholarly journal system now publishes such an overwhelming volume of research findings that it can oftentimes be difficult to discern, within an acceptable timeframe, the most noteworthy contributions. Indeed, without alerting services scientists would perhaps be as immobilised as Funes, the bizarre character created by Borges, who was hampered by uncanny powers of perceptual discrimination that constrained his ability to derive meaning from the contents of an infinite memory store. [49] [50]

Print journals cannot be comprehensively searched by an individual or project team without the allocation of a disproportionate amount of time to the task. Therefore, the ability to search it effectively for relevant sources is of critical importance. The result is an industry of abstracting and alerting services that is growing in parallel with scientific publishing in general.

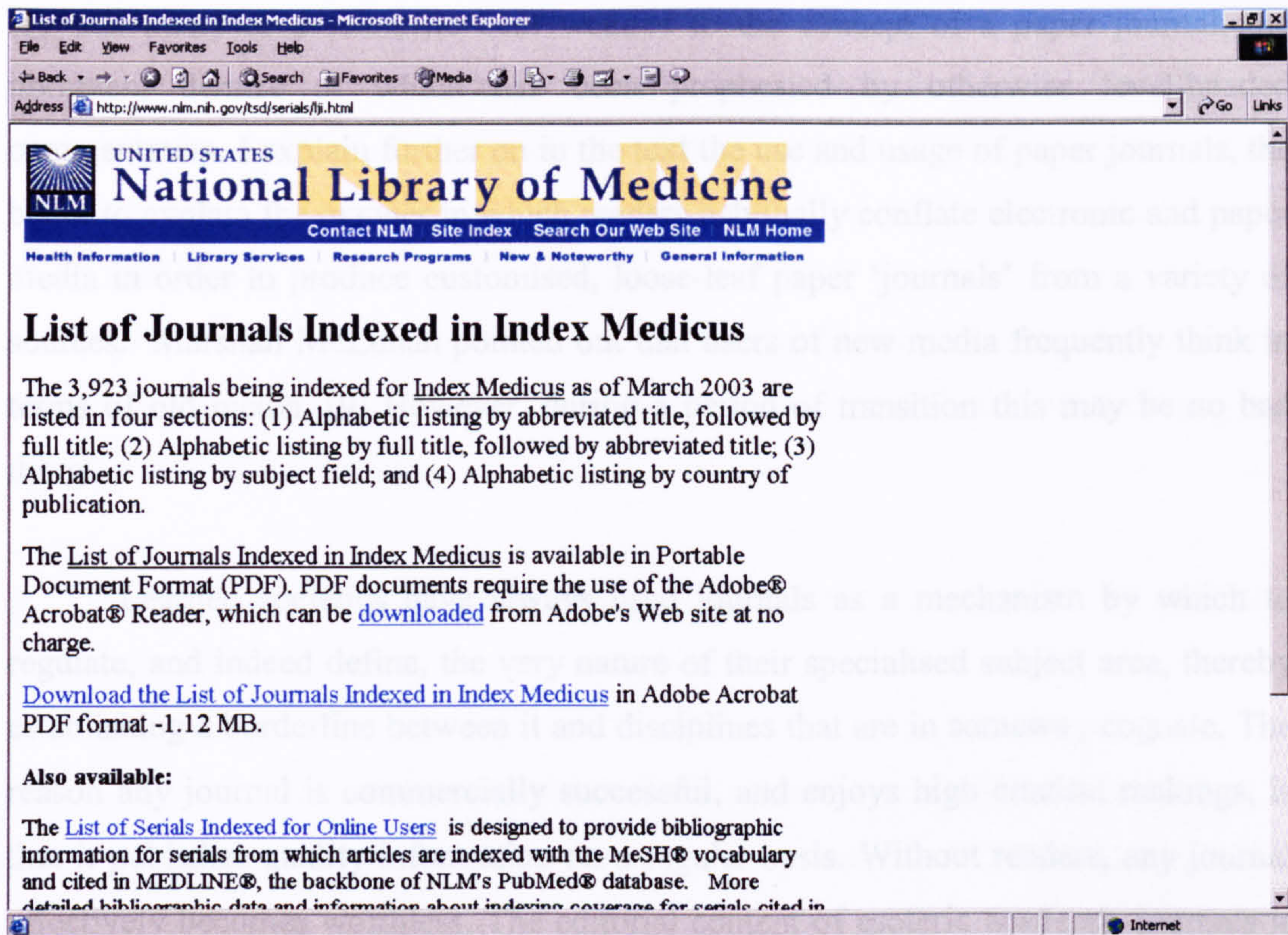


Illustration 3.4: *United States National Library of Medicine home page*

Fifty years ago, *Index Medicus*, the index of all medical research, comprised two thin volumes. By 1984, it was 16 tomes. Today, it comes several times a year on CD-ROMs that are each the equivalent of thirty to forty volumes. There is no medical practitioner, or group of researchers, or medical librarian, who could ever hope to keep abreast of such an information avalanche. Hence, the profession has to rely on guidelines, protocols, and syntheses of research done by others to remain informed of current research. [115]

The structure of research work in the sciences is now very much of a multidisciplinary nature, and this by necessity promotes collaboration between institutions on a global basis. Scientific publishing, and indeed scholarly communication in general, work within the self-imposed confines of a system that was brought into being when metal and wooden type, set by hand, was state-of-the-art print surface preparation, and methods of dissemination were still very much of an *ad hoc* nature. Digital technology has since brought about a paradigm shift in scholarly communication, but that selfsame shift has been by no means across the board. There

are still many of a scientific bent wedded to the concept of a paper journal, the imminent demise of which has been prophesied by otherwise level-headed commentators. I explain further on in the text the use and usage of paper journals, the better to explain the manner in which readers habitually conflate electronic and paper media in order to produce customised, loose-leaf paper 'journals' from a variety of sources. Marshall McLuhan pointed out that users of new media frequently think in terms of old media. [9] However, during a period of transition this may be no bad thing.

Learned societies have always used journals as a mechanism by which to regulate, and indeed define, the very nature of their specialised subject area, thereby establishing a borderline between it and disciplines that are in some way cognate. The reason any journal is commercially successful, and enjoys high citation rankings, is that it publishes quality information on a regular basis. Without readers, any journal effectively becomes worthless. The editorial content of esoteric academic journals is but seldom predetermined, unlike more commercially orientated journals such as *National Geographic*, www.nationalgeographic.com *Nature*, www.nature.com or *American Scientist*. www.americanscientist.org

It was scientists themselves who pioneered scientific publishing, not commercial publishers, and scientists look set to resort to the publishing habits of their illustrious forebears in the not-too-distant future. Indeed, despite the comparatively attenuated extent of society publishing, it is something of a commonplace to state that there has always been, must arguably always be, a causal connection between learned societies and the publishing of learned papers. That is not to say, however, that commercial science publishers no longer have a significant role to play. General science journals that have a large circulation can, and indeed will, continue to be published by commercial publishing houses, and that is surely no bad thing.

It can be seen that as scientific disciplines have become more diversified, and specialised, commercial publishers have served their publishing requirements for the greater part. These firms can achieve high levels of profit by imposing high cover prices while selling a small number of copies. [10] This vertiginous spiral of price

increases cannot continue indefinitely; the internal logic of the market must eventually bring prices back down to earth. The case studies demonstrate the part played by the staffs of library-based publishing projects, ideas and persons whose time have come, in working toward the establishment of equilibrium in the scholarly communication process. The bimodal dissemination of scientific papers, electronic and/or print, is now an accepted practice, and this has made it considerably easier for small-scale publishing projects to get off the ground, though not all such projects engage in parallel publishing.

Journals do much to create and sustain the distinctive practices of academic disciplines. Indeed,

...the point remains that scholarly journals are by function creators and exemplars of current practice. They are created to be disseminators of authoritative scholarship... [6]

The traditional printed scholarly journal is widely accepted as a reliable source for independently verified research findings, copy edited legibility, and rational discourse. It is not merely inertia that sustains the print model of scholarly dissemination, though there is plenty of that around, but rather more a plaiting of the concepts of trust and tradition. It is a system that is relatively well understood by those who use it, and there are doubtless some who are hostile to what they may see as innovation or novelty for its own sake. The shock of the new should not be underestimated.

Those who publish e-journals can, unlike those who publish solely in a print environment, solicit and ascertain reader opinion quickly and easily. The e-journal exists in a dynamic, interactive environment, which enables its readers to contribute, and substantiate, their judgements on published material. It is a generally accepted view that the process of reviewing begins in earnest after publication. This ability to invoke timely feedback from interested parties is a boon to every research group. (Of course, learned journals have long encouraged readers to respond to their published contents, though that previously took place in the form of letters to the editor.) For

example, *The British Medical Journal* has a rapid response facility that invites readers to respond to a particular article, or to read previous responses to it, simply by clicking a button on the top right-hand corner of the article. It is also possible for authors to answer points made in these e-letters. It is this degree of responsiveness that gives the e-journal its competitive advantage. [190]

3.7 Scientific information in electronic form

The electronic journal has the wherewithal to transcend the limitations inherent in the printed page. If the e-journal is to utilise its potential, it must offer functions that the more traditional paper format cannot. (This is hardly a revelation, I confess, but as Alfred North Whitehead opined over half-a-century ago, ‘...everything has been said before by someone.’) [7] The e-journal is no longer the shape of things to come; it arrived awhile back. The multimedia journal could become the new standard in some disciplines. [8]

Any given scientific journal may be delineated on the level of the postulates made about it by the editorship, whether justified or not, and by the intentions of the writership, and the expectations of the readership. Scientists need oftentimes wear two hats; they are both readers and writers of scientific papers. The nature of science is such that scientists must maintain regular contact with each other, for communication is an intrinsic part of the research process. It is only by the dissemination of research papers that research findings can be checked and crosschecked.

Scientists’ methods of inquiry are based principally on system, but occasionally on serendipity, though being self-respecting members of the scientific community they would much prefer to place emphasis on the former. The Internet enables scientists to scan journal abstracts and contents very quickly from their own desks, and allows them to conduct online search operations to ferret out even the most obscure of papers. Nevertheless, the amount of relevant information is not synonymous with the volume of data made available in whatever format. Search skills are not in themselves adequate to enable scientists to discriminate in an effective

manner. Therefore, the social constructs of refereeing and citation are employed as a guide to quality.

The added capabilities of electronic journals will doubtless influence both the manner in which scientists conduct literature searches, and the formats they choose to communicate their research results. Researchers are not necessarily seeking a wide readership, but they are most certainly seeking a critically informed one. It is a common view that paper journals are more able to promise a high level of appropriate readership than electronic journals, even though around seventy-five per cent of scholarly peer-reviewed journals are now available in electronic format. [16] Nonetheless, citation figures are high for electronic journals that are free at the point of access. [17] It is also possible for an e-journal publisher to monitor the use of the Web site, and gather valuable market-research data by downloading usage statistics into Excel.

Papers published in electronic journals can easily be corrected, or even updated, at any time after the date of publication. There is seldom the call for such changes to be made, but it does give the e-journal a flexibility that the p-journal cannot match. There has indeed been some concern about missing e-journal articles, in comparison with printed editions. On occasion, an article that has been published must be retracted, or perhaps even altogether removed. Needless to say, such a course of action is not to be taken lightly, for published articles are integral to every academic discipline's historical record. Elsevier Science, the largest publisher of scientific journals, lists strict procedures in regard to this key matter. [61] [62] These are to be found in Appendix Two.

The e-journal system makes it considerably easier to make deletions and emendations. There are some publishers of e-journals that are now usurping the librarian's traditional role of archivist of learned journals, though it seems that national libraries may divest the publishers of the responsibility, and perhaps the expense, of maintaining e-archives in the years ahead. The growth of the open access movement, and a good many publishing projects in academe are indeed open access, has consequences for the document delivery services. It is the function of document delivery to bridge the gap between customers and documents held in remote locations.

3.8 Is the e-journal a journal?

The e-journal system may be defined in a number of different ways, and indeed begs the question as to what exactly an e-journal is supposed to be anyway. There are a number of different models, each of which have their positive and negative aspects. It would perhaps be easier to explore and explain the various e-journal systems, for sometimes they differ so much in type, and indeed sometimes in nomenclature, that any attempt to list them under a single heading would perhaps be self-defeating. This is done in the case studies that appear in following chapters. Everyone seems able to explain the properties of a paper journal, but there is no such consensus on what constitutes an electronic journal.

Indeed, it should be borne in mind that electronic publishing is not an end in itself, but a means to deliver research findings to end-users; content still takes precedent over form. Just because everything is different now does not mean that anything has really changed. In the main, the artefacts of scholarly communication still look much the same as they ever did. Desktop publishing, word processing, statistical databases and the like, are used in the production of all kinds of scholarly publications, many of which are not as yet distributed electronically. It is the method of dissemination, however, that is the distinguishing characteristic of e-journals. The e-journal system, at its most basic, is merely the electronic delivery of a print format product. [188]

I believe that the task of defining what a scientific e-journal is belongs properly to those who actually publish it. Unfortunately, there seems to be as many definitions as there are publishers. Scientific papers stem from disparate sources, solicited or otherwise, and are merged into a unity by a publisher. It is the publisher who delimits the intellectual parameters of the content, constructs the typographical framework within which papers are presented, and accepts the financial risk that attends every such venture. The founding of an academic journal may seem a formulaic process, and perhaps it is, but it still remains remarkably easy to make subtle mistakes of implementation. That being said, members of the scientific community may be allowed some degree of judgement in this matter, for it is they

who read and write the contents of such publications. Indeed, it is sometimes scientists themselves who actually publish scientific papers.

The wheel of scientific publishing seems to be turning full circle back to the days when learned societies published their members' papers, and the link between origination and ownership of intellectual property was less contentious. It is the advent of digital technology that has enabled members of the scientific community to regain control of their own research output. It does not, therefore, require any great effort of imagination for scientists to embrace self-publishing, but there were, and indeed still are, a considerable number of practical difficulties that budding scientific publishers had to surmount in order to place themselves securely in the scholarly communication chain. The commercial publishing mould is by no means broken; publishing for profit is by no means a bad thing *per se*. [5] Scientific publications with large circulations are served very well by the commercial sector.

3.9 E-journals and e-books

The development of integrated e-information systems has made the widespread acquisition of e-journals by the library system a realistic aim. It has also made the publishing of monographs financially viable. [12] The continuing high costs of scientific information provision by traditional channels cannot long withstand the advent of on-demand printing facilities in academe. The monograph is now on firmer financial ground than before, but the journal remains regnant as a medium for the systematic dissemination of research papers, and in that respect at least the scientific communication system appears to be stable.

The e-journal is, in a general sense, a more economically and technologically robust method of publication than the e-book. There are, of course, many different models of e-journals and e-books, but overall the e-journal has met with more success than the e-book. The common reference points for e-publications are based on long-standing conventions in printed material. The e-book, insofar as it employs multimedia, seems to be a more radical departure from its precursor.

The pace of change in e-journal publishing is being forced by non-traditional publishing projects in response to the much debated ‘serials crisis’. Of course, the e-book has not gathered anything like a similar momentum. *Bücherdämmerung*, the term George Steiner applied to his own apocalyptic pronouncement on the demise of the printed word, has yet to materialise. [191] I very much doubt that it ever will. There is no equivalent ‘books crisis’ with which to galvanise academe. The publishing of monographs has been made much easier, faster, and cheaper by the advent of print-on-demand, and this has probably lessened the commercial and social impact of the e-book. The table below compares the relative merits and demerits of e-journal and e-book publishing. The former has proved more successful.

E-JOURNAL	E-BOOK
Journal metaphor (usually)	Book metaphor (usually)
Serialised publication (usually)	Any number of editions
Citation (dependent on publication.)	Citation (difficult to ascertain)
Prestige (usually by association)	Prestige (usually by reputation)
Journal subscription (sometimes some form of open access)	One-off purchase (occasionally open access)
Archiving (usually by publisher)	Archiving (uncertain)
Economically viable	Long-term economic viability uncertain
Uses existing hardware/software	May require dedicated hardware/software
Business models proven	Business models unproven

Table 3.2: *Comparison of e-journal and e-book attributes*

The nature of information technology brings into question the need for periodical publication of scientific papers, though some Web sites continue to publish using the timescale of a conventionally published print journal. Editions of e-books could be updated or otherwise emended with the ease that the latest version of a software package is updated on a personal computer.

The citation system is a thorny problem that makes it difficult to establish an e-journal. E-books, unless published in print format too, can find it difficult to be reviewed. The prestige factor is an ongoing problem for all e-publications; it is difficult to change perceptions. There has, as yet, been no noticeable change in the

culture of academe in regard of electronic publishing, despite the increased use of electronically sourced material.

There has been a noticeable decline in the purchasing of monographs, with funds being redirected toward the purchase of journals. Library and academic staffs have to prioritise, and make the best use of scarce financial resources. There are a number of factors that serve to define the salient problems pertaining to scientific journal publishing.

- A continual rise in journal subscription costs in the desire of publishers to maximise profits.
- Publishing house mergers that can have an effect on pricing policies.
- A rise in the number of journal titles published due to increased specialisation in science and increased academic output, which correspondingly makes it more difficult for libraries to provide a comprehensive coverage of research findings.
- A comparative decline in circulation figures overall, and a marked decline in the number of private subscriptions.
- Rising prices lead to declining circulations, which lead again to rising prices in an attempt to maintain profit levels.

The archiving of e-journals is mainly in the hands of publishers, which could perhaps present problems for libraries if they cancel subscriptions. The Library of Congress began the large-scale archiving of e-journals in 2000, but due to the variance of copyright legislation this might not be replicated in some other countries. [51] There are also copyright problems with e-books, for they seem to differ with the copyright laws as applied to printed books, and different publishers have different interpretations of copyright legislation. The *Koninklijke Bibliotheek*, the Royal Library of Holland is now archiving Reed Elsevier e-journals, in addition to the e-journals of several smaller publishers, including BioMed Central.

The multimedia journal is becoming more common; it could well change the nature of publishing, and also the way that research papers are presented. The non-

textual components of the multimedia journal give it the flexibility to present a holistic view of research methods and findings, and in so doing lays bare the inherent limitations of the printed page. It is now an established, and extensively used, format, and is economically sound. It is cheaper to produce an online journal than a paper one, but parallel publishing is still very common, and this increases costs. The extent of parallel publishing can be expected to reduce in the coming years.

A number of e-book publishers claim to be selling a lot of books, but who on earth is buying them. [192] [193] [194] [195] In truth, it is a challenge to sell e-books. The print-on-demand publishers have been more successful, for they seem to be selling a product with which the consumer feels familiar. It seems to be a bridge technology between e-book and print. The economic viability of e-books, as opposed to e-texts, many of which appear to be free anyway, is open to question. The e-book hardware is still relatively costly, and readability is much better from a printed page. E-journal papers are customarily read from hard copy. The various business models for e-journals have been successful. The e-book business models have been significantly less successful. The e-book, though apparently still a somewhat nebulous concept in the minds of many, including some of those employed in the publishing industry, seems likely to favour the print-on-demand model rather than the dedicated hand-held computer one. [116] The on-demand printing of monographs, e-texts rather than e-books, does seem to be the future, though CD-ROM monographs that can utilise video and audio files must eventually become standard in some disciplines.

Indeed, there are now noises being made in certain quarters in regard to print-on-demand-style production of compact disks, and it is surely just a matter of time until on-demand printing facilities of some sort become available in libraries. This may seem somewhat far-fetched, but the personal computer, the Internet, and the photocopier are comparatively recent arrivals in the library environment, and even they must have seemed rather fantastical at one time. It is surely the case that the various forms of electronic and paper media can coexist, and indeed complement each other, for all have their strengths and weaknesses. The e-publication is no *tabula rasa*; e-publishers do feel obliged to follow the typographical conventions adhered to by their predecessors, for it does seem to be what their customers expect of them. A study of circulation records carried out by the Institute of Electrical and Electronic

Engineers (IEEE), the largest professional engineering society in Europe, found that IEEE publications catalogued as monographs received twice as much use as those catalogued as serials.

This suggests that monographic records with individual thematic conference titles, geographic locations, conference-specific subject headings, and partial or full table of contents notes produce more uses than serial records with limited generic titles and fewer subject headings. [40]

The use by those who consulted the material for reference only was not monitored, and hence the circulation figures provide only an approximation of the actual levels of use. It can be taken for granted that many users would photocopy specific articles they wished to peruse at another time and place. The publication date of research findings has a significant impact on their use, affecting both monographs and serials, particularly in the areas of engineering and applied sciences, with papers being consulted much less frequently as they aged. [40]

3.10 E-journal publishing and the scientific method

The printed journal has been integral to the scholarly publishing system for so long that it is impossible to conceive of its demise. It is a medium through which scientists talk to each other. The transition to non-traditional methods of scientific journal production has, of course, had a marked effect on scientists' ability to disseminate scientific knowledge, allowing them more control over their output, but the paradigm of the scientific method nevertheless remains unchanged.

There is no hard evidence to suggest that e-journals have altered research processes as yet, though hyperlinked references are a boon to those wishing swift access to references. The ability to search e-journals online gives the medium a marked advantage over the paper journal, though some believe that hard copy is much easier to read from than a screen. [13] [14] [20] In the main, the content remains the

same, but the form has changed. Academic disciplines differ in their publishing strategies, and some are more willing to embrace change than others.

However, that being said, e-journals are, at least in the context under discussion, a marriage of the traditional scientific society publishing and the nascent interactive scientific communication network. Once the multimedia journal becomes more widespread, and that is surely in the very near future, the structure and content of papers will change in order to utilise its potential, allowing the journal to play a more dynamic role in research, scholarship, and the advancement of learning in general. It could be argued that e-journals disadvantage readers who do not have access to the Internet, or who live in countries that do not have a developed information technology infrastructure. It is often the case, however, that these selfsame countries do not have a reliable postal service by which to receive print journals, though I admit that my evidence in support of this view is purely anecdotal. In addition, such countries are usually less able to keep up with the rising costs of journal acquisition in whatever form. The following table compares positions *pro et con* the e-journal.

<i>E-JOURNAL POSITIVES</i>	<i>E-JOURNAL NEGATIVES</i>
Timely publication	Onscreen readability relatively poor
Ease of access from desktop	Questions concerning e-archives
Search facility	Less suitable to browse than print
Hypertext references	Parallel publishing sometimes
Hypermedia capability	Biased citation system (RAE)
Desktop publishing	Less prestigious than printed journal
Restores academic independence	Publishing is time consuming

Table 3.3: *E-journal positives and negatives*

The nature of science is such that its practitioners must be in communication with one another on a regular basis in order to facilitate widespread examination, and cross examination, of theories and evidence. [94] The pace of change in communications technology is constantly increasing, but the traditional printed science journal seems, to all intents and purposes, to be preserved in amber. The reasons for such intellectual conservatism are not difficult to discern, and are perhaps not unconnected with the empirical mindset of the scientific community itself. There are many members of the research community who have no interest in alternative

publishing models. The p-journal system has been proven to work; the e-journal system is, in the minds of many, as yet unproven.

The journal system continues to ill serve an increasingly disaffected scientific community, though there remains still a not insignificant number of Panglossian types who feel that the system we have at present is the best of all possible systems. It is a shade of opinion, however, that is based on wilful ignorance. There are, in addition, not a few who feel some disquietude in respect of the overproduction of scientific papers, and the related proliferation of journal titles. This is readily comprehensible, particularly to those who publish in the STM sector. Scientific knowledge is now seen as a commodity, but the market for such intellectual products is by no means infinite. It is hardly surprising, therefore, that the open access movement is now gathering such a fair head of steam.

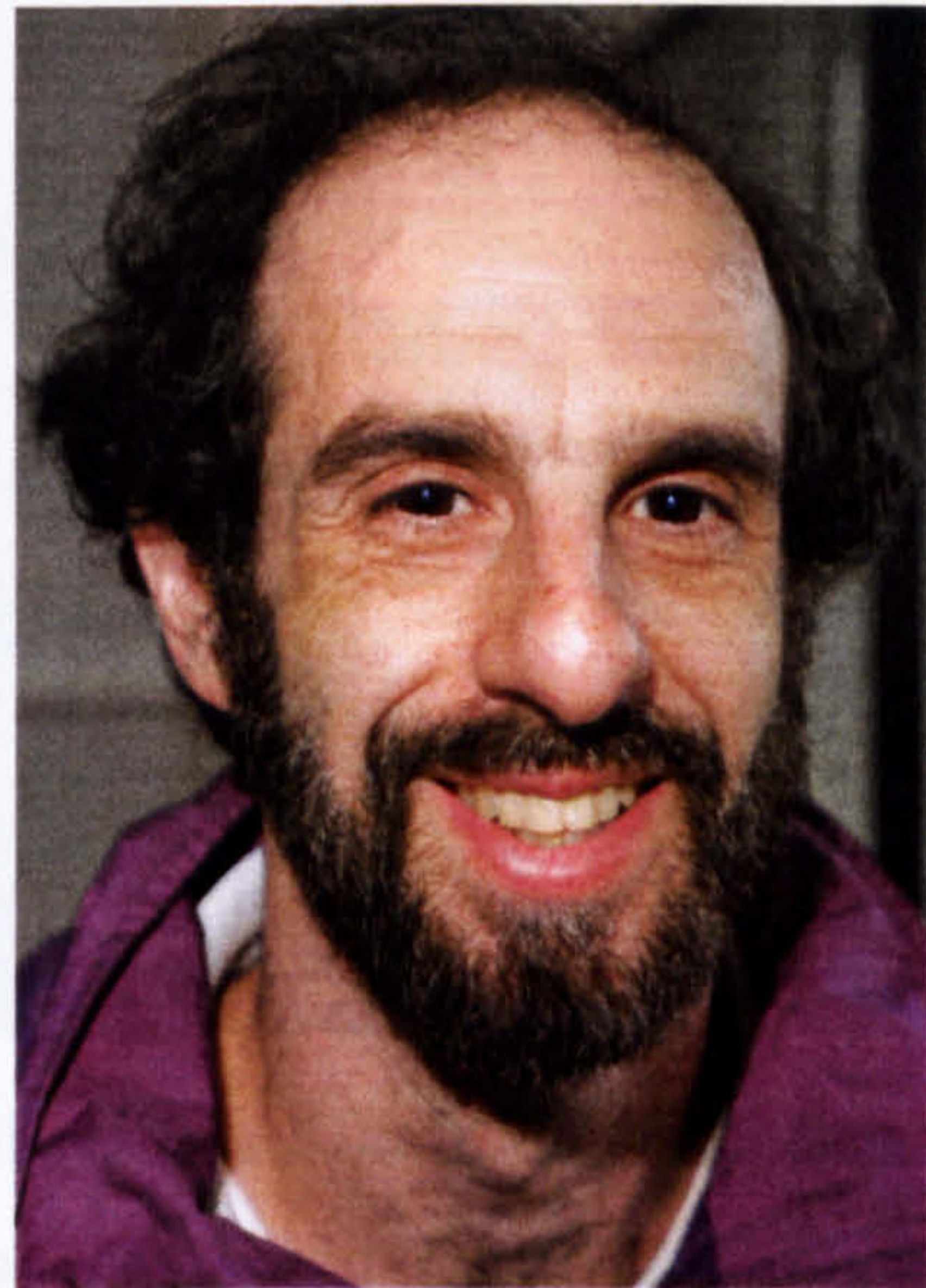
3.11 Are open archives e-journals?

The term 'e-print' can, and indeed often is, used to cover a variety of meanings, and is consequently by no means definitive. However, it is commonly used as a definition of any e-text file published outside of traditional publishing channels. [29] The term 'preprint' is commonly used to describe an e-print that, though still in the research cycle, and yet to be refereed, has nevertheless been put into circulation. [28] E-prints software enables an author to assemble a web-based archive in which research papers and their associated metadata are made available, free of charge, to whomsoever wishes to access them.

There is already a standardised infrastructure in place to support the system, made available by the Open Archives Initiative. Interoperability between the e-print archives is widening now that commercial publishers are becoming involved in the system. The main difference between an e-print archive and an e-journal is that the latter seems to be markedly better at raising awareness of its existence. It seems that most articles listed in e-print archives have already been published in journals. In addition, an article published solely by an e-print archive lacks impact in the Research

Assessment Exercise. Some authors invariably ensure that their papers have been peer reviewed before posting them on a server, while some find it beneficial to publish their work without the benefit of peer review, but solicit informed comment on, and criticism of, their research findings.

Open archives are unlikely to usurp the established publishing system or the journal metaphor, but they have nevertheless proved a useful method of publishing for some disciplines. The Los Alamos unrefereed preprint and refereed reprint archive, which was founded by Paul Ginsparg (right), being the best known, and arguably the most successful. (Ginsparg called his e-print archive 'deskbottom publishing', due to the server being placed underneath his office desk.) However, open access is really about a much more decentralised, or perhaps fragmented, system than the global Los Alamos electronic archive.



Open archiving is really a system in which self-publishers use their home servers to communicate their research findings and offer informed comment on each other's research work. The open archives projects could be looked on as similar to e-journals, for readers seldom, if indeed ever, read a journal from cover to cover. In addition, research shows that most readers use open archives in much the same way that they use e-journals; they browse and search a lot, but download relatively few papers. [26]

There is also the question of whether periodic issues make any sense in an electronic environment. Publishers seem unwilling to divorce themselves from the print journal metaphor that has served them so well in the past. Publication in a journal of repute is a stamp of academic legitimacy, but it is still generally the case that dedicated e-journals lack the prestige of printed ones. [29]

The open archive system, however, has citation difficulties, and indexing services fail to recognise the papers published on home servers. The Open Initiatives Archive, though certainly deserving of its place in the scheme of things, does seem

unlikely to overcome the collective mindset of academe regarding the publication of research findings.

Stevan Harnad (right) has done much to raise awareness levels in respect of the e-print system, though he has experienced difficulty convincing his peers of the system's efficacy. Indeed, Harnad's 'subversive proposal' is beginning to look a little more like a Swiftian modest proposal with each passing day. [27] [30] [52] However, that is no reflection on the soundness of the OIA concept itself, for it is invariably difficult to win hearts and minds.



There may simply be too much resistance to change for a system that Harnad himself has described as 'scholarly skywriting' to succeed. A great many authors do not want the responsibility of archiving their own papers. Yet, it may simply be the case that Harnad's initial idea was ahead of its time, for it seems that an increasing number of researchers are now looking upon self-archiving as an addition to, but not a substitute for, publication in a learned journal.

Harnad believes that people conflate the problem of journal affordability with the problem of access, and the impact factors related to access. Search engines are much improved, and are now in competition for quality content rather than just quantity in their search results. The major players, such as Google and Yahoo, have financed a great deal of research into software that can help search engines find scholarly articles, and Microsoft has announced its intention to build a search engine that can meet the new demands being made by users. [181] Harnad is right in believing that self-archiving can improve scholarly communication in a number of ways, but this does not invalidate the traditional journal metaphor. Postprint archiving on a universal scale could produce a system similar to that espoused by Harnad. The figures on the following page, which appear in one of Harnad's own papers, illustrate to good effect the systems that serve to limit and maximise access, and also the advantages to be derived from self-archiving. [180]

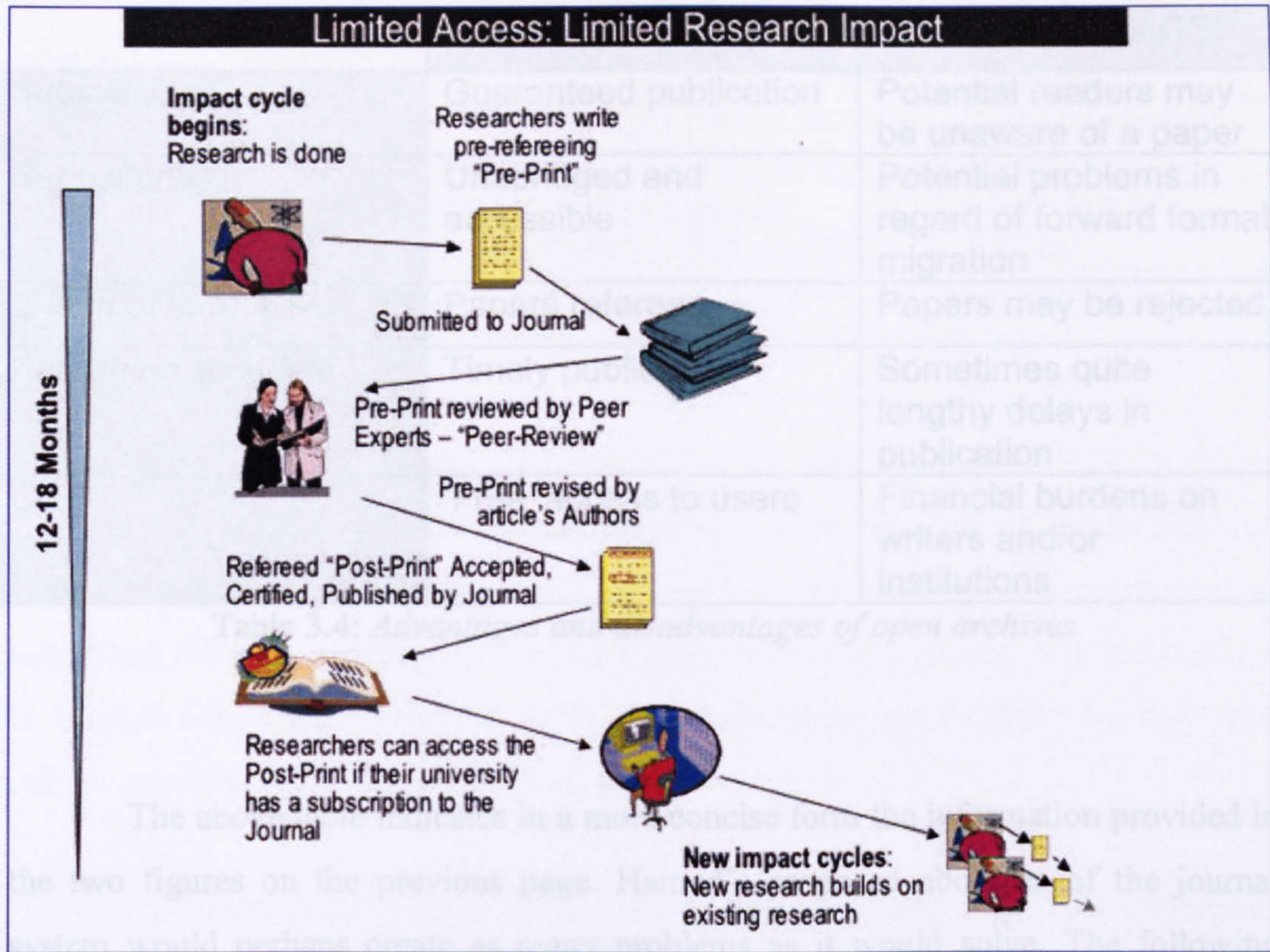


Figure 3.3: Limited access limits research impact

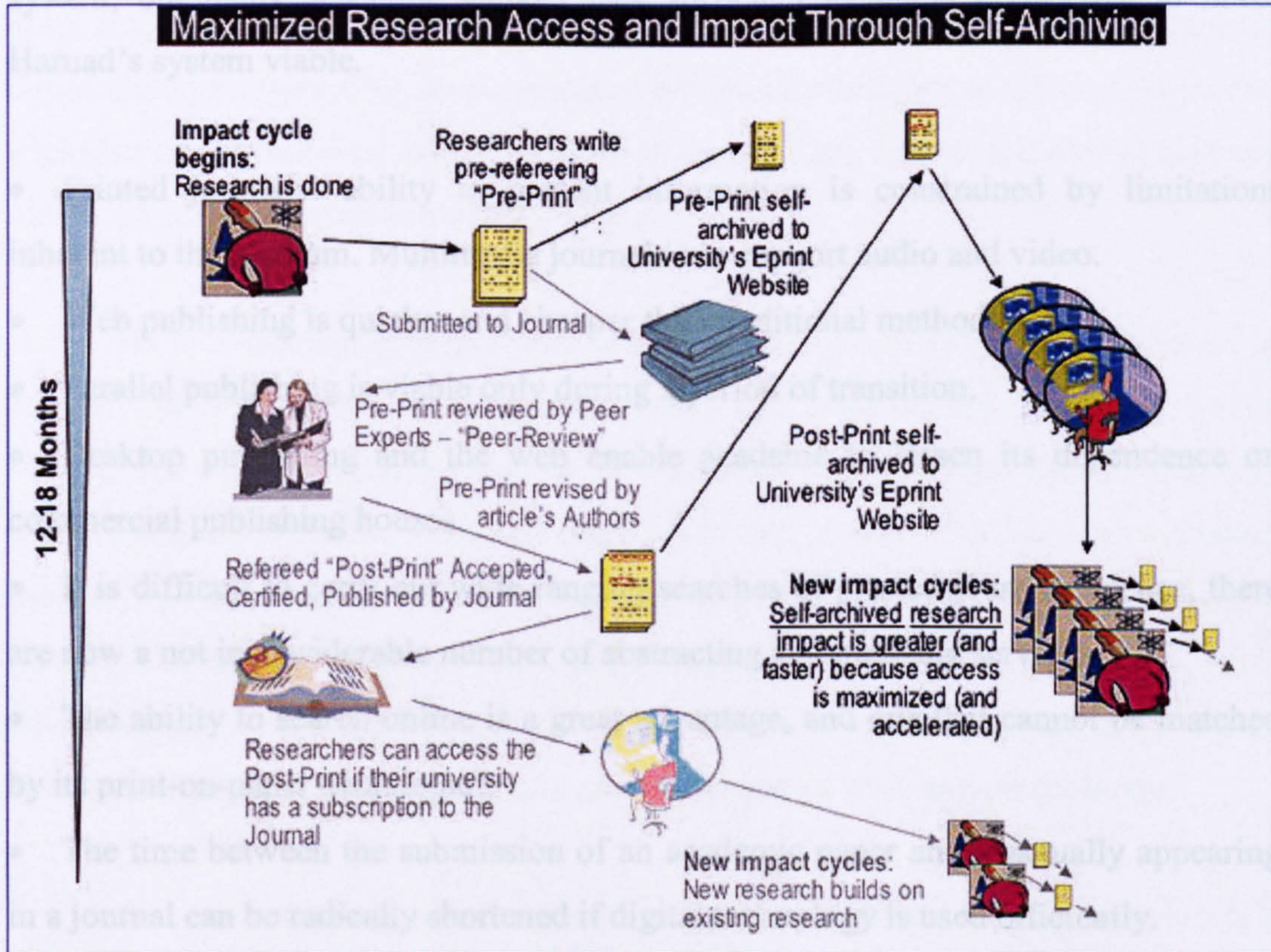


Figure 3.4: Maximised research access and impact through self-archiving

	ADVANTAGES	DISADVANTAGES
<i>Submissions</i>	Guaranteed publication	Potential readers may be unaware of a paper
<i>Repositories</i>	Unabridged and accessible	Potential problems in regard of forward format migration
<i>E-journal format</i>	Papers refereed	Papers may be rejected
<i>Publishing schedule</i>	Timely publication	Sometimes quite lengthy delays in publication
<i>Cost</i>	'Free' access to users	Financial burdens on writers and/or institutions

Table 3.4: *Advantages and disadvantages of open archives*

The above table indicates in a more concise form the information provided in the two figures on the previous page. Harnad's proposed abolition of the journal system would perhaps create as many problems as it would solve. The following advantages of e-publishing apply equally to e-journals and Harnad's e-archiving system, but many academic authors lack sufficient technical knowledge to make Harnad's system viable.

- Printed journals' ability to present information is constrained by limitations inherent to the medium. Multimedia journals can support audio and video.
- Web publishing is quicker and cheaper than traditional methods.
- Parallel publishing is viable only during a period of transition.
- Desktop publishing and the web enable academe to lessen its dependence on commercial publishing houses.
- It is difficult to carry out wide-ranging searches of printed journals. Hence, there are now a not inconsiderable number of abstracting and indexing services.
- The ability to search online is a great advantage, and one that cannot be matched by its print-on-paper counterpart.
- The time between the submission of an academic paper and it actually appearing in a journal can be radically shortened if digital technology is used efficiently.

	E-JOURNAL	P-JOURNAL	OPEN ARCHIVE
DELIVERY	Internet	Postal service	Internet
FEATURES	Search facility Hypermedia	Easily browsed Readability	Search facility Hypermedia
STRUCTURE	Non-linear	Linear	Non-linear
DISTRIBUTION	Subscriber/'free'	Subscriber	'Free'
PUBLICATION	Regular	Regular	Irregular

Table 3.5: *Comparison of dissemination strategies*

It can be seen from the above table that e-journals are, at one and the same time, a new genre and an old genre employing new methods of production and distribution. [11] E-journals employ the printed journal metaphor, but are nevertheless something rather more than mere mirror images of printed journals. It is unnecessary to attempt any Hegelian *Aufhebung* of these apparent contradictions, for they may only be resolved in the fullness of time. [21]

The value-added potentialities of electronic publishing are as yet very much underdeveloped. The application of hypertext and multimedia to scientific journals facilitates innovatory methods of presentation. The Internet is, to all intents and purposes, on every desktop, but most e-journals still have to be bought and paid for out of library budgets. The development of e-publications offers the library profession a number of new options, over both the short and the long course, and should lead to a more cost-efficient provision of information.

As a consequence, researchers and librarians have reasons to be involved in scholarly publishing that are at marked variance to those of commercial publishing houses. The e-journal, though sometimes trumpeted as a paradigm shift in scholarly communication, is for the most part old wine in new bottles. Indeed, it is commonly the case that an electronic edition of a journal is a mere paginal facsimile of the paper journal edition. Nevertheless, while the e-journal does have the potential to effect radical change, it is multimedia that may prove to be what many hoped the e-journal would eventually become. Multimedia, however, comes with its own problems.

The advantages of publishing one's own work online are many and varied. It can be extremely useful to visit someone's glorified home page and print out papers at will. This is much easier than having to hunt down journals in the library, or put inter-

library loan staff to the cost and bother of obtaining photocopies by surface mail. However, it is by no means all plain sailing for the do-it-yourself e-article publishers and archivists.

The question of who should own scientific papers has been the subject of lengthy debate. Public funds and commercial interests support most of the scientific research that is undertaken by academic staffs, but universities are becoming less able to buy back the research from publishers that their staffs have carried out due to budgetary constraints and the unrealistic pricing policies of the commercial publishing industry. Society journals cost less than commercially published journals, but they are still relatively expensive. The free online scholarship movement makes much of the fact that those who submit to their journals have the right to retain copyright. The following table indicates the merits and demerits of academe-based publishing.

ACADEME-BASED E-JOURNAL PUBLISHING POSITIVES	ACADEME-BASED E-JOURNAL PUBLISHING NEGATIVES
Retention of copyright commonplace	Lack prestige of paper journals
Cheaper 'cover price' or free to user	Citation delays
More widely read if free to user	Time-consuming for academic staffs
Lessens pressure on library budgets	Initial funding difficult to procure

Table 3.6: *Pro et contra of academe-based e-journal publishing*

There is not as yet a pecking order, or canon, of dedicated online journal titles. It must only be a matter of time before such a hierarchy, analogous to that which exists in print, develops in response to the perceived needs of the academic community. Until such a time arrives, however, institutionally-based e-journal publishing must compete for papers, albeit on an uneven footing, with the established journals. The e-journal system, as envisaged by the open access movement, must put in some more spadework yet before it can accrue sufficient prestige to attract worthy papers in substantial numbers.

It is too often the case that prestige is regarded as being synonymous with quality. The very necessary process of filtering and grading needed to enhance their individual reputations, and indeed the genre itself, are inextricably entwined with the ability to attract submissions of note. It is the unquestioned reputation of a publication

that affixes the much-coveted badge of academic respectability to a paper. It is, at its most basic, a system of repute by association. It has been asserted that the chief difference between open access journals and open access archives is that the former conducts peer review and the latter does not. [185] Yet, this is not, and indeed never has been, the case. The recent decision of Elsevier to permit postprint archiving of its published articles should dispel any misapprehension that e-prints are never subject to peer review. There is a crucial distinction between preprint and postprint.

3.12 The rights and wrongs of copyright

Copyright is a serious matter. Indeed, due to the protean nature of information technology all matters pertaining to the concept of copyright are now coming under scrutiny from all corners. [120] The copyright laws are perhaps the easiest in the book to break, both intentionally and unintentionally. [118] The first copyright law in the modern sense was enacted in England, which was the Statute of Anne in 1709, but did not pass into law until April 10, 1710. However, prior to this date disputes in respect to publishing rights were judged by appeal to common law. [119] [126]

The whole question of free online access to scholarly material is by far and away the most compelling reason why copyright is now the focus of so much attention. The very term 'copyright' seems to be, on initial inspection, a rather confusing one, for it appears to refer to the right of a party to copy any given piece of work. However, rather the opposite is the case, for it refers to the right of a work not to be copied unless permission has previously been granted.

The copyright laws have been put into place in order to protect the financial and moral rights of both author and publisher. They provide all interested parties with some degree of protection from reproduction of an indiscriminate nature, illicit publication, and public performance without full and prior permission. Copyright law underpins the publishing trade, providing a framework within which publishers can profitably do business. [9]

The whole question of online access to material is by far and away the most compelling reason why copyright is now the focus of so much attention. Indeed, the idea that scholarly material should be freely available strikes at the very *raison d'être* of copyright. Those who have in the past provided scholarly material must now change the way they do business. The Internet poses complex questions for creators, content providers, and users. [58]

Nevertheless, the group attitudes that once were so closely associated with the production of texts in scriptoria are now beginning to reassert themselves. [117] These shifts in attitude are, of course, being driven primarily by information technology. If one considers just how learned articles are actually produced, it immediately becomes obvious that they are, for the most part, the result of collaborative efforts. [1] This is a point that should not be lost on the academic community, for if the concept of authorship becomes blurred they have everything to gain. At present, a number of publishing projects are laying the foundations for an almost universal open access system. If research material were to lie unequivocally in the public domain it would greatly increase the viability of such a system. [121] [122] However, that is not to suggest that authors should abdicate the moral rights to their published works. [123]

Commercial publishers mainly use the copyright laws to protect the revenues that their publications generate, but institutional publishers, such as those involved with the SPARC and FIGARO projects, can afford to take a more relaxed attitude toward copyright, and be a good deal less stringent in its enforcement, for they have a rather different agenda. It is perhaps ironic that the not-for-profit publishers seem to be more purposefully customer-centred than their commercial counterparts.

In some fields, though mainly medicine, there are commercial journals that use the Ingelfinger Rule, which inhibits preprint archiving. In 1967, soon after he became editor of *The New England Journal of Medicine (NEJM)*, Franz Ingelfinger learned that two publications sent free of charge to medical practitioners had repeated details of a paper before its publication in *NEJM*. Ingelfinger believed this to be commercially damaging, and thereafter rejected any paper that had been previously published. This policy became known as the Ingelfinger Rule, and has been adopted

by many journals, including *The Lancet* and *The British Medical Journal*. The open access system allows authors to retain copyright, and hence preprint and postprint archiving is the author's own affair.

According to the Copyright, Design, and Patents Act of 1988, copyright exists automatically in all original works. However, the concept of 'originality' may be defined in a number of ways. There is no requirement for copyright to be formally registered with any kind of administrative body, for it is held to inhere from the moment that it is fixed in a tangible medium of expression, such as print and various other media. This is true of virtually every country in the world. Copyright protection does not cover ideas *per se*, but it does cover words or symbols in which ideas are expressed. [119]

Electronic copyright pertains to issues in the use of software, databases, and the Internet. Electronic media are subject to the same copyright restrictions as traditional media, but multimedia products are commonly comprised of several copyrighted works, thereby making it problematic to identify copyrights or obtain permissions. [124]

Of course, the right to disseminate information, and the acknowledgement of intellectual originality, are core academic values, and not least because the progress and promotion of academic staff members depends almost entirely on research output and the income generation that is often connected with it. Nevertheless, copyright is a legal, and not an academic, construct. If the laws pertaining to copyright are impeding the progress of science, it is surely incumbent on all concerned to lobby for the appropriate changes in legislation. [125]

There are now some journals that accept papers for publication that have hitherto been made available online. Many of the e-print papers that appear on the Los Alamos site have been published in paper journals some period of time after their initial appearance in the electronic archive. Academics are now more wary of surrendering their copyright to journal publishers, for many would like to post their papers on their home pages, and publishers sometimes view this option as commercially disadvantageous to themselves. To be sure, an increasing number of

authors now believe that they should retain copyright rather than relinquish it to the publisher, but it is still a standard practice for authors to transfer their copyrights to publishers.

There is, however, the question of commercially sensitive information. A very great deal of basic STM research, sometimes even of the blue-sky variety, is driven by the quest for profit. For example, the pharmaceutical industry would not consider any renunciation of copyright. It would not be in their commercial interests to countenance such a policy. It is sometimes the case that scientific research requires a lengthy gestation period before tangible results are born. As a consequence of this, market forces compel scientists to secrecy, which is antithetical to the scientific tradition.

It is by no means easy to enforce copyright, and there are those who question its practicality in the digital environment. Copyright remains the foundation on which the publishing industry stands, but is it really at risk of being undermined?

The fact remains that once data are displayed on a monitor in a graphical operating system, they can be captured in some format. There are, unfortunately, many ways to fool even the most sophisticated systems. When bright people make use of information resources, it becomes difficult to know if a particular bit of information has a legitimate provenance. To be clear: copyright in the new medium will be difficult to protect. It is unlikely that law will be the solution. [58]

It is considered fair use to make one copy of a journal article for research or private study, but this is not always followed to the letter. A great deal of copying that is done in academic environments, usually by downloading to a printer, is an infringement of copyright. The photocopier, for good or ill, is an essential cog in the machinery of the library system, but it does facilitate the misappropriation of copyrighted material contained in print journals. The Copyright Licensing Agency has accepted the principle of payment for photocopying in the academic environment. However, while the CLA undoubtedly has the law on its side, policing and enforcing it can prove somewhat burdensome. [127]

The concept of copyright seems to be endlessly reinvented in accordance with prevailing mores and emerging technology. [128] At the end of the day, copyright law is a compromise, and it is simply in the nature of things that compromise does not satisfy everyone. The Open Access Movement, in all its many and varied manifestations, is looking very much like the shape of things to come. The consequences of this development for the publishing trade should prove as influential in shaping the intellectual landscape as the aforementioned Statute of Anne. University libraries are now beginning to publish e-journals, and these form part of the open access movement. The library profession has good reason to embrace the role of publisher

3.13 Why librarians should publish

The main problem facing the library profession of today is to determine how best to employ digital technology to achieve their traditional purposes, thereby maintaining, and perhaps even extending, their traditional roles. It is entirely right and proper that universities, which originate by far the greater part of scientific research papers, should become journal publishers. [132] The functional role of the traditional publisher will continue to exist, as indeed will the traditional role of the library, but these roles are slowly beginning to integrate. [160] However, how the shape that these evolving roles will take can only be ascertained in the fullness of time. [112] [113]

It is commonly assumed that central government underwrites research and development in universities, but according to Pieter Bolman, Elsevier executive, and former CEO of such prestigious names in scholarly publishing as Pergamon and Academic Press, has claimed that between fifty and fifty-five *per cent* of research costs in the United States are paid for privately, either by companies or foundations. He may well be right, but he does not give the source of his figures. [114]

Indeed, given that other parties have now assumed tasks that once fell within the well-established remit of library staffs, such as archiving journals and administering special libraries, library-based publishing projects are beginning to look

more like a Darwinian necessity than an extension of duties. Over the long term, however, such changes may bid fair for the role of the librarian in academe. Information technology would seem to present threats and opportunities in equal measure.

Things must change in order to remain the same, as those of a certain frame of mind are wont to say. Of course, it cannot be gainsaid that innovation itself is an entirely natural part of any problem-solving process. The scholarly communication process, being as much social as technical, must be innovatory as much in work practices and fundamental attitudes as in technological developments. The future of library e-journal publishing is, to a great extent, what publisher librarians choose to make it. Academic libraries have the potential to become the loci of change in the scholarly communication system, for the academic library is surely the worthiest locus for both readers and writers of scholarly papers. Publishing is entirely in keeping with the fundamental ethos of research libraries, which exist in order to make academic material available to the research community, and archive such material systematically and securely. The library profession has petitioned the publishing world to change its ways in regard to pricing policies, but they have remained as refractory to their pleas as ever. What has changed, however, is the library profession's ability to challenge this hitherto ineluctable condition of scholarly communication.

Bas Savenije, University Librarian at Utrecht, believes that librarians should shape their own future, and not have it shaped for them by external forces. Utrecht University Library publishes a number of journals, both paper and electronic. He believes that the library profession cannot stand aside and let others decide the future of scholarly communication, and has long advocated that librarians should become more active in scholarly publishing.

It is illusory to assume that we are independent onlookers, in no way related to any development or reality as such. The developments taking place are not occurring autonomously; we are all part of it. A clear example of this is the way that Western civilisation has been determined by script and print. They form the base for our preoccupation with linear, printed text, and of our

predisposition toward related communication devices. One cannot rule out the possibility that our culture could change as a result of the increasing influence on our lives exercised by multimedia communication. [92]

Library publishing projects are not just about sustainable business plans and information technology, but convenience and efficiency. The main issue in library publishing today is surely not how to play the old game better, but rather how to look ahead to what the next game will be, and discover the rules that will apply. The trade publishers have themselves demonstrated a lack of foresight in the past. Indeed, their failure to foresee that digital technology would provide the wherewithal for academic communities to publish their own high-quality, low-cost journals in direct competition with those produced by the trade has had dire consequences for some of its publications in terms of both circulation and citation. [24] Moreover, loss of market share is not simply an issue of status; it can also mean a loss of pricing power, and the concomitant ability to shape markets rather than to follow them.

However, it is not necessarily the accuracy of forecasts that are of prime importance in the decision-making process, but the validity of the assumptions underpinning them, and the full realisation that intended actions may well lead to unintended consequences. Library publishers would do well to learn from the mistakes, many and varied, that have been made by the commercial publishing houses—though that is much easier said than done. It is in no way easy to plan for change, for it is a nebulous concept, and the ability to recognise new and unconventional forms of competition before they come to fruition is much more an art than a science. Publishers, of whatever stamp, require peripheral vision to observe constantly changing business conditions, and to develop effective strategies to cope with these selfsame changes.

It is perhaps tempting for publisher librarians to take a scientific approach to the publication of scientific journals. Of course, publishers must strive to master the technical side of it, but they must also learn to deal with areas of ambiguity. It is a simple fact of life that publishing can be a rather messy business, and that many decisions, and sometimes quite important ones at that, are taken on the basis of

informed guesswork. The traditional publishing model is based on straightforward, and perhaps deceptively simple, relationships. There are writers, who submit to publishers, who sell to readers. These relationships are now being restructured, or in some cases deconstructed, to accommodate the realities of the digital age.

There is some degree of risk attendant on librarians who would wish to throw their hats into the publishing ring. It can be difficult to get a new journal off the ground, and in the past journals have taken sometimes five-to-seven years to make a profit. [137] The dynamics that shape and form the journal publishing business may be outside their immediate realm of experience, and it is understandably difficult to transcend preconceptions. Nonetheless, librarians and academics, in the very act of attempting to resolve this systemic problem, seem to have created a kind of *post facto* rationalisation syndrome—nothing very much has really changed, but the practitioners of scientific disciplines are in general coming to have a rather rosier outlook regarding scholarly communication.

The trade publishers already do an excellent, though prohibitively expensive, job of distributing esoteric literature throughout academe and beyond, but it does not do to confuse excellent means of scholarly communication with scholarly communication that is excellent, for that would be to place too high a value on the means, while undervaluing the end.

Librarians have been known to claim, and perhaps not without justification, to be possessed of a deeper, more subtle view of what knowledge actually is than most. That being the case, the library profession is serving its own interests, while promoting the interests of the scientific community, by striving to establish a commonwealth of knowledge within which the advancement of learning through the free exchange of scientific papers may be promoted. However, the same applies to the humanities.

...in less prosperous fields, including the humanities, one attractive model is for university libraries to publish open access journals.

Philosopher's Imprint, for example, is a peer-reviewed journal published by

the University of Michigan. Its motto is, 'Edited by philosopher's, published by librarians.' Because the philosophers and librarians are already on the university payroll, the journal need not change processing fees. The point is that there is not just one way to cover the expenses of a peer-reviewed, open access journal, and we have a long way to go before we can say that we have exhausted our cleverness and imagination. [159]

The authors of refereed scientific journal papers publish in order that their work may be read and cited; it is by no means a money-spinning occupation. The work being done at the University of Arizona, which is explained in a later case study, is proof positive that scientists and librarians can work together in a collegial fashion for the common good. The digital approach to knowledge creation and distribution, free at the point of access, can indeed create a cornucopia of scientific data, but even success has its problems. The problems and solutions, successes and failures attendant on any such attempts to enter the publishing trade should be looked upon as foundations upon which the library profession can build its future development.

A fair number of library-based e-journal initiatives are offshoots of digital library projects. [2] The conceptual foundations of the futurist thinking required for these early attempts at publishing online were laid down in the early days of library computerisation. Indeed, this process of library-based e-journal publishing appears to have been driven by a handful of visionaries who were determined to make it all happen. That being said, these people did have the assistance of some highly motivated, highly skilled support teams.

The pricing policies of commercial publishing houses have generated much resentment, and everyone with a working knowledge of the scholarly communication system is aware that commercial publishers have been playing fast and loose with academe for many a long year. It is the commercial publishers themselves that have done so much to foster competition to their own titles, though they doubtless do not appreciate the irony. There is certainly a place for the commercial publishing houses in the system, but that place should not be of a hegemonic nature. The table below sets out, in a very basic form, how the system works.

Function	Division of labour	Source of funding	Value added
Researching	faculty	faculty/grant/government	knowledge creation
Writing papers	faculty	faculty	dissemination
Refereeing	faculty	faculty	quality control
Publishing	publisher	subscriber	structure
Marketing	publisher	subscriber	awareness
Distributing	publisher	subscriber	convenience
Cataloguing	library	institution	listing/abstracting
Displaying	library	institution	accessibility
Archiving	library	institution	secure storage

Table 3.7: *The basic structure of scholarly publishing*

This linear scientific information chain is now being disintermediated by widespread and ongoing technological change. As a consequence, scientific communication seems set to become multifaceted, with different disciplines having different publishing arrangements. The shape of this non-linear system is as yet unclear. Human nature would seem to militate against any form of one-size-fits-all system, but that itself does not by necessity preclude an attempt to create one.

There is most certainly a place in the scheme of things for a self-publishing system. Indeed, for all the talk of a communications revolution, the transformation from a primarily paper-based system to a primarily electronic one is still a long way off. The e-journal system now has a fair head of steam, and it would be most impolitic for any one involved in scientific communication to look askance at the development of this medium. The definition of publishing has broadened somewhat, prompted by a new range of media, and innovative schemes to transmit them, but the journal, as central metaphor in the realm of scientific communication, seems set to remain unchallenged in any significant way. [9] Library publishing of journals has been on a relatively small scale. The resources for publishing on a large scale are as yet not quite in place. Indeed, Fytton Rowland made this point very well in a remarkably prescient commentary on questions related to e-journals and the likely pattern of their development. Library publishing seems set to remain a cottage industry for the foreseeable future, and this may be no bad thing.

A university library of a million volumes has to have a staff of professional librarians, and while a journal publishing 15 papers a year could

be run on an 'amateur' basis, one publishing 1500 papers a year cannot, regardless of the medium it is published in. The sheer administrative load of organising the input, refereeing, copyediting, formatting, and distribution of that many documents (including the ones that get rejected, which generate work, too) requires full-time staff, and since these people have to eat, they need a salary. [3]

Publisher librarians are specialist staff possessed of a wide range of skills, which are in comparatively short supply. As a consequence, it is not at all easy to get a library-based e-journal project off the ground, though the self-help guides issued by the Scholarly Publishing and Academic Resources Coalition (SPARC) have assisted many aspiring academe-based publishers. The latest in the series, 'Gaining Independence: A Manual for Planning the Launch of a Non-Profit Electronic Publishing Venture' [4] offers practical advice, and lots of encouragement, to novices and veterans alike. The information contained therein also serves as ammunition for proponents of library-based e-journal publishing. However, peer review remains the preserve of those in possession of recondite knowledge.

3.14 Peer review and citation

It is perhaps a moot point whether the whole of this vast corpus of research papers is valuable in its entirety. [166] There are now innumerable write-only papers being published. Library use studies indicate that a very great deal of research literature simply goes unread, and if they have not been read they cannot be cited. Indeed, there is evidence to show that in many disciplines over half of all published papers are destined never to be cited.

It is an accepted fact of academic life that some papers, in whatever discipline and wherever published, will never be cited. Of course, it is not possible to identify beforehand which papers will be cited. Indeed, no matter how long a particular paper has remained uncited, there is always a chance that it will be cited at some time in the future. On the other hand, it seems

intuitively clear that the longer a paper has been uncited, the less likely it is that it will be cited in the future. [63]

There is always the remedy of self-citation, of course, and helpful colleagues can also be of assistance by giving citations; the so-called 'buddy citation'. [174] [175] Moreover, it has been shown that reviewers recommended by authors themselves give much more favourable assessments than those chosen by editors. [152] The Library Profession is keenly aware that, for all the sound and fury surrounding access in research libraries to high-quality content, expensive material in print format and online is not used as intensively, or consulted as frequently, as it could be, or perhaps should be.

The impact factor is calculated by dividing the number of current citations to articles published in the two previous years by the total number of articles published in the two previous years. [198] Obviously, this formula creates difficulties for publishers of new journals, since there is an elapse of at least three years before even the worthiest of journals can be awarded an impact factor. The necessary three-year period only begins once the Institute for Scientific Information (ISI) begins to track the journal. There are a number of factors that determine the commencement of a tracking process. [199]

- How many articles the journal publishes.
- How many competing journals ISI already tracks in the same discipline.
- The previous citation record of the journal's editorial board.
- The previous citation record of the authors who publish in the journal.
- The number of times the journal has been cited in journals that are already tracked by ISI.

However, this system is fast becoming anachronistic. The growing use of XML formats by journal publishers means that citation analysis is no longer the administrative challenge it once was. Citation tracking data for open access content is already available through Citebase, but it is at the present time an experimental demonstration, and cannot yet be used for academic evaluation. [200] CrossRef, the

full text linking service, also collects article reference links from publishers for the purpose of forward linking, and such data has the potential to ascertain impact factors. (CrossRef is discussed more fully in the following chapter.) [201] Furthermore, Elsevier is now developing Scopus, an abstracting and indexing database-cum-citation analysis service, which promises to offer much wider coverage than ISI. [202]

The peer review process remains a crucial element in the exercise of scientific reasoning, and in the publishing of its results, for scientific assertions cannot be proved; rather they can be only disproved. Francis Bacon's *The Advancement of Learning*, published in 1605, aired the view that '*the registering and posting of doubts has a double use*' insofar as it not only guards '*against errors*', but also furthers the process of intellectual inquiry, causing issues that would otherwise be '*passed by lightly without intervention*' to be '*attentively and carefully observed*', and subsequently verified and recorded. [154] [155]

However, although there is some evidence that peer review improves the quality of reporting research results, it is nevertheless susceptible to a number of biases. [163] [216] Michael Polanyi has written on the need for the highest possible standards of peer review, though his views on the subject are possibly more jaundiced than any available evidence on the subject would seem to support.

The first criterion that a contribution to science must fulfil in order to be accepted is a sufficient degree of plausibility. Scientific publications are continually beset by cranks, frauds, and bunglers whose contributions must be rejected if journals are not to be swamped by them. [93]

Nevertheless, it must be said that the intellectual value of a journal cannot invariably be ascertained by recording how often it is consulted. [203] [214] For example, the article on Cold Fusion by Stanley Pons and Martin Fleischmann, which was published in the *Journal of Electroanalytical Chemistry* in 1989, has been highly cited precisely because it has been proved to be so very wrong. Yet, papers that challenge received opinion are not always so intellectually incoherent.

The general theory of plate tectonics, or continental drift, proposed by Alfred Wegener, was originally espoused in the pages of some less prestigious journals. (The term 'tectonics' comes from the Greek root 'to build', so plate tectonics is a theory of how the surface of the earth is built from plates.) His theory met with outright hostility from the scientific establishment and, as a consequence of his heterodox views, he found it impossible to obtain a teaching post in a German university. It was not until the Sixties, more than thirty years after his death, that he was vindicated in the eyes of his profession. [149] The validity of the theory of plate tectonics has now been almost universally accepted, despite the absence of scientific consensus as to its cause. [146]

Gregor Mendel's seminal paper on the common pea plant, *Pisa sativum*, was published in the Annual Proceedings of the Natural History Society of Brünn in 1866. A number of eminent biologists dismissed Mendel's findings out of hand, and his paper was forgotten. However, over thirty years later his experiments were repeated, and found to be valid and significant. In 1902, Mendel's paper, *Experiments in Plant Hybridisation*, was published in *Journal of the Royal Horticultural Society* to widespread acclaim. Mendel lived in anonymity, and his research went unrecognised in his own lifetime, but he has since achieved posthumous fame, and is now known as the father of genetics. [147]

Indeed, the credibility of *Science*, one of the world's most prestigious research journals, was dented after it was forced to retract a methodologically flawed paper, published in September 2002, that linked methylenedioxymethamphetamine, more widely known as the recreational narcotic 'Ecstasy', to potentially fatal neurological disorders. The study, by George Ricaurte *et alia* of Johns Hopkins University School of Medicine in Baltimore, purported to show that monkeys injected with a 'recreational dose' of Ecstasy incurred brain damage of a type similar to Parkinson's disease, and that many of the animals subsequently died as a direct result. Colin Blakemore, Professor of Physiology at the University of Oxford, and Director of the McDonnell-Pew Centre for Cognitive Neuroscience, has made it known that he believes the procedures for peer review, the supposed 'gold standard' system by which scientific research work is independently refereed, have been compromised.

'One wonders whether there might be some explicit or implicit compromise on the process of peer review. This could have been picked up by the most simplistic peer review, and it was not. This sequence of events makes one wonder whether some motivation other than the purity of science was involved in the dissemination of this research.' [150]

Science consequently published a statement retracting the paper, after the authors discovered to their alarm that they had injected the animals with methamphetamine, which is commonly known as 'speed', instead of Ecstasy. They claimed that incorrectly labelled vials had caused the error. [151]

Scientific paradigms, as described by Kuhn, can hinder as well as help scientific research. [156] Peer review is central to the organisation of science, but it is by no means a failsafe process. If it were, groundbreaking papers would not be overlooked due to the relatively low impact factor of the journals in which they are published. The peer-review process for submitted papers is a critical determinant of what appears in any journal of import, but peer review is fallible. [157] For example, no fewer than seven papers that were originally rejected for publication in prestigious journals eventually earned Nobel Prizes for their authors. [158] There are some very good papers published in journals with low impact factors. Bibliometric indicators reflect frequency of citations; they are not perforce indicators of quality. Evaluating the quality of a scientific paper does present difficulties for which there is no generally agreed solution, but there is room for more qualitative judgements to be taken into consideration. [129] Undoubtedly, some would say that peer review is already more of a lottery than a rational process.

To be sure, the e-journal has had an impact on the practice of citation, with page numbers being a useful example. A printed journal is an immutable format, and it is therefore wholly appropriate to use page numbers as a valid reference for citation. However, articles published in an e-journal are presented in a much more flexible format, and the pagination is controlled by the user, not the publisher. Hence, there is no reason to try to emulate the print-based notion of immutable page numbering when publishing an e-journal. Instead, a section heading, or a numbered paragraph, may prove more appropriate for the purpose of citation. In addition, non-linear articles,

such as hypertext or hypermedia, may well transform currently accepted modes of citation. [177]

The editorial staff of the journal *Leukemia* seemed to think that they had a solution to the problem of citation deficit. In October, 1996 letters were sent to every author who had submitted papers to *Leukemia* with a view to publication. Authors were asked to increase their references to papers published in *Leukemia*, as this would increase the journal's impact factor, which is calculated by dividing the number of citations of papers in a journal by the number of papers that could be cited. A letter from *Leukemia* to one author stated:

Manuscripts that have been published in Leukemia are too frequently ignored in the reference list of newly submitted manuscripts, even though they may be extremely relevant. As we all know, the scientific community can suffer from selective memory when giving credit to colleagues. While we have little power over other journals, we can at least start by giving you and others proper credit in Leukemia. We have noticed that you cite Leukemia once in 42 references. Consequently, we ask you to add references of articles published in Leukemia to your present article. [130]

Unsurprisingly, this clumsy attempt to inflate the journal's impact factor, and thereby distort the scientific process, did not meet with success. A great deal of significance is attached to impact factors, which is often connected to funding. The editor of *Leukemia*, Dr Nicole Müller-Bérat, displayed an appalling lack of judgement.

It appears that a very great deal of what funding bodies spend on research each year is wasted. A National Audit Office report stated that much of the £1.4 billion that the government spends on research each year is wasted. [64] Improved communication technologies are now making it quicker and cheaper to disseminate research findings, some of which may be of an uneven quality, and this can only exacerbate the problem of overproduction. Such an intolerable situation cannot be allowed to continue indefinitely, and it is surely a matter of time until criteria other than publishing output are employed to satisfy tenure and grant requirements. [165]

Unfortunately, there is no objective standard of quality of a scientific paper or grant application against which the worthiness of peer review can be assessed. [158] There are a number of reasons why peer review can be inconsistent.

Firstly, some reviewers may not be certain about which aspects of the work they should be assessing. Secondly, some reviewers may not have the time, the knowledge, or the training required to assess research properly. When deliberately flawed papers are sent for review the proportion of major errors picked up by reviewers is certainly low. Thirdly, it is possible that reviewers do agree on the more specific assessments of the quality or research, but that this consistency is undermined by personal opinions and biases. For example, assessments of reviewers have been shown to be biased by the fame of the authors or the institution in which the work was performed, and by conflicts of interest due to friendship, or competition and rivalry, between the reviewer and the authors. [153]

The German aphorist, Georg Christoph Lichtenberg, was aware of the problem of unread research material in his own day, though he neglected to propose a remedy.

What are our learned journals and most of our magazines? They differ from a mere catalogue of books to be sure, but what makes them differ from a catalogue of books is precisely that which ensures that almost no one reads them anymore. [65]

However, Lichtenberg's assertion was most probably wide of the mark, as indeed it would be today, for scholarly journals are indeed widely consulted and read. The myth of unread journals is by no means a modern phenomenon. [66] There are, however, a number of low-use titles that do not justify the financial outlay needed to acquire them. [67] [68] The information contained in journals serves a number of purposes, and some readers, particularly those who consult medical journals, feel that journal articles are more important than any other source. [69]

R. B. Woodward, a Harvard professor, and Nobel Laureate in Chemistry, published fewer than ninety papers over the course of what was, by any standard, a

very distinguished career. [70] Ludwig Wittgenstein, perhaps the most influential philosopher of the twentieth century, occupied a chair at the University of Cambridge for a fair number of years, and yet published precious little in his own lifetime. [71] Indeed, those were the days, my friend. Of course, that was in many ways a kinder, gentler age, when the agents of Leviathan adopted a rather more *laissez-faire* attitude toward scholars and their recondite pursuits, and largely trusted academe to run its own affairs. Nowadays, and in divers ways, our political masters are mesmerised by the magic of numbers, statistical reasoning reigns supreme as a model of cultural inquiry, and the spirit of the age demands that all and sundry be measured and quantified and published in league tables from which any amount of illusory correlations may be derived at one's leisure. After all, what are numbers for anyway?

The sort of knowledge with which many academics concern themselves is that of a kind which by its very nature cannot, in the main, be described statistically, and hence cannot be conveyed to any central authority in statistical form. It surely follows from this that decisions based on statistical information alone cannot possibly take account of factors such as quality and timeliness. [72] [73] Indeed, as Einstein so tellingly remarked, '*Not everything that counts can be counted; not everything that can be counted counts.*' [74] It is difficult to assess utility, at least over the short term, and I would regard citation as an unacceptable proxy for utility; it is still a numbers game, though played by different rules.

The laws of nature are written in the language of mathematics, averred Galileo, and many others since have proved him correct. The mathematical sciences can describe, and in some cases predict, innumerable types of phenomena, but they do not provide explanations. However, Konrad Zuse shifted the paradigm somewhat when he proposed that programs could be used as potential explanations of phenomena. [161] Stephen Wolfram has done much to popularise this view of simplicity begetting complexity by demonstrating how comparatively simple programs can trigger and model dynamic and complex systems. [162]

Wolfram states that there are general principles that govern the behaviour of a wide range of systems. He believe it to be counterproductive to attempt to describe all systems in terms of numbers, for most systems, most complex phenomena, are in

actual fact computationally irreducible. He is proposing a method of scientific inquiry that is devoid of equations. Wolfram believes that he has successfully demonstrated that there are many systems whose behaviour cannot be described except by computer simulation. [162] Wolfram believes that his theory, the principle of computational equivalence, will eventually impact upon each and every area of academic research, and influence the presentation of research findings.

The journal has been hijacked in support of such transient policies as the provision of title rankings, and the quadrennial research assessment exercise. Every researcher must submit reports for publication, whether the outcomes of their research projects are worth reporting or not, or sometimes even whether their research projects have been completed or not. There is an enormous body of literature that is critical of the peer review system.

Derek J. de Sola Price once suggested the establishment of a hypothetical Journal of Really Important Papers; Eugene Garfield has proposed a Journal of Citation Classics®; and as an extension, I have proposed a Journal of Previously Rejected Important Papers. These suggestions reflect a more serious concern about neglect and error in the review process, and they take on a new urgency as we observe a profound change in the patterns of scientific publishing, especially through the challenge of electronic journals. [158]

The perception that a problem exists is not unique to the present day, for almost half-a century ago a paper was published alleging that only 8 out of every 100 technical articles made an original contribution to learning and research. [75] The National Enquiry into Scholarly Communication, which was organised by the American Council of Learned Societies, was published in 1979. This report pointedly criticised the volume and quality of scholarly work being published. Richard Abel, a serials librarian, comments on its findings twenty years later.

...the compelling evidence of the dismaying extent of the irrelevance and/or the insubstantiality of vast tracts of the journal literature—a naughty

secret that the academic and research community simply wished would go away. [167]

One more recent source states that between 50 to 75 *per cent* of papers are cited only by their own authors, or by graduate students or departmental colleagues of the author. It should be noted, however, that the paper in which these views are stated does not itself contain any references. [76] Dr Peter Dorey, a senior lecture in Politics at Cardiff University, understands only too well how the system works.

'Research is now an obsession in universities, and the only real criterion of appointment or promotion. It does not matter how badly you teach, or whether you do any teaching at all, as long as you keep churning out ever more books, articles, and conference papers.' [133]

The research assessment exercise has done much to distort the process of scholarly communication, and one does feel compelled to ask, *cui bono*? Researchers are sometimes prone to divide the findings of a single project into sections and then publish them in several different journals, thereby hoping to raise their research profiles. This tactic, commonly known as salami slicing, also creates the illusion that their research output is greater in volume than is actually the case. Academics want to have to read far fewer articles, but nevertheless want to have far more articles published. [77] [78] [80] [89]

This pressure to publish is born of a fear that vital funding could be withheld. The funding-council grant that is awarded *per capita* does not cover the costs associated with undergraduate teaching. These costs are almost entirely subsidised by the research grant, which rises and falls according to an academic department's RAE grading. As a consequence, large swathes of academe feel compelled to feign faith in this government-inspired quantitative delusion. [81] It perhaps goes without saying that all of this bizarre folderol of fulfilling a published works quota is meat and drink to commercial publishers. The journal is an antiquated legitimising tool that has overlong been subject to the Machiavellian machinations of big business. Of course, the education sector is itself a business, but business is not the business of government.

It has been my pleasure to read a number of seminal articles and monographs that have increased my knowledge of, and indeed my enthusiasm for, electronic publishing. Such texts can sometimes be like a breath of fresh air to one who has been overlong in stuffy confinement. However, there are so many occasions when reading journal articles that I find myself thinking that I have read this before somewhere. Unfortunately, this is not a mistaken belief. A great many contributors to academic journals seem to be earnestly intent on reinventing the wheel—presumably to facilitate the traversing of already well-trodden ground. Such a recycling of ideas is sometimes awe-inspiring in its inventiveness, but is ultimately pointless. It may be an interesting exercise in creative writing, though hardly Milton's '*precious life blood of a master spirit*', but whether such work can be described as original research is a moot point. [82]

Nevertheless, the authors of these papers are not themselves to blame. After all, they have their livings to make. It would be not only ungenerous, but unintelligent, to reproach them, and for the same reason that it is folly to deride apple trees for not bearing pears, for those who submit papers to scholarly journals are not, in the main, think-outside-the-box theorists, but rather researchers pure and simple. If they research similar subject areas, using similar sources and resources, and similar methods and methodologies, it should hardly be surprising that they produce similar results and draw similar conclusions. [83] That being said, it is a truism that we all live by others' ideas, and perhaps that is as it should be, for it is surely no bad thing to have stood on the shoulders of giants.

The reinvention of the system is entirely contingent upon those working in academe being sufficiently determined to adopt the requisite Brave New *Weltanschauung*. It cannot be brought about simply by *diktat*, for there is neither the machinery nor the desire to create, and to sustain, any form of centrally planned system. [84] It is all too easy for enthusiasts of a certain stamp to be carried away by fancies of virtual journals, in a virtual library, administered by a virtual librarian invisibly at work like Ariel on Prospero's Isle. [85] The printed academic journal was slow to evolve, and was never at any time held to be entirely satisfactory, but I am unaware of any compelling reason to believe that a centrally planned revolution in

journal provision would be of inestimable benefit to Everyman, for order and stability are not inevitable outcomes of grand design. [86] [87] There is truly an Alice-in-Wonderland quality to the present system. Academe produces material for publication, passes it on to publishing houses free of charge, and then pays exorbitant sums to buy it back from them, which is ludicrous. It is surely only a matter of time before a more equitable network of scholarly communication is brought into being. It seems that a transition to some measure of open access to academic texts is on the cards, with submitters of articles, or their institutions, contributing relatively small sums toward publication costs.

I believe it would be imprudent to seek to work hand-in-glove with commercial publishers in an attempt to ameliorate the present sorry state of affairs, for any bargain struck would perforce be of a Faustian nature. [144] There are doubtless those who believe that commercial scholarly publishers can be part of the problem and part of the solution at one and the same time, but I for one remain sceptical, for such a scenario brings all too readily to mind the story of the wolf and the sheep discussing what to have for dinner. Sadly, scholarly publishing is not an occupation in which peace, love, and charity are found as naturally occurring by-products.

Nonetheless, university-based publishing projects, despite their sometimes limited successes, do appear to have gone some way to altering the collective mindset of commercial publishers, and time may yet indeed prove my scepticism unfounded, for the future is made of surprise. [88] [89] [90] Indeed, the alliance between Oxford University Press and Loughborough University's *Journal of Digital Information (JoDI)* demonstrated that a *modus vivendi* of sorts is achievable, albeit on a small scale. * The problems faced by academic libraries the world over are, like Borges' fabled Library of Babel, infinite and unending. [91] Governmental rules and regulations are drag chains on the development of a free and fair scholarly communications system; simple rules would indeed go a long way to solving academe's complex and varied problems. William of Ockham was not wrong.

* The relationship between *JoDI* and iText (OUP/BCS) has since, by mutual consent, come to an end. This situation was brought about by a refusal to adopt an author subscription fee model with which to maintain an open access policy. Since January 2005 *JoDI* has been hosted at the Texas A&M University.

3.15 The Open Access Movement

The open access movement is a disparate association and not a centralised organisation. [196] The majority of open access journals to date have resulted from the collaborative effort of small groups of individuals, and sometimes just a single academic who has held strong opinions regarding the scholarly communication system. They carry out the editorial duties that their journals require on a part-time basis. As a consequence, the information technology infrastructure varies a great deal, due to publishing being a secondary factor in the working day. Of course, this is a generalisation, but it holds true for most of the e-journal publishing projects in academic departments. The publishing output of the open access movement numbers four salient properties.

- It is a digital format.
- It is available online.
- It is free of charge to the user.
- There are little or no copyright or licensing restrictions.

The level of technical knowledge displayed by open access publishers covers a wide spectrum. Nevertheless, many such journals are technologically sophisticated.

- Format of the papers (HTML, XML, PDF).
- Graphics and hypermedia content.
- Management of submissions and the review process.
- Indexing and hyperlinking.
- Alerting, sometimes customised, for readers.
- Statistics on citations, downloads, domains, *etcetera*.
- Site security and mirror sites.
- Discussion boards.
- Digital archiving of articles and metadata.

Open access means that a researcher can find an article that has been published on the Web, print it out, and distribute it for non-commercial purposes

without payment or hindrance. The Internet is employed to facilitate the distribution of information that has been placed in the public domain. There are those who have adopted the unfortunate habit of referring to open access publications as ‘free’ journals. However, in the last resort, there is really no such thing as a free journal, even though it may be free at the point of access. The use of phrases such as ‘free online access’ or ‘free online journals’ give some the impression that because they are ‘free’ they are of less value than something that has been purchased at great expense, but the value of a journal is not necessarily related to its cover price. [148]

Indeed, Peter Suber, who changed the name of his Web site from ‘Free Online Scholarship News’ to ‘Open Access News’, admits that the field covered is now much more widely known by the latter term. The launch of the Budapest Open Access Movement initiative in February 2002, which has done much to raise awareness regarding this issue, may well have influenced this change of wording. [131] Ultimately, the driving force behind the open access movement is the commercial publishing sector itself. Ivy Anderson, digital acquisitions program librarian in Harvard University Library, knows where the blame lies. [138]

‘Elsevier is the largest worldwide publisher of science, technology, and medicine (STM) journals, commanding 18 per cent of this market. By contrast, all nonprofit publishers combined comprise only 21 per cent. According to a recent Wall Street Journal article, Elsevier’s STM revenues have doubled to \$2.33 billion since 1999. For the academic consumers of its journals, however, this high profitability—nearly 34 per cent in 2003—has come at a cost. Between 1986 and 2001, research library spending for scholarly journals rose by 210 per cent—well over three times the rate of inflation—while the number of subscriptions actually declined by 5 per cent.’

The publication of research findings can be an expensive business, and someone, somewhere, must foot the bill. Learned publishing makes an enormous contribution, albeit indirectly, to the *summum bonum*. Authors and publishers now hover on a cusp of strategic inflection. The academic community should do all it can to restore the learned journal to its previous status of a scholarly commons, thereby

reducing the largely invidious dominance of commercial publishers in the scholarly communication market.

It would, needless to say, be of great assistance if those who administer research grants could be persuaded to include the cost of funding publication, and indeed if grants were to be made conditional on publication of research results in open access journals. Admittedly, the cost of publishing research findings are mostly financed by publishing houses, but this service is ultimately paid for out of research libraries' budgets. The open access system, whether journals or repositories, must eventually come to the fore as part of a hybrid system of formal scholarly communication.

Open access archiving took off quickest among physicists, and open access journals were most quickly embraced by those working in the field of biomedicine. In contrast, however, the rate of participation in open access initiatives by those working in the humanities has been slow. This is doubtless related to the fact that humanities journals are markedly cheaper than their STM counterparts. Indeed, according to the *Library Journal* 2002 pricing survey journals in the STM sector were between 10 and 20 *per cent* more expensive than arts journals. [139]

Research carried out in the humanities is not well funded, and sometimes it is not funded at all. There are few open access journals covering humanities, and most of those operate without imposing a manuscript processing charge. According to the latest United States General Accounting Office Report total US federal funding for university research in 2001 was approximately \$19 billion, which constituted about 60 *per cent* of all funding for university research. It is interesting to note that just eight federal agencies, all of which are in the STM sector, provided 97 *per cent* of this funding, and two of these agencies, the National Institutes of Health, and the National Science Foundation, provided \$14.2 billion, which is 75 *per cent* of the total. [140]

By way of comparison, the National Endowment for the Humanities budget for 2002 was a mere \$124 million, which is less than one *per cent* of the total STM budget. [141] However, the National Academy of Sciences, as reported in *The Wall Street Journal* of May 23, 2003, disagrees with these figures, stating that the US

federal government is present funding only about one-third of all basic research carried out within universities. [142] Open access publishes less than one per cent of STM articles.

There is, of course, a different set of systemic interdependencies in the humanities publishing process, insofar as they must sometimes seek permissions from copyright holders to reproduce texts or illustrations. Online journals, and particularly open access ones, find it more difficult to obtain permissions than traditional print journals. This is a problem that is particularly acute in history of art. In the humanities, journal articles often take the form of reports on the history and interpretation of the primary literature, which is for the most part contained in books, but also journal articles and manuscripts.

Overall, humanities journals have much higher rejection rates than STM journals. The rejection rates for arts journals are between 70 and 90 *per cent*. However, the rejection rates for STM journals range between 20 and 40 *per cent*. Therefore, for open access journals that are financed by means of levying a fee on accepted papers, the fees charged would perforce be markedly higher for an arts journal. Moreover, given that the humanities receive substantially less financial support than the STM sector, this could possibly have a restrictive effect on the publishing of research in the humanities.

The widespread adoption of the open access system is inevitable. It is scholars themselves who are spearheading the drive to open access, by means of a series of incremental steps, though librarians have also proved supportive through such initiatives as SPARC and FIGARO. Authors of journal articles do not seek royalties; they instead wish to be cited by their peers.

Articles that have been made available online in an open access format are cited 4.5 times as often as those available through subscription only. This statistic alone would be enough to lure a number of authors, but the fact remains that many choose to publish elsewhere, for the academic reward system is, for the most part, based on publication in journals with a high impact factor.

The Institute of Scientific Information (ISI) offers some of the most highly used online indexes to the journal literature. Researchers use its *Current Contents* more than any other service to learn of journal articles soon after publication. There are currently 8,700 selected journals covered in Web of Science, of which 191 are open access. [169] A study conducted by ISI on whether open access journals perform differently from other journals in their respective fields found no discernable difference in terms of citation impact or frequency with which the journal is cited. It is useful to have proof positive that open access journals are indeed indexed by ISI, and that they do have comparable citation impacts. However, it is patent that this methodology does have some degree of circularity. [186]

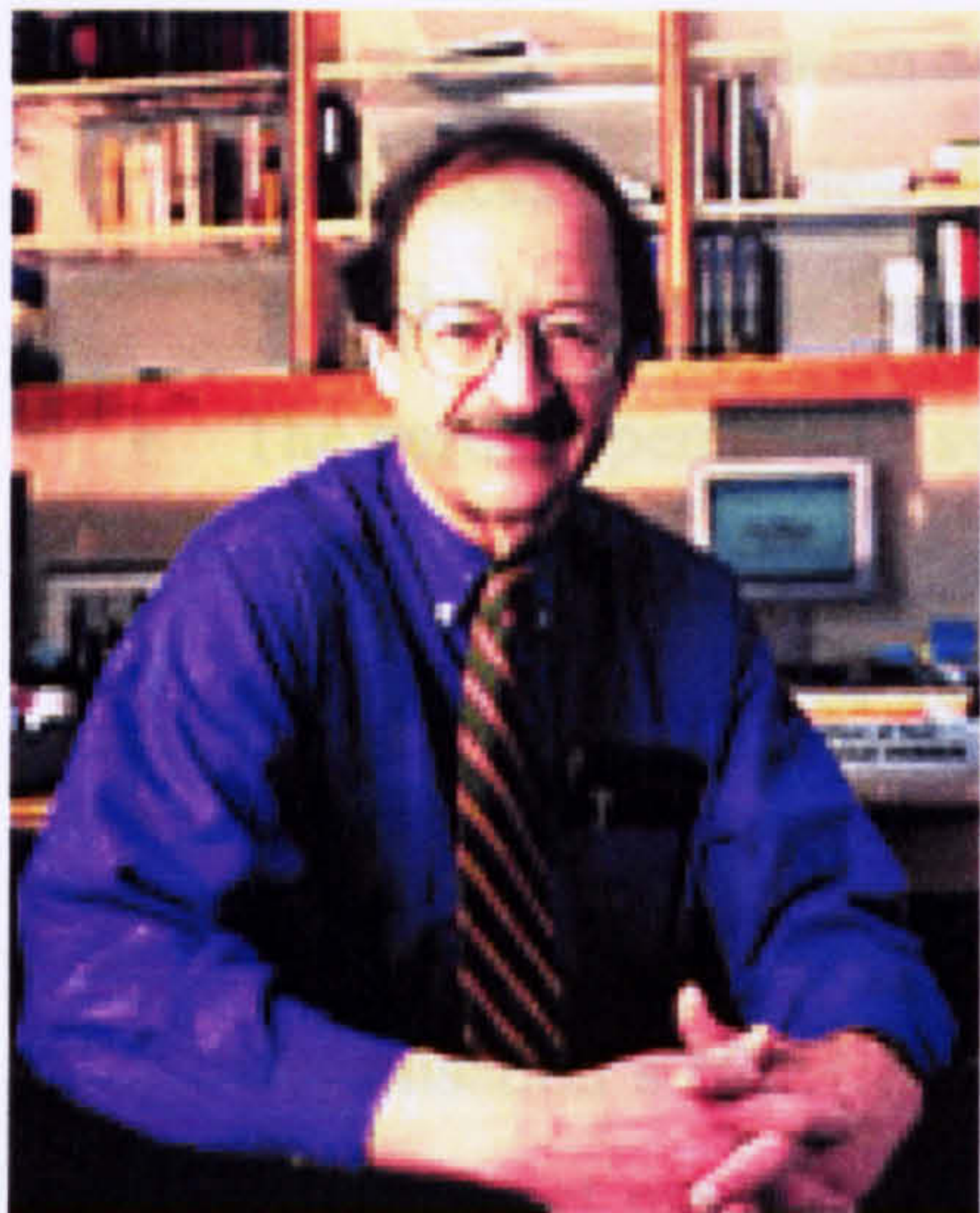
A joint venture by the open access publisher BioMed Central, which at present publishes over 90 journals, and the Joint Information Systems Committee has enabled biomedical researchers at British universities to publish their papers without payment of authors' fees. Normally, BioMed Central charges authors for publishing their papers, which are then made available free of charge to readers. The policy of eliciting payment from authors may seem untoward, and perhaps it is, but it is nevertheless a relatively common practice in the field of biology journal publishing.

Junior researchers need to be made aware that they shall not suffer by publishing their work in open access journals. Those who make decisions concerning appointments, promotions, and research funding ought to look favourably upon publication in such journals. However, whether they will or not remains to be seen. Indicia of quality are changing, but the effects of this may have unforeseen consequences. Senior researchers, who have had all the promotions, and received all the plaudits, that they are ever going to get, could certainly help the situation by submitting their papers to open access journals. This would help such journals to acquire high profiles in their research fields. [182]

The mounting pressure on commercial publishing houses is beginning to take its toll, and there are now a lot more publishers opening their archives one year after publication. Learned societies are now beginning to embrace the open access model, even though they themselves are not among the main beneficiaries of the change. [209] *Molecular Biology of the Cell*, which is published by the American Society for

Cell Biology, now opens its archives after two months. The editor-in-chief hopes to convert the journal to open access soon. [197]

Public Library of Science (PLOS), a scientific society whose Chief Executive is Harold E. Varmus, (left) a Nobel Prize winner in the field of medicine, is by far and away the best funded of the open access publishers, and employs no fewer than 16



full-time staff members. [217] In December 2002 PLoS, received a \$9 million dollar grant from the Gordon and Betty Moore Foundation with which to launch a not-for-profit scientific publishing venture. PLoS Biology online is open access, but the print version requires a subscription.

PLOS has a charge of \$1500 *per* article to publish, which is levied after an article has been accepted for publication. In the academic area in which PLoS works this represents around one per cent of the average grant, which means that from now on publishing must be considered as an integral part of the cost of doing research. PLoS Medicine begins publishing in October 2004.

The open access movement, if it were to become the dominant model, would transform interlibrary loan systems. Document delivery of paper-based media hinges on complex logistics, which are by their very nature non-linear, indeed sometimes Byzantine, and consequently labour intensive. The savings derived from a diminished interlibrary loan system would enable research libraries to transfer staff and resources to other duties, one of which could be publishing. There are various approaches to open access.

- The e-print archive, which means that authors place preprints and/or postprints in an open access archive. The most widely known example of this system would be Paul Ginsparg's Los Alamos National Laboratory arXiv.org.
- The unqualified model, which means immediate and full open access to full text. For example, *First Monday*, or *DLib*, or *Ariadne*.

- The dual mode, which offers both subscription to print journal and open access online editions. Sometimes these may differ in content. For example, *The Journal of Postgraduate Medicine*, or *The Occidental Quarterly*.
- The delayed open access system. This offers open access only at a later date, sometimes up to a year after initial publication. *The New England Journal of Medicine* and *Learned Publishing* are two examples of this system.
- The author submission fee method. Authors pay a publishing fee to support open access to articles. For example, BioMed Central, which is a commercial publishing house, or Public Library of Science.
- The partial open access system, which offers open access to selected articles in each edition. *The American Conservative*, or *The New York Review of Books*, would be examples of this.
- The *per capita* open access system, which links open access to a country's per capita income. *The Review of Economic Theory*, or the World Health Organisation's *HINARI* would serve as examples.
- The abstract method, which makes available tables of contents and abstracts only. For example, Reed Elsevier's ScienceDirect.
- The co-operative model, whereby institutions support open access journals. For example, *The Journal of Insect Science*, or *International Journal of Education and the Arts*.
- The reduced service model. The current issue is completely open access, and in addition a text-only archive is open access. However, the full archival service of hypertext, still images, animation, audio, and video is made available to subscribers only. For example, *Postmodern Culture*.

There are, of course, journals that integrate some of these systems. For example, a journal can have an author submission fee, but also have a *per capita* open access system. The impact of such open access systems on research libraries, and the research community, could prove momentous. Of course, not all academic publishing projects are open access, but their subscription fees are a fraction of what commercial publishers charge.

Derk Haank, the former Chief Executive Officer of publishing behemoth Reed Elsevier, who is now with Springer, has recently stated, '*I am not against open access*'. [210] To be sure, this may be a conversion of truly Damascene moment, though on the other hand it may simply be sophistry in the service of commerce. Haank claimed that Reed Elsevier already offered open access, '*...but it's paid for by the librarian*'. However, this is not a definition of the term 'open access' that would meet with universal agreement. Nonetheless, Haank is not alone in his conjuring with words. The Thomson Scientific Web site lists the following piece of nonsense.

An Open Access License gives you freedom to access Thomson Derwent databases on STN, including Derwent World Patents Index®, without worrying about online costs. You simply pay a pre-determined fee that covers all connect hour, online display, offline print, and SDI (alert) charges for your selected databases to an agreed level. Then you can access Derwent data as often as you wish. [211]

Commercial publishers seek to assign their own choice of meaning to the term 'open access'. This is a strategem known to logicians as a stipulative definition. Apparently, publishers believe they can stipulate what any given term means and, in so doing, confuse the issue. It does rather seem that they are, like Humpty Dumpty before them, trying to make words mean whatever they choose them to mean. Now, a Web site that offers access to subscribers only cannot, under any circumstances, be described as 'open access'.

The employment of such semantic legerdemain could be interpreted as a tacit admission that the present business model is flawed, and that the large publishing houses are uncertain about what to put in its place. Commercial journal publishers, despite all their market research brouhaha, still seem to have a rate of success in predicting future developments that ranges somewhere between a fairground palmist and a reader of tea leaves.

Open access now poses a threat to the share prices, and possibly the profit margins, of the publishing establishment. [213] Nevertheless, open access comes with its own problems, and it should not be seen as a panacea. [215]

3.16 Conclusion

There are those in the commercial sector who believe that the principal problem is not their pricing policies, but rather a general shortfall in governmental funding of the tertiary education sector. [212] It would not be impolitic, however, to call into question this concatenation of cause and effect. Scientific journals have become significant cash generators for big business, and market forces are now driving research in a good many disciplines.

Scientific papers have become commodities, and publishers charge whatever they believe the market can stand. Any increase in research library funding would simply provoke a corresponding increase in journal prices, for such is the nature of the beast. Profiteering publishing houses have plundered the public purse with abandon for many a long year; they should not be expected to relinquish such a long-standing ascendance with equanimity.

Nevertheless, there are now too many players in the field pulling this way and that for the *status quo* to be maintained indefinitely. Open access journals certainly have the potential to garner an even larger readership than they possess at present, and the academe-based e-journal publishing projects have proved to be financially viable. There is now a momentum for change that surely cannot be checked.

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CHAPTER FOUR

E-journal Technology

4.1 Introduction

Electronic publishing technology has been evolving at a breathtaking pace. Nowadays, virtually all publishing is done using information technology. The following chapter explains the e-journal publishing chain; why it exists and how it operates. The International Standard Serial Number is an indispensable administrative tool, and its function is explained at some length. The journal publisher's electronic toolkit is arrayed and catalogued, and the journal industry's service providers are identified and analysed.

The Internet, a virtual entity of unimaginably vast dimensions, is protean in nature. It has been described as the largest computer network in the world. However, it is not really a single network at all, but rather an aggregation of thousands of networks. Nevertheless, it could be inferred from the definite article that invariably precedes the collective noun 'Internet' that it is a unitary, and not a discrete, system. The innumerable networks that collectively comprise the Internet interact with each other to facilitate the flow of data. These networks are able to work in concert due to a common agreement that exists regarding Internet procedures and standards for protocols. There is today almost no aspect of publishing work that does not involve using the Internet to some extent.

The World Wide Web, is a subset of Internet content, albeit the most significant. A number of other Internet protocols in addition to the Web are File Transfer Protocol (FTP), email, Telnet, and Gopher. The Web consists of an endless number of pages stored on the hard disks of computers scattered around the globe. The retrieval of documents over the Web is achieved by the use of a HyperText

Transfer Protocol (HTTP). The Internet and the Web are now regarded as givens in the publishing process.

A good many of the scientific papers that are stored in Web pages are to be found on the so-called ‘deep’ Web, which is by and large qualitatively different from the ‘surface’ Web. [41] Information that is stored in a searchable database is part of the deep web. These are discoverable by direct query only, for the contents of many online databases lie outside the purview of a search engine’s spider-gathered index. The easiest way to access content on the deep web is to use a good directory; many of these databases have Web sites of their own. The largest storehouse of scientific knowledge ever accumulated is now available at one’s fingertips, but that is not to say that all such information is easily accessible. [42]

The e-journal has been constructed on ground previously prepared by pioneers of the new information and communication technology. The World Wide Web Consortium (W3C), an industry consortium administered by the Laboratory for Computer Science at the Massachusetts Institute of Technology, develops standards for the Web. W3C defines the Web as, ‘the universe of network-accessible information’. A Web browser is a program that lets you view and explore information on the Web. The original Web browser was also an editor, and it is this function that many people wish to restore to the scholarly communication system, with an element of interaction between readers and writers of scientific papers. [43] [44] [45]

ADVANTAGES	DISADVANTAGES
Audience potentially global in extent	Actual audience mainly in First World
Most users pay tax	Users mainly in higher social scales
Quick and convenient access	Material of variable quality
Use can be monitored	Difficult to verify authenticity of sources
Suitable for large-scale polling	No permanent record

Table 4.1: *Pro et contra of information on the Web*

This interactive capability is more often talked about in connection with e-prints, preprints, or self-archiving initiatives than e-journals, but the ideas of what actually constitutes an e-journal is now somewhat moot. Nevertheless, those who access scientific papers on the Web are coming to expect some element of feedback

and interactivity in addition to the information they are viewing. The Web is a forum for consultation and debate, and there is now an acknowledged problem regarding the variable quality of material that is to be found online.

The Web has increasingly become a platform for multimedia presentation, and as broadband access increases such pages with snippets of audio, video, and animation will load with the minimum degree of delay. How exactly is broadband to be defined? To begin with, broadband is an abbreviation of the term broad bandwidth, which alludes to the amount of digital information that can flow through a channel, and is usually expressed in kilobytes per second (kbps). Technically, it is any high-speed connection to the Internet. Indeed, an Integrated Services Digital Network (ISDN) fulfils the criteria, for it transmits data at a sufficiently high speed, usually from 64kbps to 128 kbps.

A new technology, called Asymmetric Digital Subscriber Line (ADSL), allows for very high-speed connections over an existing telephone connection. ADSL is able to transmit more than 6 mbps to a subscriber, which is enough to provide Internet access with streaming video, and in that increasingly important interactive mode it can transmit more than 640 kbps in both directions. The connection between the computer and the Internet is permanent and does not need to be dialled up.

Without a doubt, Internet communication has transformed the way that scholarly communication operates. One of the biggest problems, however, is that it remains very much linked to a physical, wired network. In other words, you would normally have to be plugged in *via* sockets and cables to access the network. It is a matter of time, however, until wire-free access to the Internet becomes universal, and that way will make an impact on the way that the Web is used, particularly in the Third World. Satellite broadband could solve the scholarly communication problems found in countries that have no effective telecommunications infrastructure.

It has become more popular to access scientific, technical, and medical content from palmtops. Apparently, there are enough people around who find this service useful, and who are willing to pay for it, to make such a service commercially viable. The Wiley InterScience MobileEdition service, which delivers journal content direct

to wireless handheld devices and WAP-enabled telephones, has recently increased the level of service. Subscribers to these services may browse the contents and abstract while away from their desks, and also retrieve information such as the author's affiliation, address, and e-mail. Full-text versions are available in print editions or online. [1] Scholarly communication and technology are evolving hand-in-hand. The Internet, though of fundamental importance, is but one link in the e-journal chain. Information technology now pervades every aspect of journal production, and a few e-journals have developed into online laboratories for multimedia experimentation. Students have the highest Web usage of any demographic group, with many preferring to search online for information rather than consult paper media. [8] However, serial numbers are of equal importance in the ordering of electronic and paper sources, and many good sources are still available in paper format only.

4.2 The International Standard Serial Number

The International Standard Serial Number (ISSN) is an eight-digit number, including a check digit, which identifies every periodical publication, and is based on ISO standard ISO 3297. Since 1998, ISSN National Centres have been assigning numbers to electronic publications, including CD-ROMs, databases, and frequently updated Web sites.

The ISSN together with the key title uniquely identifies a particular serial or integrating resource, facilitates inter-library loan and bibliographic control, and is often now used as a reference source for the World Wide Web. The ISSN also serves as a mark of legitimacy, for each and every assignment of a number is thoroughly investigated and researched. [4]

It should be noted that, in the English language at least, the abbreviation 'ISSN' denotes the singular or plural forms, according to context. The ISSN should preferably be printed on the top right-hand corner of the cover of a printed journal. The United Nations Educational, Scientific, and Cultural Organisation (UNESCO), and the French Government, support the ISSN International Centre, which is based in

Paris. It manages the system with the aid of a global network of seventy-five national centres. These are commonly based at a country's national library.

It is the task of the national centres to advertise and promote the ISSN system through contacts with the local bibliographic and publishing communities. The ISSN Centre in the United Kingdom is an integral part of the British Library's cataloguing operations. Over one million ISSNs have so far been assigned, though the UK ISSN Centre has at present a significant backlog, as does the International ISSN Centre. The ISSN International Centre is responsible for ISSN assignment to journals published in countries that have no ISSN National Centre. The homepage of ISSN is displayed below.

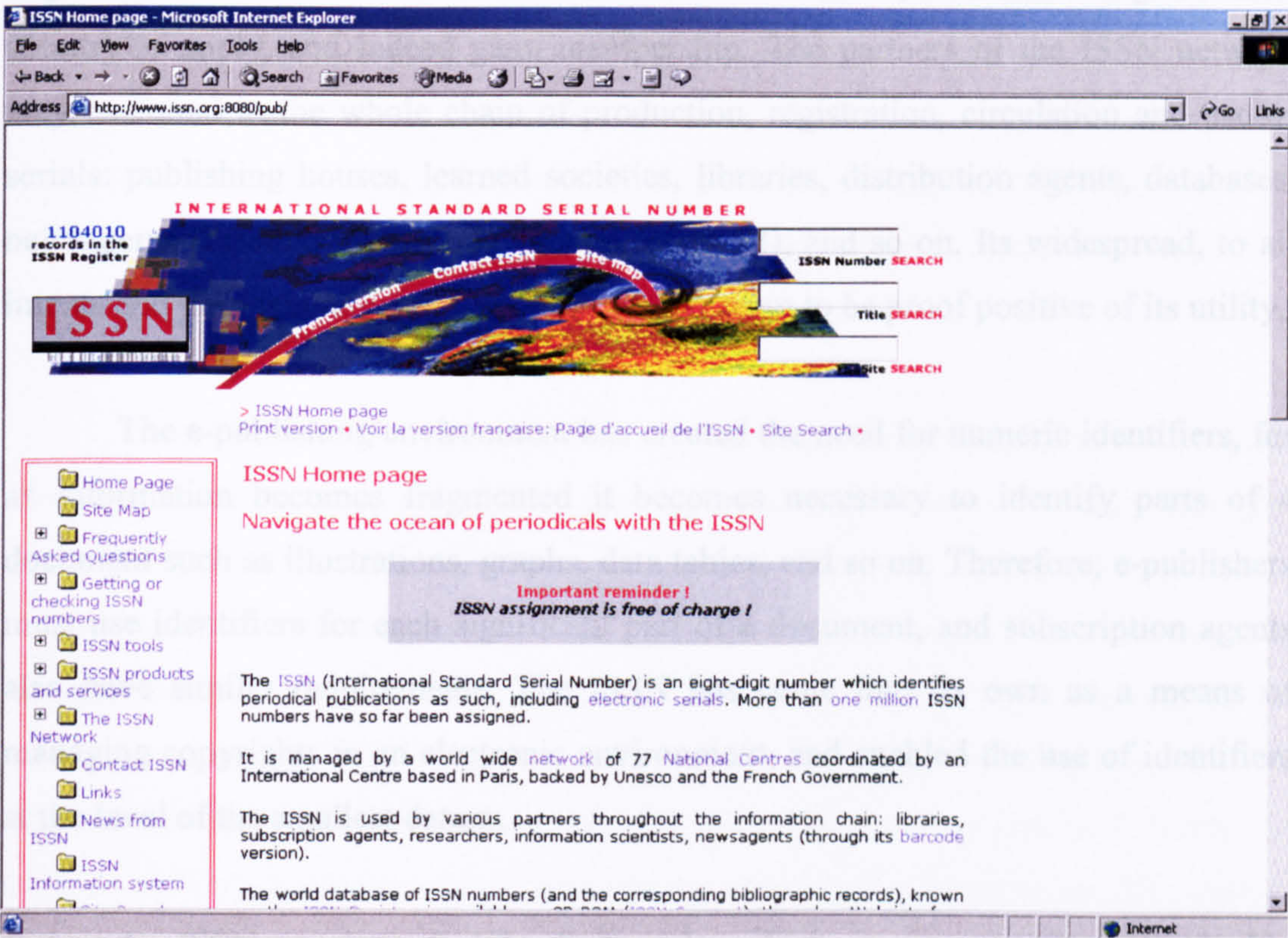


Illustration 4.1: *The ISSN home page*

The International Organisation for Standardisation (ISO) drafted the standard for the ISSN in 1971. All names of its programmes are in the English language, as that now serves the role of a global *lingua franca*. The ISSN programme was developed within the framework of UNESCO's world science information

programme, Intergovernmental Programme for Co-operation in the Field of Scientific and Technological Information (UNISIST). The ISSN Network, which until 1993 was known as the International Serial Data System, was formally established in 1974. The ISSN was established in order to control the assignment of ISSN numbers, to maintain a database of records for the world's serial publications, and to act as the standards authority. The ISSN maintains the bibliographic control function, a unique identification code that facilitates access to serial titles irrespective of the format in which they are produced, though most are print publications, of course. The technological and administrative aspects of the system are overseen by the National Centre Directors under the aegis of the ISSN International Centre.

The ISSN network has consistently fostered a programme of cooperation that is global in its extent. It covers no fewer than 239 countries, with Iran being the latest country to apply, and indeed gain, membership. The partners of the ISSN network may be found in the whole chain of production, registration, circulation and use of serials: publishing houses, learned societies, libraries, distribution agents, databases, newsagents (through its barcode version, EAN 13), and so on. Its widespread, to all intents and purposes universal, adoption would seem to be proof positive of its utility.

The e-publishing environment has created the need for numeric identifiers, for as information becomes fragmented it becomes necessary to identify parts of a document such as illustrations, graphs, data tables, and so on. Therefore, e-publishers must use identifiers for each significant part of a document, and subscription agents also have similar requirements. The ISSN has come into its own as a means of managing copyrights in an electronic environment, and enabled the use of identifiers at the level of the smallest datum.

An ISSN consists of eight digits only, which are sourced from the Arabic numerals ranging from zero to nine, with the exception of the last, or check, digit where an upper case X may sometimes occur. Since an ISSN is likely to be used in a similar context as codes designed for other related purposes, such as the International Standard Book Number (ISBN), which is a ten-digit number at the time of writing, but becomes a thirteen-digit number in January 2007, a distinction must be made in the form of presentation when written or printed.

There are plans afoot for the ISSN also to become a thirteen-digit number, and this may have some connection with the fact that the Anglo-American Cataloguing Rules body has recently seen fit to widen the scope of what is covered by the term, 'journal' or 'serial'. The ISSN Network has used only two million numbers from a potential reserve of almost ten million, but as ISSN use proliferates that reserve may be swiftly eroded.

A fundamental difference between these two numbering systems is that the stem of ISBN identifies the publisher, whereas the ISSN contains no publisher identifier. The ISSN is an arbitrarily assigned number that remains linked to a serial publication even if ownership of the title passes from one publisher to another.

There is, of course, a welter of information exchange regarding serials that transcends national boundaries and language areas. Such worldwide communication necessitates an international code that is numeric. There is no single alphabet that is used by the majority of publishers and users of serials, but the use of Arabic numerals has become universal. It is an alphanumeric identification code that is designed to eschew ambiguity.

Therefore, an ISSN has a Roman alphabetic prefix of four acronymic capital letters, and appears as two groups of four digits, usually separated by a hyphen. For example, ISSN 0953-0460. (This is the ISSN for the print edition of *Serials: the journal for the serials community*. The electronic edition and e-News service each having unique ISSN identifiers.) A new ISSN is assigned when the medium of the publication changes. It is now common for a single title to possess a number of ISSN identifiers as media proliferate. However, the same ISSN can be used for different file formats (ASCII, PostScript, Hypertext) of the same online publication. The unique name assigned to a serial by the ISSN network, and inseparably linked with its ISSN, is called the 'key title'.

The world database of ISSN numbers (and the corresponding bibliographic records), known as the ISSN Register, is available on CD-ROM and through a Web Interface. The purpose of a check digit is to guard against errors caused by the incorrect transcription of an ISSN. The modulo 11 algorithm, using the weighting

factors 8 to 2 for calculating the check digit, is one of the most efficient systems for detecting transcription errors. The Procedure for calculating the check digit, which may be carried out automatically by using a computer, is as follows:

1. Take the first seven digits of the ISSN (remembering that the check digit is the eighth and last digit):

0, 3, 1, 7, 8, 4, 7

2. Take the weighting factors associated with each digit:

8, 7, 6, 5, 4, 3, 2

3. Multiply each digit in turn by its weighting factor:

0, 21, 6, 35, 32, 12, 14

4. Add these numbers together:

$0 + 21 + 6 + 35 + 32 + 12 + 14 = 120$

5. Divide this sum by the modulus 11:

$120 / 11 = 10$ remainder 10

6. Subtract the remainder from 11:

$11 - 10 = 1$

7. Add the remainder, which is the check digit, to the extreme right (low order) position of the base number of the ISSN:

0317-8471

8: If the remainder is 10, substitute an upper case X in the check digit position. If there is no remainder, put a zero in the check digit position. [2] [6]

The ISSN is applicable to every publication that can be described as a serial, periodical, journal, or magazine, whether it has been published at some time in the past, is being published in the present day, or is about to be published in the

foreseeable future. Serials can also be defined as newspapers, annual reports, proceeding or transactions of societies, *etcetera*. Any publication that is in a series or serial can be assigned an ISSN. This does, of course, include electronic publications of whatever format. According to the ISSN International Centre, the fundamental criteria employed to define a serial publication are that its component parts are published under the same title for a period of time that is not limited in advance. All ISSN assignments are free of charge.

The ISSN Centre at the British Library needs to receive a copy of the first issue in order to validate their records. This copy will then be passed through to the Legal Deposit Office. However, subsequent issues should be sent direct to the section dealing with legal deposit. [7] The ISSN is in no way related to legal deposit. According to the Copyright Act of 1911, as amended by the British Library Act of 1972, all publications, including individual issues of serials, must be deposited with the British Library whether they carry an ISSN or not. It is possible, and indeed advisable, to obtain an ISSN number before the initial publication of a new journal. This is called a pre-publication assignment. It is sometimes the case that an ISSN can be assigned to a series of monographs as a collective identifier, with an ISBN being assigned individually to each monograph in the series. The ISSN can also be used to create a bar code. The European Article Numbering Uniform Code Council 13 (EAN.UCC-13), the global commercial article numbering system, uses it as an identification code. [48]

The ISSN is of equal importance to the title. It is suitable for use over a computer network in file update and linkage, and also for retrieval and transmittal of data. The ISSN can also assist the accurate citing of serials by academics, researchers, and librarians. The library profession can also use the ISSN for such tasks as identifying titles, interlibrary-loan, and catalogue reporting. Important questions in regard to identification procedures have yet to be answered. Publications that were once looked upon as serials are now regarded as continuing resources, and while it is acknowledged that finite integrating resources fall outside the remit of the ISSN system, there are conceptual and practical difficulties associated with assigning an ISSN to a site that is intrinsically mutable and amorphous, but nevertheless describes itself as an e-serial. [13]

TYPES OF PUBLICATION MODEL

Bibliographic resources

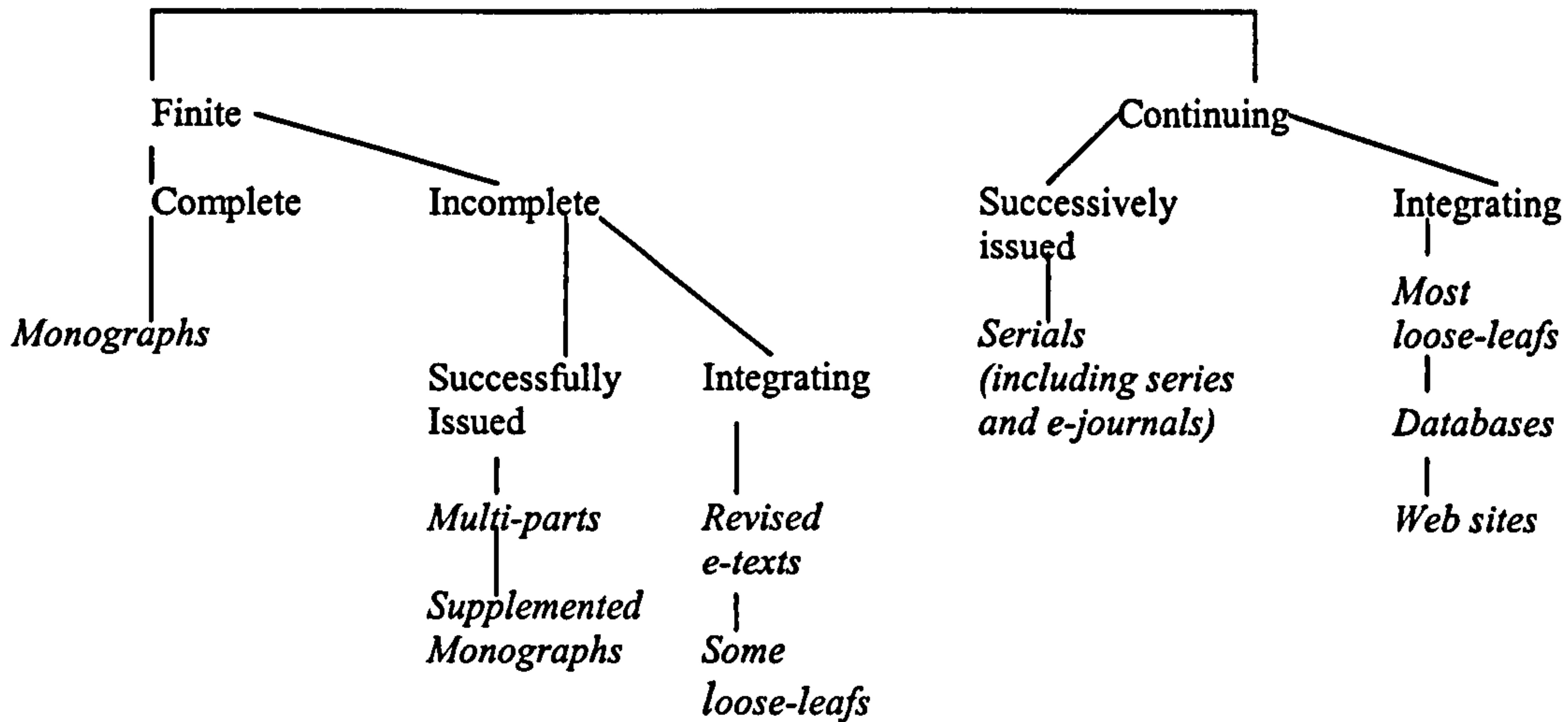


Figure 4.1: *Types of Publication Model*

The ISSN also assists the publishing trade distribution systems, particularly through the use of the bar-coding facility. In a number of countries it is mandatory that all serial publications covered by legal deposit must have an ISSN. A number of publications have identical or similar titles; the title of a publication cannot be regarded as falling under the protection of copyright law because it has been assigned an ISSN.

On assignment of an ISSN to a serial publication it is registered in an international database. The ISSN Register is a comprehensive and authoritative source for the identification of serial publications, no matter their origination. All ISSN records have been made available as Machine-Readable Cataloguing Records (MARC). The term 'machine-readable' means that a computer can read and interpret the data in the cataloguing record. The ISSN MARC format has been derived from USMARC, which was created at the Library of Congress. The ISSN Register is also a bibliographic utility that functions as a global catalogue of serial publications. The ISSN is the core element of the Serial Item and Contribution Identifier (SICI), which is an identifier that is of signal importance for the accurate identification of serial

issues and articles. It impacts upon such aspects as online displays, form field lengths, data validation and printing, in addition to electronic data catalogue (EDI) messages, indexing, searching, and a wide range of processes involving record identification and matching.

The SICI code is described in the American standard ANSI/NISO Z39.56. The SICI provides a clear and unequivocal identification of each individual article published in any given issue of a serial publication, regardless of the distribution medium. It is now increasingly common for large publishing houses and reproduction rights agencies to use the SICI code. Below is a slightly enlarged example of a SICI, and its barcode equivalent, which is called the Serials Industry Systems Advisory Committee (SISAC) barcode. It is possible to obtain a set of best practice guidelines regarding the creation of a barcode from the Periodical Publishing Association. [8]

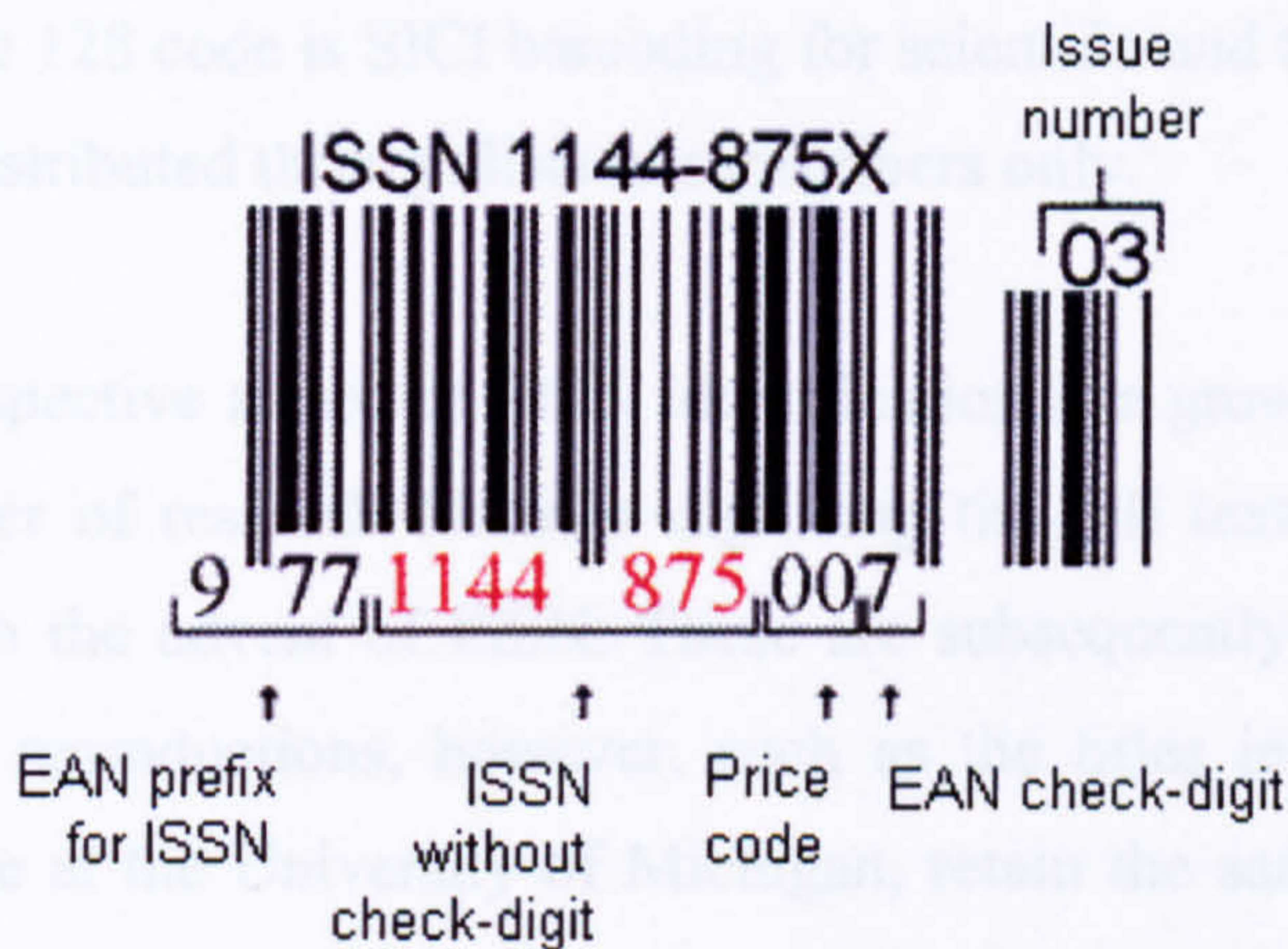


Illustration 4.2: *The ISSN barcode*

The SICI, which is located under the barcode, contains:

- The ISSN, minus the acronymic prefix.
- The publication date, which is placed between a set of brackets and formatted according to the formula YYYYMM.
- The number of the issue (52).

- The version number of the standard, here 1, which is preceded by a semicolon.
- A hyphen, which precedes the control character calculated on the basis of all the preceding characters.

Large publishing houses are now placing the SISAC barcode symbol on the covers of their publications, and library system vendors are developing interfaces for automated check-in systems. This barcode representation of the SICI symbol permits automated scanning of publications. SISAC is a body that develops exchange formats to facilitate the administrative tasks associated with serial publications, especially in transactions between publishers, subscription agents, and libraries. The SISAC barcode does indeed contain all the elements of the SICI, but it formats them in a rather different manner, thereby creating a wholly numeric code. This formatting permits a reduction of the length of the resulting barcode in the 128 symbology. There are a number of symbologies used in barcoding that correspond to a variety of coding requirements. The 128 code is SICI barcoding for scientific and technical publications that are mainly distributed through lists to subscribers only.

The retrospective award of ISSN identification is a growing challenge. There are now a number of research libraries digitising the full text of serials that were published prior to the advent of ISSN. These are subsequently being posted on the Web. Secondary reproductions, however, such as the titles in the Journal Storage (JSTOR) database at the University of Michigan, retain the same ISSN as the print editions from which they have been scanned. [12] There is some debate as to how the ISSN may evolve in an electronic environment, but for the foreseeable future it seems set to remain in, if not its present form, at least something closely akin to it.

4.3 Desktop publishing programs

There are basically five general categories of desktop publishing software that together form the foundation on which a publishing enterprise can be built. In addition, there are a number of utilities and speciality programs that can do much to

improve the standard of production. E-journal publishers use more than just the page layout program to build pages and folios onscreen. In addition, these programs must share a common denominator, which is the wherewithal to utilise the PostScript page descriptive language. All of the programs that are listed below conform to the conventions of PostScript output, and can export to formats that enable file transfer without the occurrence of any noticeable degree of degradation.

A word-processing program enables users to type and edit their text, and also provides grammar and spell checking. The files produced can then be imported into a page layout program, thereby simplifying some formatting tasks. Microsoft Word is the most widely used word processing program, and using it means that files can be imported and exported in a variety of formats, for it maximises compatibility with other Microsoft programs, which are seemingly ubiquitous. However, some degree of file degradation can occur when transferring to other software houses' programs, as they are seldom fully compatible. Adobe InCopy can be very useful, as it is fully compatible with Photoshop, Illustrator, and InDesign, all of which are widely used by the publishing industry. All of these Adobe programs are designed to fit together seamlessly.

To be sure, page layout programs are foundational to desktop publishing. It is necessary to use a page layout program to integrate all stages in the desktop publishing process. The integration of text and images on the page, and the manipulation of page elements, are basic to the presentation of many publications, not least e-journals. QuarkXpress, Adobe InDesign, and Microsoft Publisher are major players in desktop publishing and graphic design. These programs handle text well, and can import graphics with ease. The use of Adobe PageMaker is also widespread. Quark is closely associated with Apple, a combination much favoured by those involved in the publishing trade. Web publishing tools are usually included in such programs, though they can be considered a separate class of their own.

Graphics illustration programs allow the user to draw and edit vector-based illustrations. The most commonly used for drawing are Adobe Illustrator, MacroMedia, FreeHand, and CorelDraw. Drawing programs such as the aforementioned can handle text, but they are comparatively inefficient when a

substantial volume of text is to be used. The files that are generated from these types of programs can be saved in their own application format, or more usually be exported into Encapsulated PostScript (EPS) for placement into a page layout program.

Photo/Image Editing programs allow the user to edit scans and draw bitmapped artwork. The program most commonly used for photo and bitmap editing is Adobe PhotoShop. Bitmap graphics are necessary for doing any kind of work with photos, scans, or other images. Illustration programs can export images in bitmap formats, but paint programs are rather better for the final output of images to be posted on the Web. The files generated by these programs can be saved in their own format, or they can be exported into EPS, or Tag Image File Format (TIFF), an image file format designed for page assembly. It is common for publishers to have a very large number of fonts and images on hand to use at their discretion when building pages. Font management tools enable the user to organise and group the most appropriate fonts for specific projects. Image viewing or management utilities make it considerably easier to locate pictures. Adobe Type Manager is a popular choice of program for the purpose of font management.

The salient characteristics of a desktop publishing program are:

- The ability to import objects from other desktop publishing programs.
- The ability to export the page, or objects on the page, into an acceptable desktop format.
- The ability to use key CMYK or Pantone inks for four-colour printing.
- The ability to separate colours when sending to laser printers or image setters.
- The ability to print bleeds, colour, crop, and transmit registration information to the output material. [9]

Word processing programs are becoming more complex, and producing higher quality output, but desktop publishing still gives the user more control over typographical characteristics, in addition to providing more support for four-colour work.

4.4 Journal manuscript management software

It is in the interest of all players in the learned journal game to seek to reduce delays in the dissemination cycle. Authors and referees now take it for granted that submittals and reviews can be posted by e-mail to editors. The peer-review process can be a rather time-consuming occupation, and any software package that can assist in implementing it is to be welcomed. Thankfully, or perhaps not, there is a large selection from which to choose. However, some packages are more popular than others, for reasons many and varied.

A number of these Web-based software tools are but variations on a theme, but there are relatively significant differences between some and, while every editor has his own way of working, there are enough constants in the process to allow a formulaic approach. Hence, the most complex programs, even although they offer quite specialised functions, have many characteristics in common. Editors may believe their quirks set them apart from others, but they are commonly unaware how far their work practices mirror those of their peers. It is now common for programs to be configured for each journal's specific requirements, though special programs can be written for specific needs.

A manuscript management program comprises several interfaces, though these may be customised to suit the needs of users. Needless to say, the ability to customise does vary to some degree between programs though an intuitive user interface is the goal of all software packages. For example, the EdiKit system, authored by the Berkeley Electronic Press, can enable an editor to have papers assigned automatically to referees by category of academic specialisation, though anecdotal evidence suggests that small publishers at least, learned societies and the like, much prefer the personal touch.

- Author screen
- Editor screen
- Reviewer screen

The author screen permits the submittal of articles by e-mail attachment. This would be in one or more previously specified formats, perhaps ones that can be easily converted to PDF. The editor screen enables editors to file and read submitted articles, and then assign them to suitable reviewers who are knowledgeable in a particular field. The reviewer screen allows the reviewers to receive, and to read, the articles, and then return them to the editor with informed comment and any suggested emendations attached.

It is the ability to customise, the better to address the workflow requirements of each and every editorial office, that is the salient feature of manuscript management programs. It is possible for the working practices of editorial teams to be mirrored by the program. Therefore, the program is adjusted to suit the user, and not *vice versa*. The workflow comprises all elements of the manuscript handling process, which includes, but is not limited to, the roles and legal rights of authors, editor-in-chief, the editorial board, and publishing staff. The table below gives some indication of how similar manuscript management programs can be to each other.

	AllenTrack	EdiKit	Bench>Press	ScholarOne	RapidReview
Automated submission	yes	yes	yes	yes	yes
Automatic Notifications	yes	yes	yes	yes	yes
Article Tracking	yes	yes	yes	yes	yes
Event logging	?	?	yes	yes	yes
Reviewing/ Copyediting	yes	yes	yes	yes	yes
Category Tags	yes	yes	yes	yes	yes
Reminders/ enforcement	flexible	flexible	flexible	yes	yes
Automatic posting	yes	yes	yes	yes	yes
Reviewer performance	?	?	?	yes	yes
Security	yes	?	yes	yes	flexible

Table 4.2: *A comparative list of manuscript management software features*

A journal manuscript management program is designed for editorial personnel involved in data entry, data retrieval, correspondence, workflow control, and manuscript file management. There is also a need for database maintenance and access, which usually means that it is backed up on a daily basis. However, there are software packages that provide these functions from remote sites, and such an application service provider can shoulder the responsibility of file management, system security, and archiving data. In addition, the remote systems supervisor can carry out software upgrades and forward format migrations.

It is now customary for authors to submit their manuscripts for publication by means of e-mail, though some authors, particularly those who do not reside in the West, still submit their contributions by surface or airmail. Indeed, there are still some authors residing in Europe and North America who persist in using the postal service to convey their work to publishers' offices, but they are declining in number. Journal manuscript management systems are geared for electronic submission, but the editorial staff members can act as the author and enter the contents of a printed manuscript into the system by scanning, which helps to shorten the turnaround time for reviewing purposes. This is a two-tier system that would seem to negate the purpose of online submission, and is surely viable only as part of a transition period.

There is some evidence that some authors feel unhappy about using online submission systems, and much prefer more traditional methods of submission. One learned society discovered that moving their four journals online substantially increased the workload of staff, and that this was because of a reluctance of authors to make use of the online submission system. However, after some initial scepticism, it seems that authors do see advantages in the possibility of quicker review and publication. [10] The transition from a paper-based system for peer review to an online system necessitates the cooperation of authors, referees, and editorial staff members in almost equal measure.

Journal publishers offer guidelines to the formatting of papers, in order to impose typographical consistency. The manner in which electronic files are submitted mirrors that of print submittals, with text, figures, tables, and appendices submitted as separate files. Print conventions demand that figures, tables, and appendices be

submitted on separate pages at the end of the paper. Manuscript management programs now provide text templates to facilitate this conventionalised set of principles for the organisation of a learned paper. This type of template can easily be transferred over into the author's chosen word processing package, whereupon a number of tags can be added to identify each individual section of the paper. Automated submission provides the formatting tools that enable editorial staff to perform the following tasks, which are common to every manuscript management program in some shape or form.

- Initiate the manuscript-tracking program.
- Despatch an acknowledgement of receipt to the author.
- Notify the editor-in-chief that a new manuscript has been received.
- Append an identifying number to the manuscript.
- Enter the numbered manuscript into a database.
- Open a password-protected review site.

It is common for the editor-in-chief to be informed of the arrival of a new paper by an e-mail message from the system. He could then send it on to the subject editor, or referee, of his choice, soliciting peer review prior to publication, and bypassing the automated process. However, the peer-review software is able to offer a number of helpful functions.

- Lists of subject areas in academic disciplines.
- The number of reviews required from each referee.
- Potential referees for each subject area.

The listed areas of expertise permit the editor to flag potential referees for either particular sections of a paper or a paper in its entirety. The ability to customise a program is particularly useful in this respect, for the peer-review process can differ markedly from one journal to another. Sometimes there may be multiple reviewers who work independently of each other. The systems software automatically monitors the progress made by the chosen reviewers by means of a tracking database.

- Who has agreed to review a specific manuscript.
- Sends relevant instructions to those reviewers.
- Decides which manuscripts require alternative reviewers.

The editor-in-chief may view real-time information at any given time during the review process, usually conveyed by means of manuscript history reports. Many programs have automated reminder systems that contact reviewers and inform them of their position in the time scale of the reviewing cycle. If reviews are long overdue the editor-in-chief customarily intervenes directly, just as they did before the coming of the so-called Information Age. After the manuscript has been accepted for publication the copy editor can go to work on it, ensuring that contents are presented in a consistent style.

On completion of the copyediting process, volume, issue, and article numbers can be assigned. A volume is usually completed on an annual or biannual basis. In essence, manuscript management software handles the greater part of the clerical work involved in publishing a journal, structures the review process with a variety of prompts and reminders to keep reviews within a permitted time frame, tracks all the transactions that are associated with a manuscript, and integrates the contributions of all involved in the peer review process.

4.5 Data conversion and hosting

Ingenta is a provider of data conversion and hosting services to publishers. It is arguably the best known in the British Isles, having increased its share of the market with the acquisition of CatchWord, which was hitherto their direct competitor. However, HighWire, MetaPress, and Extenza also provide similar services. A data conversion and hosting service is an electronic content management operation that functions as an extension of each publisher's own editorial staff. It is not itself a publisher.

There is customarily a highly responsive, and indeed collegial, relationship between those working in publishing houses and those in data conversion and hosting services. The relationship is of a distinctly symbiotic nature. It allows publishers to maintain control of their online business while suffering minimal operational and technical inconvenience.

A range of services is offered, including the conversion of electronic print files into online content, hosting journal titles, and their complementary text databases, on global networks of servers, while providing authentication and access control. There are options of PDF and/or HTML delivery, in addition to web-based search capabilities across abstracts and titles. If a document created for one purpose subsequently needs to be used for several different purposes, publishers are forced to come to terms with the costs and complexities involved.

Managing and implementing online access to publications is a task that many publishers find more cost effective to outsource. The rapid evolution of digital publishing technology and the growth of the World Wide Web have made data conversion services key to publishers.

4.6 E-journal systems suppliers

Publishing houses that are exploring ways to implement media-neutral content management systems need to weigh a number of crucial factors, not the least of which is how they can migrate to a new system while incurring the least degree of risk to their existing services. Atypon is a good example of an innovative e-journal system supplier. [46] The main reason Atypon has been singled out for study is that the Publishers' International Linking Association saw fit to choose this company to assemble the technological solutions required by the CrossRef Web site, which interconnects bibliographical references between publishers. CrossRef is discussed at some length further on in this chapter.

Such service providers have to maintain close contacts with their customers in the publishing world, and try to anticipate market demand. In business jargon it would

be known as a B2B (business-to-business) operation. Publishers perform a thorough scan of the market, seeking service providers that can offer software solutions to their problems that are cheaper than the option of an in-house development programme. Audrey D. Melkin, who has extensive experience of this field, believes in pursuing an explicitly customer-centred approach

As a vendor, both at Catchword/Ingenta and now at Atypon, I need to know what publishers want, and I spend a lot of time talking to them about the services their customers want, and which they actually use. I also follow the library and industry literature for anecdotal and, preferably, quantitative studies on online features and their uses. [14]

Service providers have become increasingly aware that complexity can be self-defeating. Value is added to a service only if that service is used, and it is too often the case that the average user regards many of the bells and whistles so beloved of programmers as superfluous. Indeed, it may be the case that the average user is unaware that they exist in the first place. A survey carried out on behalf of the Association of Learned and Professional Society Publishers indicates that users dislike extraneous extras, and that it is simply the content itself that users find most useful. [15] The following services are important to e-journal publishers.

- Full service hosting with guaranteed uptime.
- Technology to manage the sale of digital content. This is becoming more important as some publishers granularise their publications.
- Real time usage reports that tell publishers who exactly is accessing their Web site, and indeed when. Usage statistics have become more targeted and granular, and now publishers are able to identify which articles, authors, and subject areas are being accessed the most, and by whom. Consequently, publishers can create new publications based on the knowledge derived from their own usage statistics.
- Complete reference linking through CrossRef, ex-Libris, and other abstracting and indexing sources, while also depositing metadata in those selfsame sources.

- Customisation options such as multiple alerting capabilities.
- Management tools for librarians to enable integration with library services.
- An information management system that can enable a publisher to index a large volume of text-based data.

4.7 Discovery services

Abstracting and indexing services, subscription agents, and search engines are involved in a whole range of activities such as discovery, aggregation, purchase, and access. These services provide essential bibliographic information to innumerable scholarly publications. Subscription agents, and other such intermediaries, help librarians and publishers to operate in a more cost-effective manner.

They greatly reduce the amount of time that is spent on the numerous, and sometimes quite detailed, administrative tasks associated with acquiring and accessing journals, thereby enabling librarians and publishers to focus their attention on matters of a less mundane nature. Subscription agents can perform these tasks much more cheaply than librarians or publishers; hence it makes financial sense to outsource all such work.

Agents deal direct with publishing houses that invoice research libraries at different times, with different terms of subscription, and often in foreign currencies. In addition, they deal with multiple claiming terms, and use many different communication protocols. Sometimes they must also deal with customer service staff members who do not speak English.

Agents save their customers the time and trouble of the aforementioned, and also save their customers money into the bargain. However, the advent of the e-journal has substantially increased the pre-existing complexity, and agents have to meet the challenge by developing new services. It is not economically feasible for libraries to go direct to each and every publisher.

4.8 Aggregation

EBSCO, an acronym for Elton B. Stephens Company, is the largest intermediary between publishers and libraries in the business, upholding active relationships with over 60,000 publishers worldwide. In the main, EBSCO plays three types of aggregator roles.

- The consolidation of financial transactions for print subscriptions.
- The creation of full-text databases.
- The administrative aspects of finance and access pertaining to online journal subscriptions.

There is a degree of confusion in some quarters in regard to the difference between a journal available in a full-text database, and that selfsame journal being made available in the form of an online subscription. However, the basic differences between these methods of access are not difficult to understand.

Online journal subscriptions customarily cost the same, or just slightly more, than the same journal in print format, and it is rather common for a publisher to offer a benefit of some kind for the library to maintain its subscription to the paper edition. The purchase of an e-journal subscription commonly includes a guarantee of access to the e-archive of that subscription period in perpetuity. It remains to be seen whether this means much in practice.

The conditions connected with the e-journals that are made available through the system of full-text databases are very different. It is important to bear in mind that it is the publisher who possesses the intellectual property rights, and it is well within their powers to halt, or even withdraw, full-text-coverage from full-text databases. Commercial publishers have created services for aggregating not only their own electronic content, but also that of other publishers; third party aggregators offer a range of electronic services to publishers.

The policies of the various third party aggregators such as ProQuest, Gale, Ovid and such like can differ markedly, but they sometimes have limited room to manoeuvre when dealing with publishing houses. One of the most prominent aggregators, HighWire, originated at the Stanford University Library, which is an early example of a research library becoming actively involved in the scholarly publishing process. However, it should be made plain that HighWire itself is not a publisher. [22]

A number of full-text database aggregators have advocated the cancellation, though perhaps they really mean the abolition, of paper journals. The database vendors have been experiencing as much turmoil in their operations as the publishing houses. As a consequence, it is likely that in the years ahead some research libraries may find that their e-journal collections are not as comprehensive as they would like. For example, ProQuest recently removed nearly seventy journals from its database with little warning to its customers. [16] It is unwise for a library to put all its eggs in one basket by becoming overly reliant on a single database vendor, and the same goes for publishers themselves. Aggregators do indeed offer valuable services to their customers, but there is no good reason to believe that they are a viable long-term substitute to direct contact between librarians and publishers.

The return to publishers for participation in aggregators' full-text databases is really quite limited in comparison to what they are able to earn from subscriptions, and this is sometimes reflected in the service they sell to aggregators. Some publishers do not permit images in their e-journals to be accessed *via* full-text databases, while others may not include articles by freelance authors due to intellectual property issues. Therefore, those purchasing the services of full-text database vendors, primarily research librarians, are well aware that they are not always being given the real deal.

Publishers may look upon aggregators as a means of obtaining market exposure. EBSCO, for example, is the leading subscription agency, and also the leading full-text database aggregator, in further education colleges and small academic institutions in North America, and a number of e-journal publishers have cited this fact as a reason for involvement with the company. [17] These are not the type of institutions that normally subscribe to a large number of journals, and it is

difficult to gain a foothold in such markets. Subscription agencies and database aggregators know that it is in their own interests to take time and trouble over marketing issues.

The business model for the aforementioned services is now in the process of changing. The open access movement may make a significant impact on it. The technology, administration, and intellectual property laws associated with this line of business are steadily becoming more complex, and market conditions seem set to become increasingly problematic.

4.9 Article supply and pay-per-view

The British Library is a name that has long been associated with article supply and document delivery. [20] Articles can be delivered by mail, courier, fax, or Ariel®. However, it is InfoTrieve, the developer of Ariel®, that is probably the most technologically innovative document delivery service in the business. [19] Ariel® offers the choice of sending and receiving documents through multipurpose Internet mail extensions (MIME), as well as file transfer protocol (FTP). Ariel® also has a number of advantages over the fax.

- It sends and receives data at the same time.
- Data is compressed for faster transmission.
- Higher resolution and superior graphic quality, enabling users to forward articles without any loss of quality.
- Recipients' addresses can be easily stored as they are despatched, which helps to maintain accurate records.
- Documents can be forwarded as PDF files to a Web server, or directly to the recipient.

Ariel® is a software tool that is widely used to support interlibrary loan and the transmission of specialised materials. The fact that its use has become almost

universal, and indeed is used by InfoTrieve's own competitors, is proof positive of its utility. Ariel® outperforms the fax in every department.

Nevertheless, that is not to say that InfoTrieve does not face stiff competition. The Canada Institute for Scientific and Technical Information (CISTI) and the British Library offer to supply journal articles within two hours of them being ordered, and have sterling reputations for reliability and quality of service. [21] However, both organisations use Ariel® to provide some of their services. In addition, there are also fulfilment companies such as Ingenta's Turpin service, which handles orders for e-journals. The open access movement should have an impact on these services in the coming years.

4.10 Linking enablement

Hyperlinks within articles, and between articles, are a salient feature of electronic publishing. They impart an immediacy of use, and have brought about a layered approach to publishing online, by means of enabling articles to be viewed in conceptual parallel with the related content to which they have been referred. This is a process that is most commonly associated with interdocument linking, though intradocument linking is equally widespread. A full markup of references allows authors and publishers greater control over their content, and influence how it is accessed in electronic referral schemes.

The sciences rely on abstracting and indexing services much more than they rely on catalogues, and each scientific discipline has a service dedicated to assisting researchers to find information in journal articles. Library catalogues are a good source of information about monographs, but they are somewhat less useful in regard to journals. The catalogue can provide a concise record for an entire run of a journal, but this is of little use to someone who wishes to consult specific articles. In order to reduce costs some libraries form consortia in order that a single source of bibliographic data may serve a great many libraries. [35]

CrossRef is a not-for-profit network founded on an innovative collaboration between publishing houses. [18] It has a mandate to make reference linking throughout online scholarly literature efficient and reliable. It is an infrastructure for linking citations across publishers, and the only full-scale implementation of the Digital Object Identifier (DOI) System to date.

A DOI is a unique alphanumeric string assigned to a digital object, in this instance an e-journal article. In the CrossRef system, each DOI is associated with a set of basic metadata and a Uniform Resource Locator (URL) to the full text, so that it identifies the article, and provides a permanent and unambiguous link to its location on the Internet. CrossRef's mission is to serve as a comprehensive citation linking backbone for all scholarly literature online. To that end, any publisher of primary research material in a digital format, irrespective of size or status, is encouraged to register their content with CrossRef. There are a number of bodies, in addition to publishing houses, that participate in the CrossRef system.

- Libraries employ CrossRef as part of their localised linking solutions, thereby improving online catalogues and databases with by linking to their own full-text holdings where appropriate.
- Software houses are producing several types of tools that facilitate an interface with CrossRef.
- Journal hosting services are using CrossRef in order to enhance the size and scope of their listed content with DOI-based citation links.

Publishers of electronic scholarly content are assigned a DOI prefix on becoming members. A publisher wishing to register an item in the system creates a unique DOI, which incorporates the assigned prefix, and tags it to the article's metadata, and to the URL where the article resides. Subsequently, the publisher submits the record to the CrossRef metadata database (MDDDB) in an XML-based document type definition (DTD) format, wherein each article's DOI and URL is registered in a central DOI directory.

This process enables permanent inbound links to the publisher's content, for publishers, librarians, and other players in the field such as subscription agents can retrieve from CrossRef the DOIs that link to that content, thus in effect making access ubiquitous. However, it should be stressed that CrossRef is not itself an aggregator, which is to say that it does not store content on its own database. Rather, it uses a system of distributed aggregation, whereby content is linked through a database consisting of concise publisher metadata in which each individual record is basically a triplet in the form of a metadata plus URL plus DOI. It is a simplicity that makes for reliability and flexibility.

The CrossRef system has a number of significant benefits.

- Those using CrossRef create reliable, persistent links in citation and database records, for a DOI link is a persistent link, unlike a URL.
- A single agreement with CrossRef serves as a linking agreement with all participating publishers, which avoids having to sign a multiplicity of bilateral linking agreements with publishers.
- There is an added value to electronic publications, for it is now a universal assumption that online material contains *outbound* links to cited sources. In addition, CrossRef linking augments the accessibility to a publisher's content through the use of *inbound* links.

CrossRef is financed by its own members. The publishers pay a membership fee that is based on the number of publications they have online, in addition to nominal transaction fees for each DOI deposit and retrieval. Those who are affiliated to CrossRef must pay an annual administrative fee, in addition to DOI retrieval fees. However, libraries and researchers may use the system free of charge. Those carrying out research in a library environment may well find that CrossRef links redirect to local holdings.

Initially, CrossRef was devoted to links between scholarly journal articles, but its scope was expanded in 2002 when it began to accept metadata from other sources such as books and conference proceedings. CrossRef currently project that their database will grow by over half-a-million links *per annum* for the foreseeable future.

Ex Libris SFX is another commonly used open linking service in the scholarly information environment. [23] It is fully integrated with DOI and CrossRef, and is Unicode compliant. [24] It should be noted that neither Ex Libris SFX nor CrossRef are in competition with OpenURL. [25] OpenURL is a *de facto* tagging standard for including metadata in URLs in order to make links. The DOI, CrossRef, SFX, and OpenURL are complementary services that can work together. However, the current DOI/CrossRef is unable to handle multiple resolution of DOIs independently. SFX and OpenURL are now working with DOI and CrossRef to solve what has come to be known as the ‘appropriate copy problem’, which consists of the need to construct a mechanism to support the selection of the most appropriate copy for a particular user. For example, a copy to which the user has access rights by virtue of an affiliated membership. [47]

It is a truism that content is the basis of every form of publishing. The effective linking of content can increase the number of users accessing it many fold. Content is mainly in the form of text. The word ‘text’ is derived from the Latin word for weaving, and for interwoven material. [26] The manifold open linking solutions have collectively woven a web of knowledge.

4.11 Authentication

Athens is an access management system that is used to verify the authenticity of those who wish to access online subscription services. [27] Aries is another reputable, though less widely used, system for managing online access. Athens is, at its most basic, a database of institutions, usernames, and associated passwords that have been allocated rights according to status. The account management facilities enable institutions to create and manage user names and their corresponding passwords, allocating rights to individual usernames, and providing extensive and flexible access controls.

There are at present in excess of two million users of the services provided by Athens. The Joint Information Systems Committee (JISC) contract for the provision

of authentication services by Athens to Higher Education, Further Education, and Research Councils runs until 2006. Authentication serves a number of important functions.

- It safeguards the proprietary rights of the publisher.
- It safeguards the acquisition rights of the article recipient.
- It provides the publisher with valuable information on use.
- It maintains a detailed history of article distribution.

Athens has become the *de facto* standard for access management, and data service providers may find it problematic to sell their product to the scholarly community without the assurances that Athens can provide. Athens also offers the ability to federate authentication to local authentication services. This is called Athens devolved authentication.

Each institution that is registered with Athens must appoint a site administrator who is thereafter responsible for the management of Athens accounts. The person appointed to this position must ensure that accounts and passwords are issued solely to individuals who are authorised to access resources under the terms of the institution's licence. It is likely that the open access movement could lessen the importance of authentication in the coming years.

4.12 Managing access for libraries

There are a large number of library system vendors. TDNet, [29] SerialsSolutions, [30] Innovative Interfaces, [31] and Sirsi [32] to name but a few of those in the market for managing serial collections, though they do offer a host of additional services. There are many in the library profession who believe that e-journals, though expensive to purchase, are being grossly underused. It is easy to track access and download records and present statistical evidence in support of this view. Therefore, the expense incurred when purchasing specialised serials management software to facilitate searching can be justified.

It can be difficult to search for a specific journal within library databases, and that problem can be greatly exacerbated when a library subscribes to multiple aggregators. However, that being said, a great many users do seem to be satisfied with subject-based search functionality. It can prove time-consuming to search through every database held by a large institution. In addition, a common problem with multiple data subscriptions is that users are sometimes unaware of their existence. It is then that a user is compelled to seek assistance from a librarian. A serials management system can eliminate the need for a user to consult a member of library staff. [32]

Information on full-text electronic resources should be stored in the same place as other full-text journal information, which is the online catalogue. It is not always the case that information about full-text e-journals is made available through the online catalogue. For example, a number of research libraries say that they support open access, but nevertheless fail to provide links to the Directory of Open Access Journals that is housed at Lund University, Sweden. Indeed, it is common knowledge that many interlibrary loans are requested, even though the journals sought after are available through the library's very own full-text aggregators. The users simply do not have the requisite search skills to find them. [33]

A serials management system maintains a master database that tracks holdings. Information is stored on full-text journals made available through aggregators. This information is then standardised into a single format that is regularly updated. The value of being able to scour multiple databases quickly and easily cannot be gainsaid. The aggregators' linking technologies determine how closely the management system can link to any specific journal. If a specific URL is not made available, a management system will link to the appropriate search page within the relevant database.

It should be noted, however, that journal management systems track journal titles, and not specific journal articles. Library system security is not compromised by a journal management system, for all linking is done within the constraints of the network security system, which involves customising each library's system. [34]

4.13 XML and journal publishing

The design of Extensible Mark-up Language XML has been an open process hosted by the World Wide Web Consortium. [39] It is designed to improve the functionality of the Web by providing more flexible and adaptable identification. [36] It is called extensible because it is not a fixed format language.

HyperText Mark-up Language (HTML), which is a single, predefined mark-up language, is a relevant example of a fixed format language. XML is a metalanguage, which is a language used to describe other languages. It enables users to design their own customised mark-up languages for limitless different types of documents.

It can do this because it is written in Standard General Mark-up Language (SGML), which is the International standard metalanguage for text mark-up systems. It conjoins the simplicity of HTML and the power of SGML. [38] XML is a subset of SGML that has been designed specifically for use with the Web. The design of XML is based upon two key factors. Firstly, that it be relatively simple to write programs to manipulate XML. Secondly, that users and systems be able to migrate to XML from HTML without difficulty. [40]

XML is a subset of SGML and, as a consequence, every document is based on a Document Type Definition (DTD), though the DTD does not have to be specified explicitly. If a file contains previously undefined pairs of tags, which delimit some section of that document, the parser automatically adds them to the DTD. The journal publishing DTD defines a document type for journal articles, and also for some non-article journal material such as book reviews and editorials. [40]

When a document is tagged with this metadata it is converted into something akin to a small database. The DTD describes both the metadata for an article and the content of an article, but it can also be used to describe the article header metadata only. Each document may have up to four components, which must be used in the following order.

- Front matter, which is essential. The article front matter contains the metadata, the header information, such as the article title, the journal in which it appears, and the date and issue of publication for that issue.
- Body of the article, which is optional. The body of the article is the main textual and graphical content of the article. This usually consists of paragraphs and sections, which may themselves contain figures, tables, sidebars, and so on. An article is not required to have a body. Therefore, this DTD may be used to record journal headers when the entire body of the article is not being tagged.
- Back matter for the article, which is optional. If present, back matter contains information that is subsidiary to the main text, such as a glossary, appendix, or list of references.
- Optionally, either one or more responses, or one or more subordinate articles. A response is a commentary on the article itself. For example, an opinion from an editor on the importance of the article, or a reply from the original author to a letter in regard to this article.
- Sub-Article, which is also rarely used. A sub-article is a small article that is completely contained inside another article. [36] [39] [40]

It is impossible to display or retrieve information unless it is structured in a meaningful way. The overwhelming majority of web pages are coded in HTML, but this contains information relevant solely to the page's appearance. HTML specifies title and author information as simple headings.

```
<H1>E-journal Publishing in Academic Environments</H1>
<H3>Glen Campbell</H3>
```

However, XML specifies title and author information in a manner that is comprehensible to a computer.

```
<articletitle>E-journal Publishing in Academic Environments</articletitle>
<author><firstname>Glen</firstname> <lastname>Campbell</lastname>
```


Other technologies are necessary for the employment of XML, not least of which is the Document Object Model (DOM). This is the interface between programs and an XML document. A binding of the DOM to a particular programming language provides a concrete Application Program Interface (API). The DOM is very important because it allows programs to do useful things with XML such as finding, sorting, manipulating, and displaying information, but only programmers need concern themselves with the highly complex technical details of the DOM. [36]

XML tagging is a powerful tool, but metadata is expensive to create. Nonetheless, developing core metadata, even at the level of a lowest common denominator, can markedly improve information retrieval. XML is especially useful for tailoring the same information to the needs of different user groups. Indeed, it is possible to develop applications that integrate such disparate sources as journal databases, online public access catalogues, and locally stored digital archives. [37] Librarians find XML particularly useful because of this ability to share and search resources that are in dissimilar formats. [38] Those involved in the provision and retrieval of information would benefit from uniform encoding standards.

4.14 Conclusion

The widespread emergence of e-journals has stimulated the growth of new companies and services. It has become increasingly common for scholarly journals to be published online, and a number of informed observers have postulated that the publishing of paper journals may decline significantly in the not-to-distant future. The market has proved to be surprisingly responsive to the technological changes that have been driving the e-journal phenomenon.

I have not attempted to present a *mappa mundi* of technology and services in journal publishing, but rather a relatively concise overview of the e-journal publishing chain. However, the symbiotic relationship between the e-journal and its manifold support services would be altered dramatically if the open access movement were to gain ground. This topic is explored in greater detail in the case studies.

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CHAPTER FIVE

Internet Archaeology

5.1 Introduction

The role of this chapter is to illustrate the manner in which information technology has transformed a mainly arts-based discipline into one in which scientific literacy is a given, and the consequences this has had for the manner in which research findings are reported to the wider discipline through the scholarly communication system.

Information technology is collapsing the current separation between field-based research and laboratory-based interpretation, and this is being reflected in the literature of the discipline. [25] Archaeologists have themselves taken control of the archaeological computing agenda rather than leave it to computer scientists and statisticians.

Archaeology is at present in the midst of a sea change in its conceptual framework, and is actively adjusting its image in the collective perception of those working in the academic community. The discipline of archaeology exists in a bracing intellectual climate that covers arts and sciences.

Archaeology is the scientific study of the physical evidence of past human societies recovered through excavation. Archaeology not only attempts to discover and describe past cultures, but also to formulate explanations for the development of cultures. [5]

There are doubtless those who would question the inclusion of archaeology as a part, or perhaps annexe, of the natural sciences simply on the basis of its employment of the scientific method. There is, of course, a fundamental distinction between the arts and the sciences in material and method. However, the discipline of

archaeology can be at once dependent on, and independent of, the natural sciences, with the required degree of emphasis being linked to the nature of the evidence under investigation. It would certainly be possible to articulate precepts for the publication of scientific research material, but precepts for the most part lack the illustrative quality of examples. *Ergo*, examples in abundance will follow in due course.

Internet Archaeology [IA] is a not-for-profit e-journal that publishes articles in every area of the discipline. [1] IA, which is published bi-annually, aspires to become one of the world's foremost archaeological journals of record. It is based in the Department of Archaeology at the University of York, which is housed in King's Manor, a stately mediaeval building that lies almost within a stone's throw of York Minster.

Archaeologists have long since regarded mastery of computing skills as an integral part of their discipline. Indeed, the use of computer and information technology has changed almost every element of archaeological endeavour. [10]

If anyone should understand computers, and the impact of the Internet, archaeologists should. The impact of technology on social reproduction, and the reproduction of technology through social practice, lies at the heart of much archaeological research, though admittedly these are often written in the past tense. [2]

The University of York hosts the largest centre of research into archaeological computing in the United Kingdom, and the Master of Science degree in Archaeological Information Systems was brought into being by the teaching staff there to provide training for the next generation of archaeological information scientists. Undergraduates are also trained in the use of information technology as it is employed in their chosen field of study. A number of departmental staff members have significant ongoing research interests in computer applications. [1]

All submittals are subjected to rigorous peer review before publication by at least one referee possessed of specialist knowledge in the relevant field. The copyright of all contributions within each issue, and the moral rights, remain with the

authors. *IA* holds non-exclusive rights in regard to electronic publication and dissemination. Academic rigour is judged to be a *conditio sine qua non* for published research material. [4] The editor, Dr Judith Winters, referees the structure of submittals for their use of Web technologies. The journal has no print edition.

The published articles make maximum use of Web technologies, from virtual reality to clickable maps to interactive databases to video clips of excavations in progress to three-dimensional modelling as a means of recording areas that have been excavated. The homepage of *IA* is displayed below.

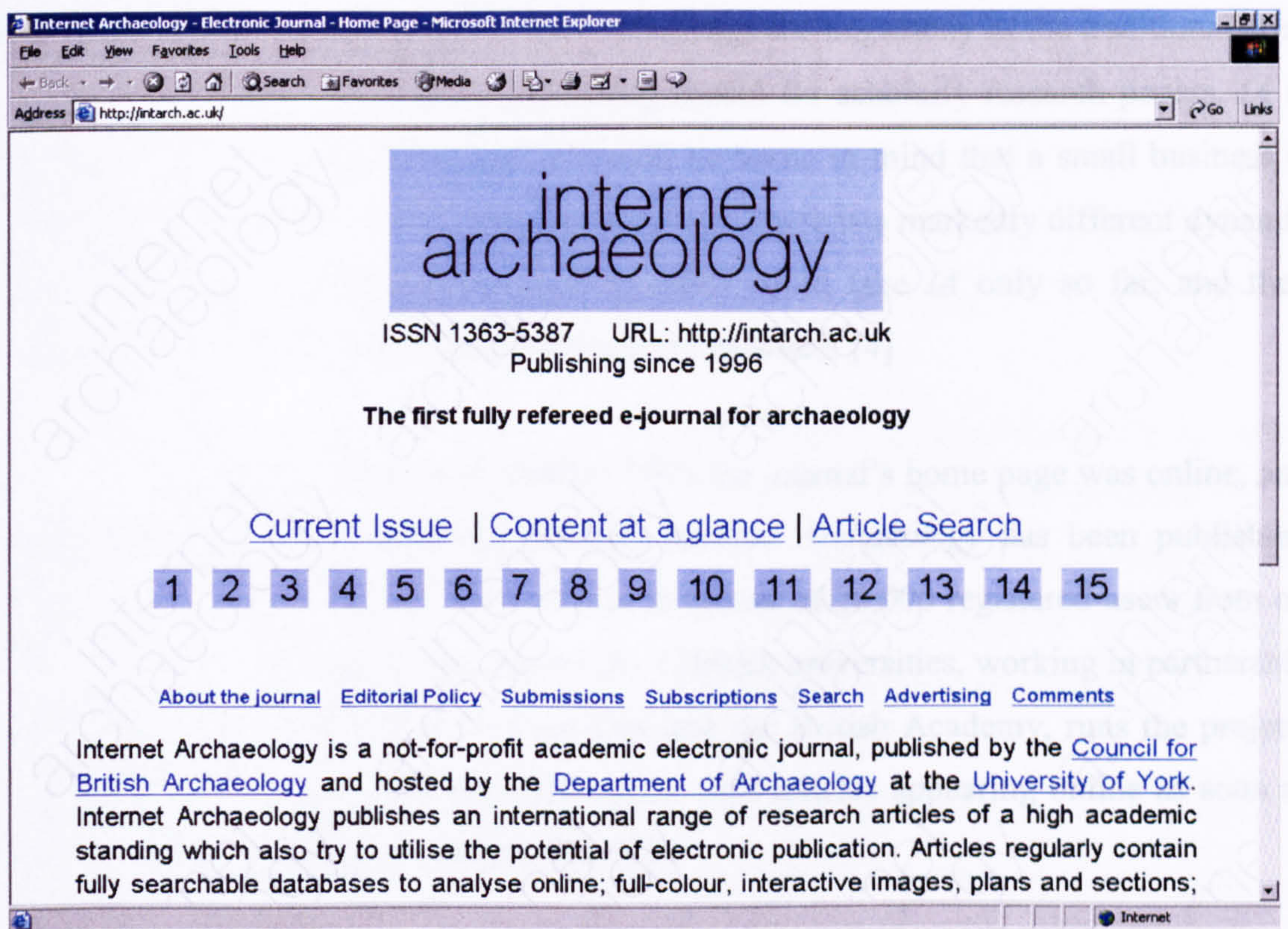


Illustration 5.1: *Internet Archaeology* home page

Winters believes that someday all archaeological journals will be like *IA*, for as broadband Internet connections become cheaper and more readily available, full-media streaming video and interactive multimedia will become the norm in such publications, rather than the exception that it is at present. There has been sufficient feedback from authors and readers to indicate that she is not alone in her views.

The journal was developed with the financial assistance, and moral support, of the Joint Information Systems Committee (JISC), whose Electronic Libraries Programme (eLib) project was the catalyst for a number of e-journals. One of the initial goals of eLib was to raise awareness, and to increase acceptance, of electronic publication within the realm of academe.

The eLib grant was used to cover the costs of acquiring computer hardware and software, computing support and Internet connection, and office accommodation, in addition to everyday administrative expenses such as postage, stationery, telephone, and associated sundries.

The aim from the outset was to challenge the hegemony of the traditional print journal as the only acceptable publishing model for scholarly research papers. *IA* is essentially a small business, and it should be borne in mind that a small business is not merely a smaller version of a big business. There is a markedly different dynamic at work. The seed capital provided by JISC could take *IA* only so far, and then alternative funding models would have to be explored. [4]

By the beginning of November 1995 the journal's home page was online, and contained a sample article for perusal. *Internet Archaeology* has been publishing continually since August 1996, and has in excess of 28,000 registered users from no fewer than 120 countries. A consortium of British universities, working in partnership with the Council of British Archaeology and the British Academy, runs the project. To date, 16 volumes have been published, with articles appearing online as soon as they have been passed for publication. [4]

Winters recognises that open access is the optimal distribution mode for research results, but admits that she would be unhappy about asking authors to pay submission or publication fees. *IA* was open access for the first five years or so of its existence, but once the JISC subsidy expired in December 2001 Winters and the editorial team had to find ways and means of acquiring the necessary funds to continue publishing.

5.2 Themed issues

The idea of publishing a themed issue was initially seen as somewhat of an experiment, but it has since become a regular feature, and is now regarded as an integral part of the journal's publishing policy. The themed issue is seen by Winters as a confluence of thought on a single archaeological issue. The theme offers authors the chance to combine their expertise in a dedicated forum. However, Winters is keen to stress that such themed issues should not be seen as definitive statements on the area under discussion, but that it should be looked upon as a snapshot of the area at a particular stage in its conceptual development. [4] The following are the themes published thus far.

- Issue 6. Digital Publication. 1999.
- Issue 8. Visualisation. 2000.
- Issue 12. Education and Archaeology. 2002.
- Issue 15. Archaeological Informatics. 2003/2004.

The themed issues of *IA* enable fairly esoteric areas of the discipline to be explored in microscopic depth, and from a gamut of perspectives. Scholars with a matrix of skills and expertise can publish lengthy articles. However, several of these contributions would, if printed by traditional means, amount to substantial monographs, though that could arguably be as much of a curse as a blessing.

Whereas the relaxation of word constraints is to be applauded for some types of articles, for others it is unfortunate. Many within these eight issues seemed far too long and wordy, such as those by Mark Gillings and Glynn Thomas Goodrick on 'Sensuous and reflexive GIS: exploring visualisation and VRML' and Mark Edmonds and Graham McElearney on 'Landscape archaeology and the Internet'. [7]

Winters is enthusiastic about the concept of themed issues, and hopes to publish many more, particularly in the area of informatics. Indeed, *IA* seems to attract some of its most worthy papers when it is made known that a themed issue is planned.

5.3 Joint Projects

The back issues of the journal are archived by the Archaeological Data Service (ADS), whose remit is the long-term preservation and cataloguing of digital research materials of every description, and not just e-journals. *IA* will be a journal of record. If *IA* ceases publication every article it has ever published will remain available to be accessed *via* ADS. It is the stated policy of *IA* not to make post-publications emendations to articles. However, Winters does plan to improve the mark-up from earlier issues in order to facilitate the next forward format migration. There is also an archive of documents related to the founding of *Internet Archaeology* that charts the progress of the journal from the very outset to the present day. The ADS is committed to the promotion, and correlative dissemination, of a broad range of archaeological data, and is administered by the Department of Archaeology at the University of York.

The *IA* server also hosts the Web pages of *Antiquity*, which is a highly regarded print journal. The new editorial team of *Antiquity* began work on January 2, 2003, and has benefited from the pioneering work done by the *IA* editorial staff. *Antiquity* is a quarterly, peer-reviewed journal of archaeological research, which has been a leading journal of international archaeological debate for over 77 years. The journal provides PDF files, and each annual volume makes a book of about 240 pages. It is owned by the Antiquity Trust, which is a registered charity. The journal has around 2400 subscribers, with around 500 of them in the United Kingdom, 700 in the United States, and almost all of the rest in other Western countries. The Web site is an enhancement to the paper edition, and transcends the inherent limitations of the print medium by enabling a more flexible approach to publication and debate. *Antiquity* does use some multimedia, but it does not signal any great desire to experiment with the more esoteric aspects of e-publishing; it does not see itself as cutting edge.

The online edition is much more than just a journal of record, important though that may be. *Antiquity* online also functions as a news service by providing regular updates on excavations, surveys, investigations, and projects. In addition, there is news pertaining to archaeology in general, and the archaeological profession

in particular, which can be updated daily if necessary. The Letters to the Editor feature has now a dynamic quality about it, for it has been transformed from a correspondence page published quarterly into a forum of archaeological debate. The *IA* publishing team is pleased to be associated with this project, believing that it is of benefit to the discipline as a whole to have such a prestigious journal online.

The transitory nature of Web pages means that ADS is providing an essential service. References that quote Web page addresses can easily vanish overnight. HTML is judged to provide a stable archival format, but proprietary software may need to be forward format migrated with the utmost circumspection if it is to remain usable over the long term. The issue of archive stability remains problematic, and curatorial duties have to be seen to be ongoing in order to maintain confidence in the system. *IA* has recently undertaken the migration of all the interactive datasets from MySQL into Oracle and ColdFusion middleware, which is a term used to describe software that connects two otherwise separate applications. This was the fifth occasion on which a major forward format migration had been undertaken.

5.4 Ethos of the journal

There are a number of disciplines in which it is rather easier to repeat an experiment than it is to determine whether such an experiment has already been carried out. [3] However, such a generalisation does not apply to archaeology.

'Archaeology is one-off, unrepeatable experiments. You can't possibly go back and re-excavate a site, so the record is primary, and therefore the publishing of that information becomes the raw data. The publication of that becomes a journal, however you may define it. Internet Archaeology...is a record of research in archaeology specifically.' [4]

A great deal of archaeological research is unable to be validated by a reviewer. The experiment cannot be repeated, and therefore the review is merely a comment on whether the research has been carried out in a satisfactory manner. It is left to the

reviewer of an archaeological research paper to validate the intellectual framework of the research.

'There's now an awareness in the profession that archaeology is basically about information, and not just about artefacts and other material remains. It's this awareness that underlies the changes in attitude toward information technology.' [4]

Winters' first involvement with e-journals was the publication of *assemblage: the Sheffield graduate journal of archaeology*, which was designed as an outlet for research work done by postgraduate students at the University of Sheffield. [9] It is still being published, and contains a wide range of content that includes academically rigorous papers, reviews, interviews, and some lighter material. She began as an editorial assistant, but had already become editor before the second issue went online.

'I learned a lot about organisation of teamwork, and about editorial skills and, of course, self-taught HTML. We didn't have any courses to go on. We just looked at other people's Web sites, and looked at the source code. ...I guess that learning HTML was the biggest stepping-stone for me, and understanding how to build web pages was what I really learned with assemblage. That gave me the experience for the job as assistant editor with Internet Archaeology. I guess that Internet Archaeology has also been very much about learning on the job.' [4]

According to Winters, the main reason that authors give for submitting their articles to *IA* is that they wish to utilise the diverse opportunities presented by online publishing. *IA* is not a text-and-images-only journal. Winters is keen to make the point that each and every article that is published in *IA* uses media that cannot be replicated in print. Whether that is just a simple search function, or intradocument linking, or reference linking to bibliographic sources. However, more than half the published articles contain more elaborate elements, such as Virtual Reality, or QuickTime panoramas, or directional stereo sound for voice-overs and sound effects. The greater part of video on the Internet is encoded as QuickTime. Nevertheless, it should be borne in mind that none of these technologies were specifically developed

for scholarly journals. These technologies will doubtless evolve into more specialised formats over a period of time.

Many of the articles contain links to interactive databases and/or large data sets. There are also articles that mimic the interactive abilities of geographical information systems (GIS) by utilising map interfaces that have been written in Java code. The potential of applying GIS viewshed analysis to excavation sites, and their surrounding areas, has been realised by a number of articles in *IA*. (Viewshed is the area visible from a given geographical point of reference. Archaeologists interested in looking for undiscovered sites, such as fortified areas, which needed to be situated on an elevated position in order to command uninterrupted views of surrounding terrain, employ viewshed to determine which areas would have been intervisible in the ancient landscape.) [26] The accessibility and publication of excavation data has been a topic that has caused some disquiet in the profession over recent years. [23] Hence, Winters is striving to improve the services offered by the journal in this area.

'I guess I'm really looking forward to the day when almost every article has online searchable data sets. That's the kind of multimedia that I'm keen to get more of, and excavation reports in the journal. Excavation reports that people can really use, as opposed to heavy A4 monographs that are really big, and have appendices, and you can't really find anything easily. That's the sort of content I would like to see the journal have more of. [4]

Traditional publication, *via* the printed page, is no longer able to do justice to the burgeoning diversity of archaeological research material. [23] Therefore, one of the criteria employed to judge whether an article is suitable for inclusion in the journal is that it demonstrates to good effect the advantages of Web over print publication. For example, the first paper published by *IA*, '*Roman amphorae in Britain*' which was authored by Paul Tyers, enables readers to use clickable maps as an index to the sources of amphorae dated to Roman times that have been discovered in the British Isles. In addition, it allows the reader to click on a timeline to retrieve links to amphora types available at any given date.

The first issue of *IA* also includes virtually the entire contents of a 629-page doctoral thesis; in addition to the author's own extensive collection of related colour photographic illustrations with accompanying comments. Allan Peacey's '*The Development of the Clay Tobacco Pipe Kiln in the British Isles*', has added hyperlinks to facilitate navigation between text and data, which makes it easier to use than the printed volume he submitted as a doctoral thesis. The publication of this thesis as an article does blur the distinction between e-journal and e-archive. There is an increasing number of cases in which invaluable research is being published solely in the form of limited edition printed monographs, but they are so highly priced that even comparatively well-funded academic libraries lack the wherewithal to purchase copies. The publication of this doctoral thesis demonstrated to potential authors the absence of spatial constraints.

Winters acknowledges that information technology has radically influenced the manner in which archaeologists conceptualise their research methods, and the ways in which archaeological research material is presented for publication. [4] It is plain that many of the articles published in *IA* on the subject of archaeological informatics are less concerned with archaeology than they are with informatics, though not quite to the point of being divorced from their legitimate intellectual context. *Contra* McLuhan, the medium is *not* the message. [8] There are doubtless some in the archaeological profession who feel that the cart is being put before the horse. However, the advent of the printing press did produce a similar disjunction among scholars to that being experienced at present.

The parallels between the dispersal of the products of this new technology in the early sixteenth century, and our own experience of technological change in the twentieth century, are striking. [14]

The second paper published by *IA*, '*A review of the archaeological evidence for food plants from the British Isles: an example of the use of the Archaeobotanical Computer Database*' (*ABCD*), provides a model of how archaeological knowledge on the use of plants as foodstuff can be made more easily accessible by being online. Readers can view the archaeological evidence as distribution maps, setting queries by taxa, site, or worker.

5.5 Archaeology is a visual discipline

Virtual reality markup language (VRML) is a standard file format for representing three-dimensional interactive vector graphics. The first use of it in an *IA* article came in September 1996, with '*Sensuous and Reflexive GIS*' by Gillings and Goodrick, both of whom were admonished for verbosity by Mithen in a Times Higher Education Supplement (THES) commentary as mentioned earlier. The authors' discussion of the theoretical underpinnings of geographical information systems (GIS) applications in archaeology proved to be heavy going even for an eminent professor. Nevertheless, their fusion of theoretical perspectives with technological analyses does mirror the editorial policy of *IA*. The introduction of VRML in 1994, which made available a platform-independent scene description format to Web publishers, has enabled users to construct and explore a variety of virtual environments. VRML files are commonly called worlds, and are easily identified by the .wrl extension. It should be made plain that VR is not an emerging technology on the cusp of impacting upon the discipline, but rather something that is now being integrated at all levels of the archaeological research process.

There are elements among the archaeological profession who are beginning to view VR as an essential instrument of knowledge, for it enables users to discover information through a more intuitive process than reading. Moreover, VR enables users to experience a heightened degree of realism during their investigation of research materials. The viewing of the journal's VRML models *via* a dedicated CosmoPlayer plug-in for Web browsers is done on a graphics monitor by means of a mouse control. As a consequence, it is not fully immersive. The authors have attempted to manufacture a synergistic link between GIS and VRML. Archaeological data spread over terrain, or indeed within the limited bounds of an excavation site, have perforce a spatial element associated with them. Archaeologists have, of course, applied GIS as an aid in the analysis of a variety of landscapes. However, GIS can also be used to facilitate intrasite analysis. [26] Gillings and Goodrick include many examples of processing concepts applied to landscape analysis that work equally well when applied on a smaller scale to sitescape analysis. It is from this point of reference that the authors base their theory of archaeological GIS.

They do not propose their marriage of GIS and VRML as any kind of heuristic panacea for the myriad problems faced by archaeologists in field surveying exercises, and indeed decline to define with precision how GIS and VRML can interact to the optimal degree. Instead, three case studies are presented, and readers are invited to draw their own conclusions. The authors show that landscapes can be infinitely complex in form, which can result in impracticably large VRML models that are simply too unwieldy to export to, and render suitably on, a standard desktop computer.

Gillings and Goodrick claim that it is the lack of a theoretical grounding that has hindered the use of VT in archaeology, claiming that the emphasis has been on how to achieve greater 'realism', without asking how that term should be defined in an archaeological context. They make the point that technology is not theoretically neutral and, like any other form of reconstruction, it is not really 'reality' at all. They suggest that the term 'synthetic environment' would be more appropriate. [15]

However, it is surely the case that the appellation accorded to this technology would not influence the manner in which it is used.

There is no way to tell how popular an article will be prior to publication. *IA* published an article in November 1999 on an



Egyptian tomb, and it quickly became one of the most highly accessed articles in the journal. The author, Melissa M. Terras, is an Oxford don, though the project was carried out at the Humanities Advanced Technology and Information Institute, which is based at the University of Glasgow. A fully functioning virtual reality model was created of the tomb of Sennedjem (above), which is situated on the West Bank of the Nile at Luxor in Egypt. There is no tomb that has been reproduced as often in books on ancient Egyptian art as that of Sennedjem, not only because of the freshness of the murals, but also because of their painterly quality. [6]

This article includes a large number of interactive elements, photographically realistic representation of the tomb paintings, and also a partial animation. The project proved that VRML could be used to present detailed archaeological reconstructions, to a degree of accuracy that would satisfy the demands of the profession, and in a relatively quick and cost-effective manner. Winters admits that the model is rather large, over 20 megabytes, but the access statistics prove that readers are not dissuaded by the size from accessing it. However, it may be worth noting that the most commonly accessed file of the Sennedjem article is not the VR model, but rather the Portable Document Format (PDF) file of the accompanying text. The VR model and the PDF file form an interesting counterpoint. Nevertheless, Winters appears reluctant to encourage this phenomenon. Indeed, the PDF file is a subject about which a number of e-journal editors have strong opinions.

'There are just a couple of articles that have PDF in addition to HTML, but most articles are just HTML, and they are created to be browsed and read purely online. The PDF can be downloaded and read. ...A lot of articles in Internet Archaeology are the type that you can dip into. They're structured so that you can dip into them. Internet Archaeology...is not designed to be printed out.' [4]

Computing and information technology have been pivotal in the conceptual and social revolution in scholarly communication and publishing, but it would nonetheless be impolitic to look askance at Gutenberg's legacy. However, Winters goes on to explain the very *raison d'être* of the journal.

'That's what makes us different. We're doing things that can't be done on paper, even if it's just using colour. Of course, colour is very important to archaeology publications. It is a very visual discipline. Black-and-white pictures in a journal, in which you are limited to five pictures in an entire article, can be quite restrictive to authors. We don't set any limitations on the size and number of colour images, because we are easily able to do all of these things. That's the main reason we attract good papers. We can do things that can't really be done in print.' [4]

This is indeed an important point in archaeology, for there is often a need to present illustrations in order to facilitate comprehension of archaeological finds and findings. The hitherto technologically dominant method of colour reproduction by means of lithographic printing is no longer the most suitable way in which to do this, for publishing such heavily illustrated research material on the Internet results in substantially lower costs compared to more traditional methods. Nevertheless, the authors of a recent survey of archaeologists' expectations from, and use of, publications have drawn the following conclusion from their data. *'Print is the favoured medium for all types of archaeological publication.'* [13]

The journal has adopted to steer a course between two contrasting views of online publishing. On the one hand, Winters does want readers to have the full benefits of online publishing, and absorb information by reading from the monitor. On the other hand, it is clear that readers can be influenced by the context in which information is presented. [23] There are still a substantial number of readers who favour more traditional page layouts and fonts. Winters is aware of a need to strike a balance, but personally favours a more radical approach.

The printed word lies at the very core of a discipline like history; archaeology, on the other hand, is made up of what we see (images), what we feel (experience), what we find (material), what we read (text)—it is multimedia. So what better way to communicate all these things than in a like-minded medium? [20]

However, not every member of the archaeological profession shows such unqualified enthusiasm for the journal's use of VRML. Goodrick and Earl would like users to be able to interact more with the VRML programs by changing weather, lighting, time, or date. VRML, as it is used online, is being developed in that direction. Those working with archaeological information systems seem to be moving away from off-the-shelf CAD and GIS software, and are now looking toward a more integrated package of customised software. This clearly has ramifications for the online publishing of archaeological papers. It seems that information technology is both the bane and the saviour of the past and the present.

5.6 Technical challenges

The same technologies can result in quite different results when introduced into different academic disciplines. *IA* was confronted with a serious problem in respect of illustrations in 2003. Winters, with the assistance of Guy Hopkinson, a freelance archaeologist, was required to convert the hard-copy illustrations of two excavations carried out in Cricklade in Wiltshire of a ninth-century Saxon fort-system and earlier Roman remains. These excavations were carried out in 1975. [11]

It is now taken for granted that the recording methods of archaeological teams working on excavations include some form of digital technology, thereby enabling illustrations to be produced with an eye to subsequent publication online. Nonetheless, it is likely that permatrace drawings will be widely used by the profession for the foreseeable future; it is a tried and tested technique with which many are familiar. The Cricklade excavation illustrative material was submitted to the journal as a series of 12 oversized ink-on-permatrace section drawings, a number of which exceeded 1.5 metres in length.

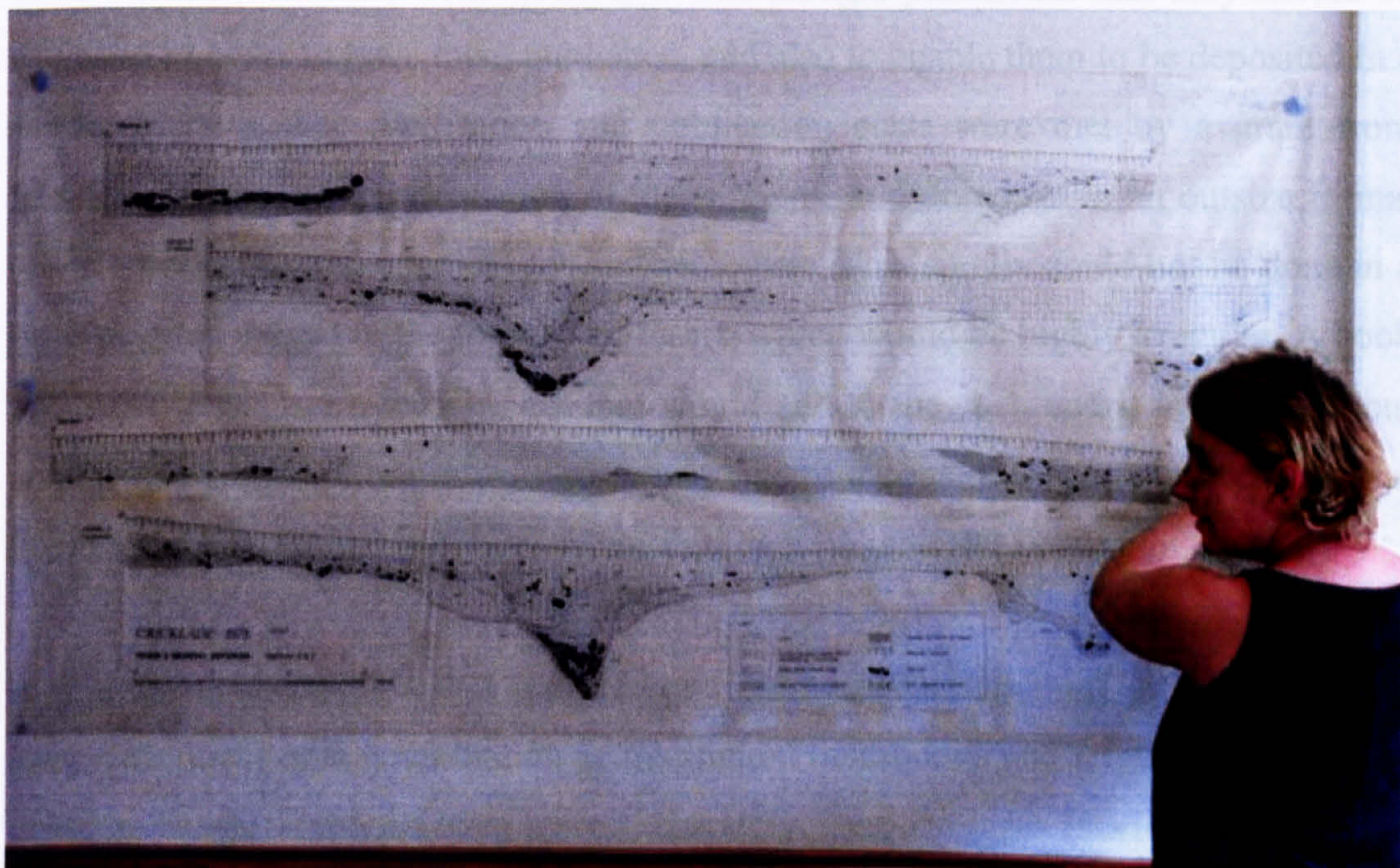


Illustration 5.3: Above is a photograph, albeit a badly taken one, of two oversized ink-on-permatrace drawings affixed to a whiteboard. Dr Judith Winters gives some indication of their scale.

The numerous plans and drawings of the excavated site had been drawn with a view to reducing their scale at a later date, and thereby facilitate their publication in a paper journal. These drawings, and the associated report, remained gathering dust in an academic archaeologist's *ad hoc* archive for the following 28 years. As a consequence, members of the archaeological profession were for the most part unaware of their existence.

Jeremy Haslam, the archaeologist who excavated the Cricklade site all those years ago, approached *IA* to inquire about the possibility of publication. The length of the report, and the size and number of the illustrations, meant it was unthinkable that a print journal would consider publishing such an article in its entirety. It perhaps goes without saying that word count is not really an issue for *IA*. However, the conversion of such large illustrations to a suitable format for publication online did present manifold problems at more than one level. In short, they presented a conceptual challenge, for there has been little work done in regard to the retrospective publication of very large-scale analogue images in an online format.

Haslam's permatrace drawings from Cricklade are the sole extant record of the 1975 excavations. As a consequence, it was thought paramount that they should be digitised in order to have them published, and also to enable them to be deposited in a digital archive. The digitisation and publication costs were met by a grant from English Heritage. The publication of maps, plans, and drawings in an outsize format has always been problematical for archaeologists. This simply could not be done in a print journal, except in the form of an insert, which would be highly irregular. A book publisher could use a foldout, but that would add to the cost, and it is a method but seldom used. Spatial constraints are much less of a consideration for e-journals, but they can still encounter problems when dealing with outsized illustrations. [24]

Winters explains that the effective online presentation of large images has been dependent on a combination of interlinked thumbnails and large scale and more detailed images that have been stored separately. Raster images (static JPEG and GIF files) are very much the norm, but can sometimes require substantial manipulation in order to enable a zoom effect to be created at the user end. In addition, they can be difficult to modify without losing file integrity. However, there are now software tools

becoming available that can convert a raster file into a vector file, which would facilitate improvement and adaptation. [12] The problems presented by the Cricklade plans compelled Winters to rethink how such non-standard material could be best incorporated into the journal. The funding provided by English Heritage enabled Winters and Hopkinson to explore fully these problems, and experiment with possible solutions.

Winters feels that the lessons learned from this exercise should stand the journal in good stead, for it is surely just a matter of time until problems of a similar nature to the Cricklade report have to be addressed once again. Several options were prepared at the article planning stage, and it was agreed that the journal would undertake to digitise important segments of the drawings as vector graphics, which would be scaled without any loss of image resolution, and link them from the static summary phase section drawings.

It was felt that this approach would provide a suitably enhanced level of detail, and allowed some degree of innovation in how the various sections could be viewed by the user. Once the nature of the work to be undertaken had been firmly established, it was Guy Hopkinson who had the responsibility of carrying out the planned course of action.

Initially, the plan was to publish Graphic Interchange Format (GIF) files of the maps, plans, and sections. The GIF is a relatively simple bitmap file format for graphics. It is widely used to present web page graphics. These would be supplemented by three Drawing Web Format (DWF) drawings of the most significant sections. This is a highly compressed file format for storing bitmapped fonts. It is an AutoCad file type that permits .dwg files to be transmitted and read *via* the Internet.

This type of file includes many drawing features such as pan, zoom, hyperlinks, layers, named views, mark-ups, and other object and header information. There would also be an animated GIF based on an isometric reconstruction of four periods of the Cricklade defences. Therefore, the specified tasks to be undertaken were to scan the monochrome permatrace drawings, improve the clarity of the drawings by using Adobe Photoshop, and introduce colour whenever appropriate in

order to assist comprehension. In addition, the three sections that were chosen to be of particular significance would be published as scalable DWF files by being digitised in AutoCad. There were four software packages used in the reproduction of images.

5.7 The flow of work

Photoshop is probably the single most powerful tool available for the creation, and also the editing, of graphic images. The first task that needed to be done was to scan each and every drawing. Scanning is easily done, but it does have one distinct disadvantage, which is that the image created directly by the process of scanning is never equal in quality to the image created directly from the source data.

There is invariably some degree of degradation. For example, it is virtually impossible to avoid picking up specks of dust, paper creases, and other flaws in the image. Below is a flow chart of the stages through which the work progressed in a linear fashion.

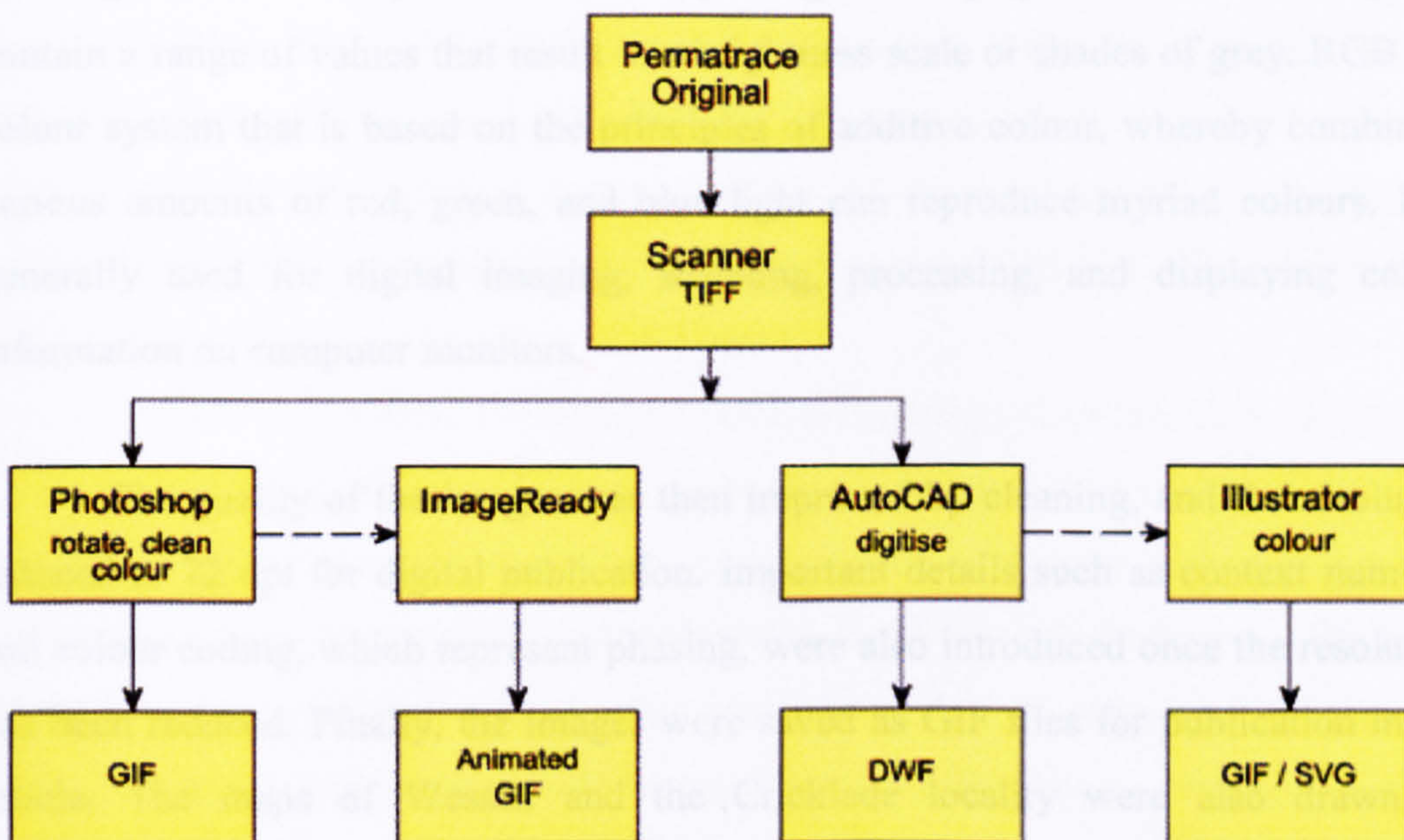


Figure 5.1: *Workflow chart of scanning process*

IA used the Tag Image File Format (TIFF), which is very popular in the graphic arts industry, particular among magazine publishers, but it is by no means cutting edge technology. TIFF/IT and PDF/X are more flexible, but create bigger files. However, TIFF is perfectly adequate for the type of work that *IA* is doing at present.

In the initial phase of the conversion process, a limited number of drawings were scanned in sections using A4 and A3 flatbed scanners. Once the various sections were collated and aligned, however, it became evident the some degree of error had crept in along one axis. As a consequence, the scanned sections could not be joined together accurately. It was inexperience in this kind of work that led to an unsatisfactory conclusion. Scanning is a mechanical process, and the resulting images sometimes require to be deskewed. Subsequently, the images were scanned as 200 dots per inch (dpi) monochrome TIFF files by using a sheet-fed scanner that is capable of scanning the entire image simultaneously. If this course of action had been adopted in the first place it would have saved a great deal of wasted time and effort.

Photoshop cannot rotate a bitmap image by arbitrary amounts, and the images were converted to greyscale or RGB colour files in order to correct the alignment of the original scans. Greyscale is a bitmap image or display wherein cells or pixels contain a range of values that result in a brightness scale or shades of grey. RGB is a colour system that is based on the principles of additive colour, whereby combining various amounts of red, green, and blue light can reproduce myriad colours. It is generally used for digital imaging, scanning, processing, and displaying colour information on computer monitors.

The quality of the images was then improved by cleaning, and the resolution reduced to 72 dpi for digital publication. Important details such as context numbers and colour coding, which represent phasing, were also introduced once the resolution has been reduced. Finally, the images were saved as GIF files for publication in the article. The maps of Wessex and the Cricklade locality were also drawn on permatrace paper, and there was, therefore, a substantial degree of editing needed to remove crease marks and assorted blemishes. It became apparent to Hopkinson after the work had progressed that it would be a good deal quicker to digitise the images in

AutoCad, and then create GIF files from the digitised images. The amount of work needed to produce the improved version was not inconsiderable. This type of work is invariably time-consuming.

The next stage in the plan was then to produce a single animated GIF to illustrate the succession of defence structures. The original drawing is comprised of four overlapping isometric images of the defensive perimeter at various stages of the fort's history. This was done with the aid of Adobe ImageReady. Once all four had been scanned and cleaned, four new layers were created in the Photoshop document, each to represent one of the four phases illustrated in the drawing. The individual isometric images were then copied to the different layers, and each one carefully aligned with the others so as to provide a common point of reference.

It was only possible to achieve accurate positioning of the images on each layer by temporarily making each layer semi-transparent, so that the image below was visible. The image being positioned could then be manipulated one pixel at a time until a satisfactory overlay was attained. The Photoshop file could then be opened using Adobe ImageReady, and the four layers used to create each of the four frames within the animated file.

It would have been equally possible to publish the phase drawings as four separate images, which could have been held in separate layers stacked on a web page. It would then be possible to use JavaScript to turn those layers on and off as the reader wished, and thereby create an interactive representation of the phase drawing.

Hopkinson digitised the selected section by using AutoCad, thereby creating the supplementary DWF files. This was done by importing the scanned TIFF files into an AutoCad drawing and then digitising onscreen. It was thought best to preserve as much of the hand-drawn quality as possible, and so the original shading was digitised. A number of the images would have required a great deal of editing in Photoshop in order to improve definition and introduce colour. It was for this reason that a decision was taken to digitise the originals in AutoCad, and then import the vector drawings into Adobe Illustrator to create the final files. The application of fill colours to the AutoCad was thereby enabled, which obviated the need for the shading contained in

the original drawings to be cleaned. The images created for online publication were not permitted to exceed a maximum of 600 pixels in width, which means that there is no need for reader to scroll horizontally while viewing *IA* pages.

The logistical problems related to the scanning of such a large number of outsize illustrations should not be underestimated. In addition, there is the problem of monitoring changes in specification as the editorial process ebbs and flows. These problems are related to image scale, degree of contrast, captions, and the optimal use of colour. Hopkinson employed a layering technique to separate each component of a drawing. However, since each layer was a raster image it could sometimes be technically challenging, and indeed time-consuming, to emend images at a late stage in the process. There is a great deal of work involved in converting a monochrome image to a colour, and adjusting the resolution, immediately prior to going online.

It was found that drawings that been digitised with AutoCad were easier to adjust, for they were maintained in a vector format throughout, only being converted to raster format at the point when the final GIF was ready for export. The lesson that Hopkinson learned from this work was that all of the drawings should have been made ready in this way from the very outset.

In retrospect, he can see that the versatility provided by a vector drawing compensates for the slightly longer period of time it takes to digitise that drawing from scratch, as opposed to cleaning a scanned image. Moreover, given that a certain number of the drawings contain repeated elements, it would perhaps in some cases be quicker over the long term anyway. Hopkinson now feels that it could be productive to experiment with Adobe Streamline, which is software that converts the raster format to vector, and *vice versa*.

The DWF images form only a small part of the Cricklade article, but Hopkinson nevertheless believes that it is a format that shows a lot of potential. There is, however, one disadvantage that comes with the DWF format, which is that it needs the Express Viewer plug-in in order to view the images. At present, this piece of software has not yet been made available to users of Apple Macintosh computers. Winters believes that a lack of specialist software makes much of the work done by

archaeologists more onerous than it has to be. It follows that publishing their work can also be fraught with difficulties.

'There are without doubt many aspects of archaeological research that would benefit from the development of customised software. There are circumstances that are unique to archaeology that require customised software solutions, but archaeology is a small field, and there's not a great deal of money involved in it, so we have to use off-the-shelf applications.' [4]

Formerly, such detailed plans and drawings as those from the Cricklade excavations would have been hard pushed to find a publisher. They may have been published in an attenuated form, but that would have omitted essential elements of the report. The archaeological profession has an obligation to generations of scholars as yet unborn to provide them with accurate records of their excavations and findings. Therefore, it is incumbent upon archaeologists to ensure that their reports are published in a comprehensive manner, and that the interpretations of the excavators are linked in order that other scholars may examine, and if necessary question, their assumptions.

Archaeologists have become aware that electronic publishing provides them with the wherewithal to explore means of recording data, and subsequently disseminating it, that hitherto were impossible due to the inherent limitations of traditional publishing methods. Indeed, there is now a trend in the discipline towards the publication of complete sets of data, rather than the syntheses of data that were once almost the rule. Winters, and the *IA* editorial team, seem pleased to lead the advance, if not indeed the charge, in this direction.

'We have set out to be a multimedia journal. We are not just setting out to deliver text and images in a slightly faster and more colourful way, which is what a lot of e-journals do. The ones using PDF files, for example. One question I get is why can't articles be printed out, but the journal is designed to be browsed and read online.' [4]

The Cricklade drawings have proved to be a catalyst in how *IA* approaches presentational issues in general, though particularly in regard to images that are simultaneously outsize and finely detailed. To be sure, it took several weeks to create images of the drawings to the high standard required for online publication. Indeed, it took some time to arrive at agreement for the provisional plan of the project prior to the commencement of work. Winters has concluded that such conversion of hard copy to digitised copy is not really an affordable option without financial assistance of some kind. There was a great deal more work involved in this project than anyone had envisaged prior to beginning work on it. [4]

However, such images could be used with ease if they were recorded digitally in the first place. Fortunately, this is now becoming a standard practice in the recording of archaeological plans and sections. There is some evidence to support the view that those primarily involved in the production of fieldwork publications are also more likely to consult such publications. Hence, *IA* expects in future to receive digital material in which vector graphics have been utilised. This would permit a wider degree of flexibility in the presentation of research material, and also afford more opportunity for any subsequent use of such images. [4]

5.8 Hypermedia

Winters regards hypermedia as central to the ongoing development of the e-journal. [4] There are a number of ways in which hypermedia may be defined. Generally, it can be defined as the combination of hypertext linking mechanisms and multimedia content that permit users to move between them in whichever order they choose. [10] A number of archaeologists are now making the case that limitations inherent in the very nature of linearity make the use of it unsuitable for interpreting large quantities of information, and also for handling multiple possible interpretations derived from such sources. Indeed, the comprehension of large information sets perforce requires a comprehension of information at a higher level. It is this interpretative process that transforms data into information. [22] *IA* wishes to publish authors who employ hypermedia to express the non-linear nature of scholarly research.

The traditional article on archaeological work follows a rigid linear structure, which presents all the data that is relevant. This is followed by an informed discussion of the evidence, which due to the nature of the discipline is occasionally an extrapolation. The overall conclusion is drawn from the available facts. However, a hypermedia excavation report is able to include more data, and present it in a greater variety of formats, than the traditional template allows. [22]

In 1999, *IA* was pleased to publish an article by Cornelius Holtorf titled, *Is history going to be on my side? On the experience of writing and submitting a hypermedia PhD thesis*. This was the first hypermedia paper published by the journal. The article outlines how and why he used hypermedia technology and the World Wide Web in the construction of his PhD thesis. He explains therein how he managed to persuade his supervisor, who was initially sceptical, and the University of Wales to accept a doctoral thesis written in HTML and submitted on a CD-Rom. [17]

The complexity of some journal articles has the effect of making linear narrative ineffective, or at least not sufficiently effective to maximise the comprehension of concepts that may prove difficult to grasp. [16] A number of writers in *IA* have employed the metaphor of a labyrinth to describe the complexity of navigation through raw data, and also through various information sources in mixed media. It has become increasingly difficult to make connections between the many and varied sources of information. [4] The term 'information superhighway' is common currency, but this is to employ a linear metaphor that betrays a fundamental misunderstanding of the World Wide Web, and thereby constrains comprehension of the issues to some degree.

The idea that texts are not autonomous entities, but rather that they are interconnected, that they are parts of a whole, is by no means a new one. This concept has come to be known as intertextuality, and this is one area that Winters wishes *IA* to explore. There are now a number of archaeologists involved with the journal who see non-linearity as the way forward, though this concept is sometimes called multilinearity or non-sequentiality. This lack of an appropriate and recognised naming convention serves as a general indicator for an overall trend within electronic publishing.

Archaeology is thought by them to be a discipline that would benefit from a multilinear mode of presenting information, instead of the dominant unilinear paradigm. The imposition of an artificial linearity on an excavation report can sometimes be counterproductive. [23] The options available to print publications are either to include a lot of introductory sections, or a lot of appendices, or both. The ability to layer a hypertext document means that the report itself can be placed front stage, with all the manifold details placed back stage. [10]

However, there are those, including some who write for *IA*, who see a hypermedia article as something that is in a constant state of evolution. This idea impacts on the stated editorial policy of *IA* not to emend an article once it has been published. Winters believes that the profession must change in order to maintain the ethos of the discipline. Information technology has altered somewhat the theoretical foci of archaeology. [4] *IA* is a journal at the cutting edge of technology, and if technological change nullifies editorial policy then so be it. Nevertheless, the policy would still stand for articles that have been published in linear form. Holtorf quotes the highly influential hypermedia guru, Ted Nelson, whose published works on non-linear presentation have become integral to the canon. [18] The contexts in which these quotations are used bespeak the fallacy of *argumentum ad verecundiam*; it is an argument from authority, and it adds nothing to the points he himself has already made. However, it does reflect on how he chooses to address the relationship between dialogue and argument evaluation.

In my work I cited Ted Nelson's wisdom that unilinear presentations 'spoil the unity and structure of interconnection' which is present in many systems of thoughts and ideas, 'breaking up these ideas into a presentational sequence is an arbitrary and complex process. It is often also a destructive process.' Nelson went on to argue that multilinear presentations can be superior to unilinear ones because they avoid any suggestion of 'a single sequence for all readers that may be appropriate for none.' [18] [19]

To be sure, Winters is aware that not every member of the profession regards non-linear articles as academically respectable. There are those, and perhaps not without good reason, who regard non-linear presentation as incompatible with the

need to present a structured argument, and follow the sequential steps of an excavation report or a controlled experiment. However, it is not the case that a non-linear paper is an unstructured one, or is badly organised. Hypermedia has an appeal to Winters insofar as it is designed to be read from a computer monitor, and is seen to be an advance in online publishing by its ability to represent evidence and interpretation as a complex web of inference. [4]

5.9 Balancing the budget

Winters believes that knowledge acquired and maintained at public expense for the public good should be placed in the public domain. [2] Nevertheless, the journal was compelled to transfer to a subscriptions model once the eLib funding had come to an end in December 2001. Editorial content is processed, and uniquely identified, at the article level, which can then be purchased as single articles, as opposed to purchasing a subscription to an entire volume. This is generally referred to as article-based publishing. The purchase price of each article is a standard one, and is irrespective of the length or technological complexity of any given article.

'We developed a pay-per-article mechanism. It had to be developed in-house. People can subscribe to an article as opposed to a whole volume. It is a similar model to a volume, with permanent access to that article.' [4]

The journal currently offers subscriptions on the basis of annual packages of two issues, and both institutional and individual subscribers have permanent access to the issues or articles they have purchased. *JA* was successful in a bid to the University of York's Proof of Principle (POP) Fund, which granted financial assistance to fund market research and the technical enabling of single article purchasing.

The subject of pay-per-article opens up a further series of technical and commercial models as well as new prospective institutional marketing areas for the journal, such as schools, further education, and public libraries, where perhaps budgets for purchasing entire issues may not be available. It

will also have an impact on individual subscriptions when students, researchers, and interested amateurs will get the opportunity or cheaper access to specific journal articles. [21]

Clickable banner advertising was introduced, and that has become a steadily growing income stream. *IA* accepts such advertising for publication on its home page. Advertising is accepted from commercial, not-for-profit, and academic sources, with the proviso that it must be of archaeological relevance, and therefore of interest to the journal's readership. In general, it is thought that the linked banner advertisements add to the readers' browsing experience rather than detract from it. In addition, it is a further step in turning the journal into a fully self-financing operation. Winters believes it important that readers' perceptions of the quality and integrity of the host site should not be adversely affected by banner advertising. The journal has had some feedback from readers on this subject, and almost all of it has been positive. Readers certainly notice the banners, but overall they are not felt to detract from the design, layout, and function of the journal's homepage.

There is an overwhelming consensus that *IA* should continue to restrict advertising content to archaeological subject matter. *IA* has a significant number of subscribers from prestigious institutions in the United Kingdom, and also in the United States and Western Europe. The *IA* homepage averages over 5000 hits a day, and an advertiser can easily target this narrow market segment of archaeology by placing a banner. *IA* states that these clickable banners must be supplied by advertisers themselves, and be designed to the specifications given in the table below.

Width	468 pixels
Height	60 pixels
Format	GIF
Colour Depth	Up to 256 colours
Maximum file size	40 KB

Table 5.1: *Advertising banner specifications*

In addition, every advertiser is obliged to supply a viable Uniform Resource Locator (URL) that corresponds with the banner. However, flashing, animated, or moving images are not considered in keeping with the ethos of the journal, and are

therefore not permitted. Despite the pressing need to increase the level of income, Winters has set a limit on the number of advertisements she is willing to accept, which is twenty. *IA* has so far attracted just half that number, one of which is from the department in which the journal itself is actually published. Listed below are the journal's advertising rates.

Period	Commercial rate	Mid-rate	Institutional/Academic Rate	
			Subscriber	Non-Subscriber
Six months	£240	£150	£120	£180
One year	£400	£260	£200	£300

Table 5.2: *Journal advertising rates*

The clickable banners and their associated URLs are served in random rotation with every request to the *IA* homepage, thereby guaranteeing each banner a minimum of five *per cent* display rate of the total number of hits on the homepage. This usually results in at least three thousand displays of each banner over any given six-month period.

5.10 Web server statistics for Internet Archaeology

There is a great deal of store set on access statistics by journals that are seeking to market their services in various ways. Web server statistics provide an abundance of information in respect of who exactly is visiting the site, where they are located, in which particular areas of the journal they are interested, and when they are at work. However, interpretation of these statistics is problematic, for the conclusions drawn from such statistics can be viewed in any number of contexts.

There is sometimes a subjective element at play in the interpretation of statistical data. The journal, in common with many other web servers, retains a certain amount of information about the users who visit its Web site. These figures are calculated on an hourly, daily, weekly, monthly and annual basis, and can provide some degree of insight into patterns of usage. For example, it can be deduced from the statistics that *IA* has a significantly larger readership than that claimed by many long-

established and highly prestigious journals in the discipline. [4] There are a number of strategies for increasing the amount of traffic to a Web site, and this can be vital in attracting advertisers or sponsors.

The Web log, the home page of which is displayed below, serves a number of functions, not least of which is to drive up the number of visitors to the *IA* site. There is a need to have a steady stream of new material posted in order for users to have good reason to visit the site on a regular basis. However, this is viewed as very much secondary to assisting archaeologists to keep up to date with developments in the discipline. *IA* sees this as a crossover between scholarly publishing and scholarly communication. [4]

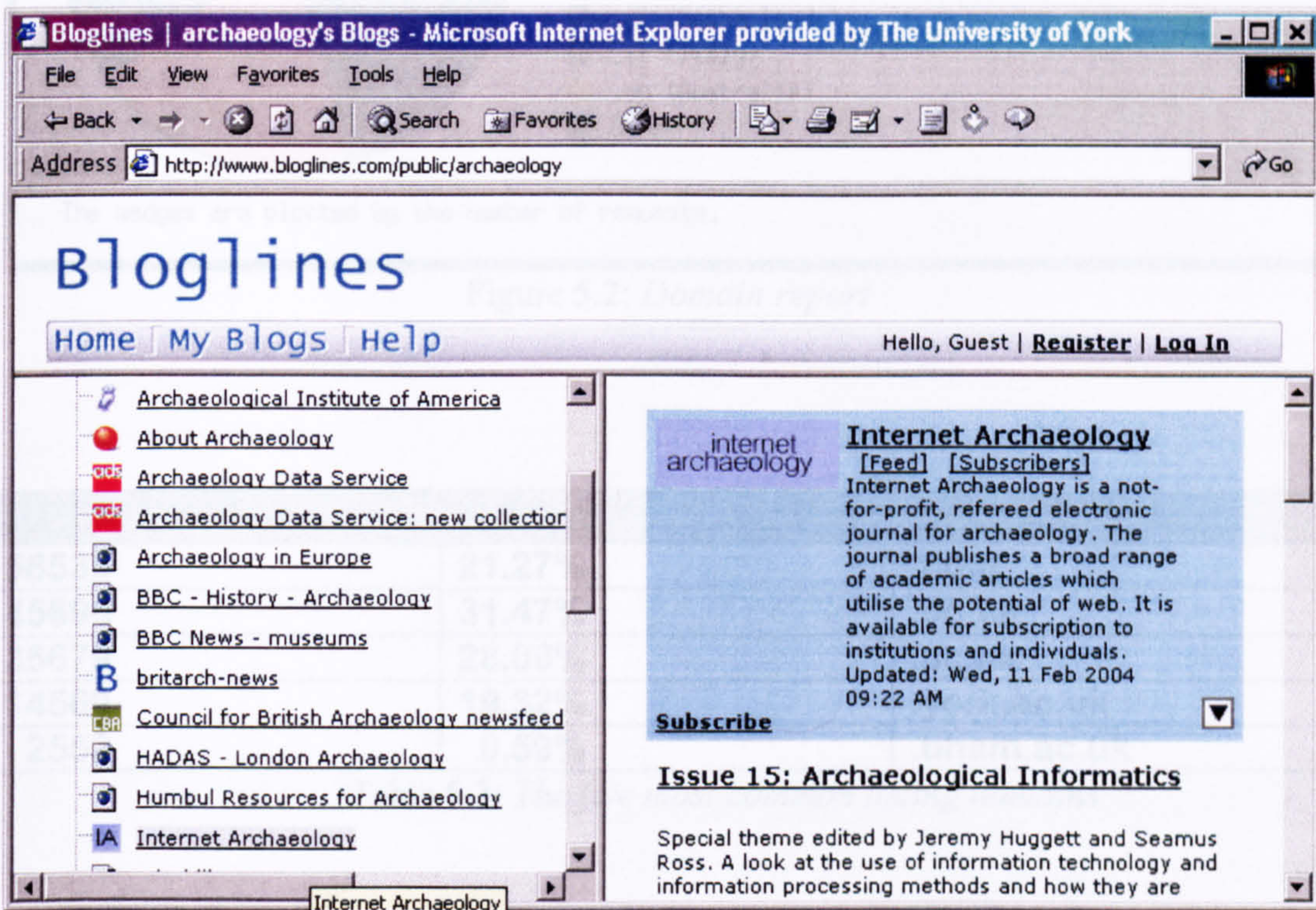


Illustration 5.4: *Internet Archaeology Bloglines home page*

A significant number of such ISPs are based in the United States. Most of the requests come from sources within the United Kingdom, which may cause those involved with the publication of *IA* some concern, for it is quite surprising to discover how few requests are made from sites with identifiable United States higher education institution addresses. Nevertheless, it impossible to quantify how many such requests

from North America come in the guise of commercial addresses. It should be borne in mind that statistical data assembled by automated processes do not perforce represent the true number of hits or user sessions on any given Web site. However, with that *proviso*, the following data may be of assistance.

DOMAIN REPORT

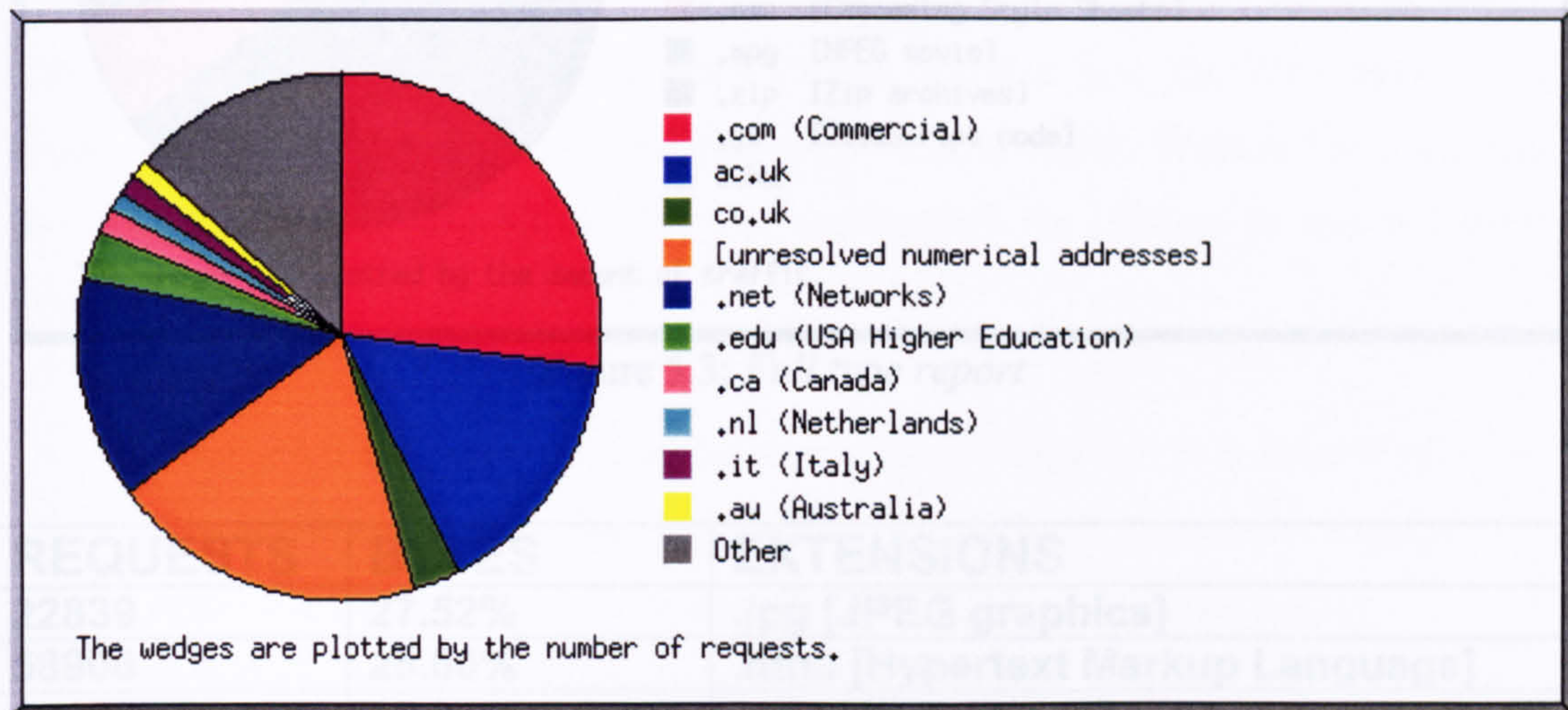


Figure 5.2: *Domain report*

REQUESTS	BYTES	DOMAINS
58535	21.27%	.com
45696	31.47%	.co.uk
35679	28.06%	.ac.uk
14569	19.32%	.york.ac.uk
2552	0.59%	.bham.ac.uk

Table 5.3: *The five most common listing domains*

It is clear from even the most cursory of examinations that graphics are a popular element of the journal. Winters regards the ability of electronic publishing to append, to all intents and purposes, limitless numbers of large colour illustrations as one of the main reasons for the journal's success. The number of video files accessed is expected to increase over the coming years, for there will undoubtedly be more of such files published in *IA* as authors increase their ability to use Internet technology to present their research findings. However, those involved in the publication of *IA* are not leaving this development to chance.

FILE TYPE REPORT

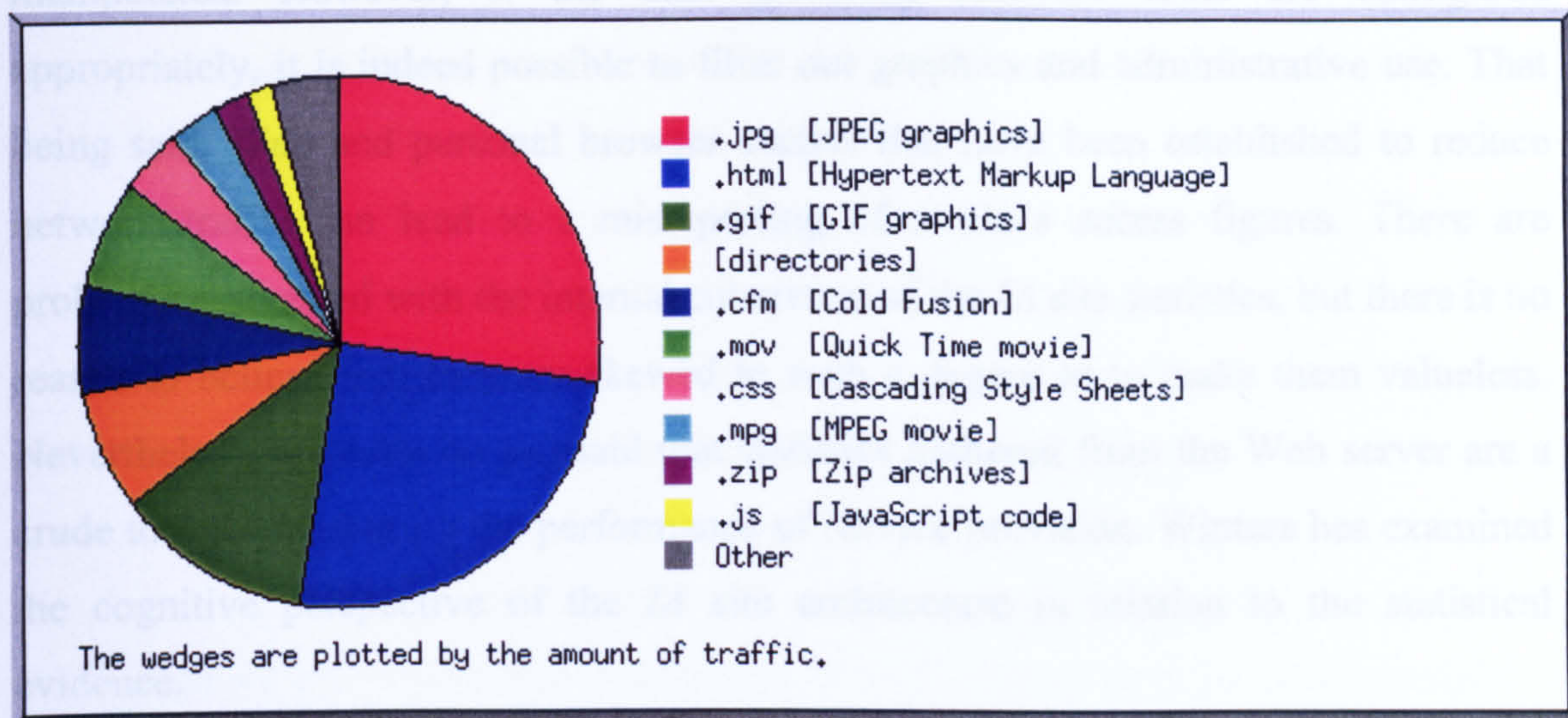


Figure 5.3: Full type report

REQUESTS	BYTES	EXTENSIONS
22839	27.52%	.jpg [JPEG graphics]
58906	25.00%	.html [Hypertext Markup Language]
31963	12.07%	.gif [GIF graphics]
23881	7.38%	[directories]
24161	6.59%	.cfm [Cold Fusion]
181	6.58%	.mov [QuickTime movie]
25912	3.89%	.css [Cascading Style Sheets]
9	3.08%	.mpg [MPEG files]
20	2.26%	.zip [ZIP archives]
14627	1.57%	.js [JavaScript code]

Table 5.4: The ten most common listing extensions

DAY	REQUESTS	PAGES
SUNDAY	23282	12826
MONDAY	41594	20531
TUESDAY	41102	20851
WEDNESDAY	41564	21031
THURSDAY	31132	14187
FRIDAY	25151	12541
SATURDAY	15901	8846

Table 5.5: Web site summary over a four-week period

There are a host of ways in which the above figures can be distorted. For example, the continual use of the Web site by its developers can have the effect of

disguising the true figures, and this is especially the case whenever graphics are being manipulated. However, if the data gathering software tools are configured appropriately, it is indeed possible to filter out graphics and administrative use. That being said, Web and personal browser caches that have been established to reduce network traffic can lead to a misreporting of a site's access figures. There are problems associated with the internal coherence of the *IA* site statistics, but there is no reason to believe that they are skewed to such a degree as to make them valueless. Nevertheless, it cannot be gainsaid that statistics gathered from the Web server are a crude tool for measuring the performance of service provision. Winters has examined the cognitive perspective of the *IA* site architecture in relation to the statistical evidence.

...it is possible to anticipate, and thus steer, users in a number of directions, thereby predisposing them to certain forms of activity. Ideally, resources should not be more than three clicks from the home page. Established wisdom suggests that interest levels fall as the number of mouse clicks rise. [2]

The intellectual worth of an e-journal cannot be estimated purely and simply by recourse to access statistics. Nevertheless, the number of daily hits recorded can indeed give some indication of market performance. The number of subscribers, and consequently the size of readership, has increased year on year since its inception. The adoption of a subscription model was eased by the fact that institutions and individuals found the journal affordable. Journal prices in archaeology have traditionally been low in comparison with other disciplines. [4]

5.11 Conclusion

The use of information technology is ubiquitous in archaeology. The ever-increasing sophistication of the subject, which is a correlation of the rising use of scientific techniques and theories, has been reflected in the growing complexity of excavation reports. [4] Yet, scholarly authorship in archaeology is still based on a print model, as

indeed is popular authorship in the discipline aimed at the broader market. Archaeology is a discipline that has a relatively large lay readership, and academic archaeology represents just one element of the wider archaeological community. [22] Nevertheless, there is an incremental migration of print publishing to a digital environment. [23] Winters is conscious of the fact that *IA* has been a trailblazer for other archaeological journals. *IA* was the first archaeological journal online, and it is very much a leading-edge journal in technological innovation. Winters is keen to take part in joint projects with other publishers.

'We have some contact with commercial publishers. It is very positive, and we are very keen to collaborate. They are very interested in integrated publications, exploring electronic and print publications combined. We're certainly not seen as competitors, and I think that they realise that what we do is very different to what they're doing in print format in terms of size, and scale, and scope, and the depth of the articles that we are publishing, especially the ones that contain searchable data sets.' [4]

As other archaeological journals go online, and employ cutting edge Web publishing technology, *IA* is likely to face more competition for papers. At present, there is no other archaeological journal that is really comparable to it. There are other online journals in the discipline, but they are basically using the Web to disseminate text and graphics in traditional page layouts. Different academic disciplines favour different media technologies, but some of these technologies make more demands on their users than others. It would be a valuable exercise for *IA* to take stock now, to review what they have achieved, and to decide any further aims and objectives they may have that are realistic and achievable. To address this latter point, it is necessary to determine what *IA* is fundamentally about, and how its existence compliments the manifold areas of research and scholarship.

The expertise that archaeologists have shown in authoring and publishing in an electronic format is not trivial. The reason for this journal's continuing success is the very high level of commitment shown by every member of the profession who is associated with it. Indeed, in respect of e-journal publishing, Winters holds markedly similar views to Cliff McKnight, whose own journal is examined in a later chapter.

They both seek to move the concept of the journal forward, and are willing to experiment in order to do this. The following case study covers developments in the biological sciences, which have a very different publishing culture from archaeology.

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This comparative case study uses data gathered at the University of Arizona to explain the credits and demands of two Scholarly Publishing and Academic Resources Coalition (SPARC) publishing projects in the field of biology. The basic idea that underpins the chapter therefore is to chart the similarities and dissimilarities of their approaches to the dissemination of scientific research material. In addition, to inquire into whether their promotion of content-driven information technology in scholarly communication has greater intellectual, cultural, and fiscal validity than the mode of production and dissemination that currently prevails.

SPARC is a catalyst for change in the burgeoning field of scholarly communications. *Journal of Insect Science (JIS)*, a library-based SPARC publishing project, and *Evolutionary Ecology Research (EER)*, a faculty-based SPARC publishing project, both based at the University of Arizona, are direct responses to the serials situation.

The reader will be led, by a process of extrapolation, to an understanding of the social and cultural dynamics that are presently at play in the formation of alternative publishing models in academe. In the main, anecdote and example have been used, rather than statistics, to illustrate the temper of the environments in which such radical attitudes and beliefs regarding scholarly publishing may flourish. It is hoped to capture unadorned an image of the e-journal as it is conceived in these two SPARC publishing projects, reflecting on how and why they sometimes do, and sometimes do not, mirror one another.

CHAPTER SIX

Journal of Insect Science and Evolutionary Ecology Research

6.1 Introduction

This comparative case study uses data gathered at the University of Arizona to explain the merits and demerits of two Scholarly Publishing and Academic Resources Coalition (SPARC) publishing projects in the field of biology. The basic idea that underpins the chapter therefore is to chart the similarities and dissimilarities of their approaches to the dissemination of scientific research material. In addition, to inquire into whether their promotion of content-driven information technology in scholarly communication has greater intellectual, cultural, and fiscal validity than the mode of production and dissemination that currently prevails.

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The importance of the context, or setting, is worth highlighting. One is published in a research library, and the other in an academic department. The case being studied takes place in a specific social and physical setting, hence the need to visit the site for a relatively extended period of time in order to accumulate qualitative data. It would have been impossible to evaluate and analyse these projects outside their social contexts in the way that a quantitative researcher can. My research involved not only close observation, but also a limited degree of participation in the production process. The interactions between members of the library-based publishing team are central to the study.

Librarians are an intrinsic component of the research community. There are multiple sources of evidence in this case study to support the hypothesis that it would be in the long-term interests of the research community to be responsible for the publication of their own research findings. A considerable number of quotations from taped interviews are used to facilitate comprehension of the factors in play. There are a number of tables that enable the journals to be compared more readily. In addition, the relationships and activities of those working in the publishing team are described and analysed. There is also some background information provided to explain the intellectual *milieu* in which SPARC operates. The following areas are of central importance. [3]

- The impact of publishers' pricing policies on the research communities that they purport to serve.
- The policies that governments, academic institutions, and publishers should adopt to promote a competitive market in journal provision.
- The influence that journal publishing in academic environments has had on the open access movement as a whole.
- At some future date academe-based journals must find replacement editors.

The Scholarly Publishing and Academic Resources Coalition, an Association of Research Libraries' (ARL) scholarly communication initiative, exists in order to help others help themselves; its stated policy is, to all intents and purposes, an Emersonian descant on the manifold virtues of self-reliance. [1] It does not itself

either publish or distribute journals, rather it is a consulting service for those who wish to publish and distribute research papers without recourse to mainstream publishing houses and their over-priced serial publications. The first named is open access, and the second is affordably priced in order to facilitate purchase by the maximum number of research institutions and learned individuals. The two projects do things somewhat differently from one another, but they both demonstrate the ability to publish, in an expeditious manner, research papers that are of high quality in both content and form. They also promote the essential nature of the relationship between origination and ownership, which means authors retain copyright. Kenneth Frasier, prime mover of SPARC, and director of libraries at the University of Wisconsin at Madison, states that spiralling subscription prices have fuelled the drive to promote internet-based alternative publishing projects.

'The problem is that a lot of commercial publishers are not only addicted to profits, they are addicted to high revenue growth, too. That creates a situation that is sure to motivate alternative systems for disseminating knowledge.' [2]

6.2 University of Arizona librarians become publishers

A great many movers and shakers now believe that the scholarly publishing system would be best administered within the realm of academe itself, and the time has long since passed when publishing titans could afford to look askance, if indeed they ever did, at these *samizdat* initiatives. It is entirely right and proper that university libraries should become journal publishers. [5] Indeed, given that other parties have now assumed tasks that once fell within the well-established remit of library staffs, such as archiving journals and administering special libraries, library-based publishing projects are beginning to look much more like a Darwinian imperative than an extension of duties.

A number of academic departments are now publishing and archiving online journals, but publishing and archiving could usefully be in the domain of librarians,

thus freeing academics to teach, research, and write papers, which are their very *raison d'être* anyway. Publisher librarians, though at present but few in number, have succeeded in marrying the *nous* of the humanities to the *praxis* of the sciences, and thereby joined the ranks of those *literati-cum-digerati* for whom Snow's Two Cultures debate is a false dichotomy. [6]

SPARC plans to counter this downward spiral in the availability of scholarly information. Indeed, the journal citation reports, as listed in the Science Citation Index, indicate that SPARC-affiliated academe-based publishing projects can, though in as yet limited spheres, compete effectively with trade publishers, and are now beginning to enter the publishing mainstream. [4] The table below compares the two SPARC journals published at the University of Arizona. They are not in competition with one another, nor indeed do they take much interest in one another's progress.

<i>Journal of Insect Science</i>	<i>Evolutionary Ecology Research</i>
Online only	Online and paper editions
Video and audio files; high quality colour illustrations and large data sets	Text, black-and-white illustrations and large data sets
Published by Digital Library Initiatives Group, University of Arizona Library	Published by Evolutionary Ecology Ltd., Department of Ecology and Evolutionary Biology, University of Arizona
Editor: Dr Henry Hagedorn	Editor: Dr Michael L. Rosenzweig
<i>SPARC Leading Edge</i> —sponsors use of latest technological developments and also innovatory business models.	<i>SPARC Alternative</i> —aims to provide, at lower cost, direct competitors to highly priced STM journals.
Compared to <i>Archives of Insect Biochemistry and Physiology</i> (Published by John Wiley & Sons, Inc.) Institutional subscription: Online only: \$2340. Print only: \$2340–USA. \$2460–Canada and Mexico. \$2562–Rest of World.	Alternative to <i>Evolutionary Ecology</i> (Published by Wolters Kluwer) Institutional subscription: Paper version or online version: \$504. Combined paper and online package available for an additional twenty <i>per cent</i> of single medium price.
<i>JIS</i> Free to users (Open access)	<i>EER</i> institutional subscription: (All countries) Internet only: \$340. Internet with paper copy: \$396
Publishes each individual paper within one week of acceptance.	Publishes monthly issues, but now also publishing some papers online shortly after acceptance.

Table 6.1: *Comparison of journals*

Nevertheless, data from OhioLink indicates that journals are not substitutable for each other, and that as new journals are added to a database there appears to be no decline in the use of others by researchers. [7] The possibility does exist that these two SPARC journals could become additions to, and not substitutes for, commercially published journals. [8] It would be wholly unrealistic to anticipate significant additional financial support from already cash-strapped institutions for such projects, advantageous though that most certainly would be, but as such a system spread, and access became free at the point of delivery, funds which were once allocated to purchase grossly over-priced journals from commercial publishers could be re-allocated to support library-based digital publishing and archiving projects.

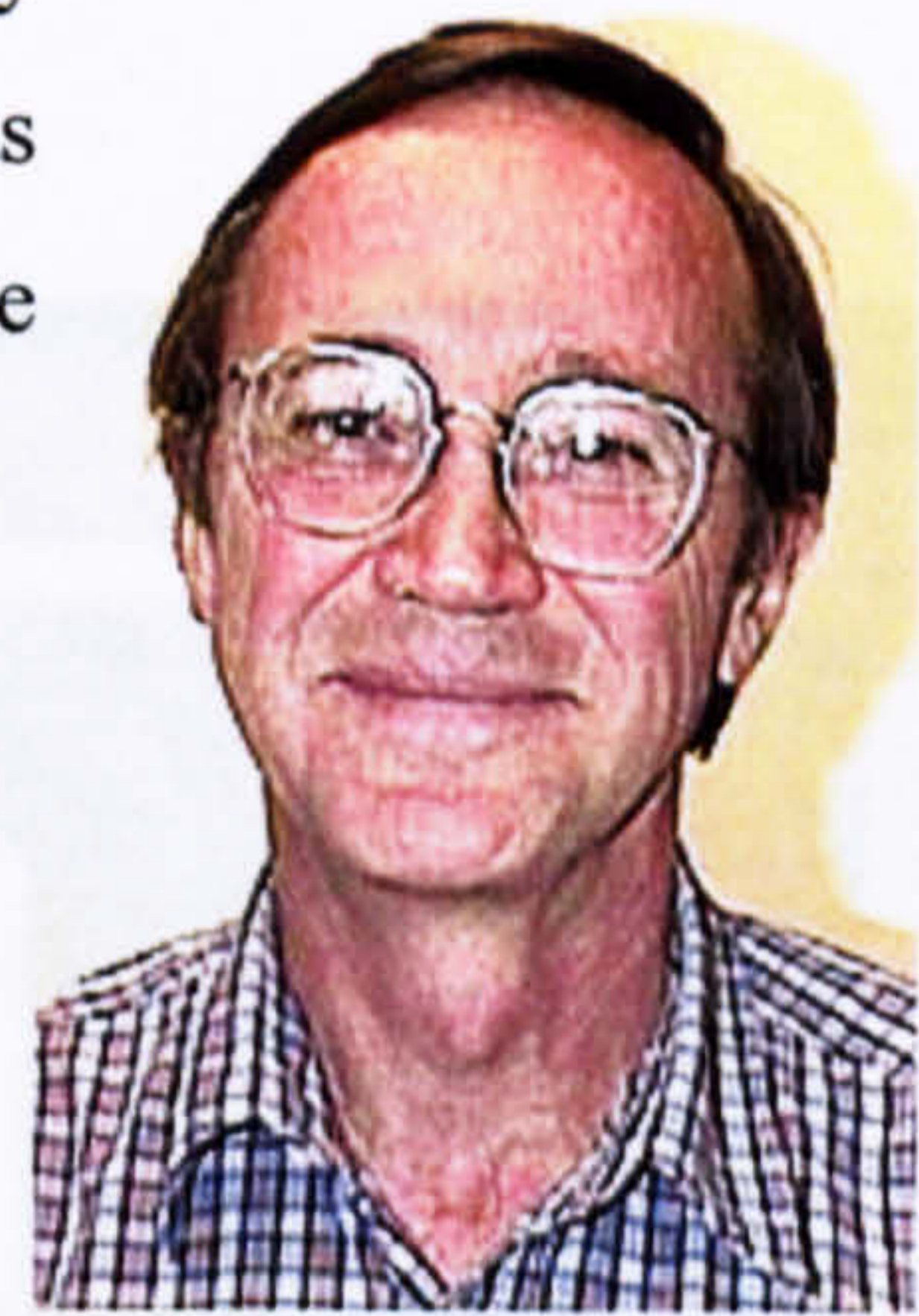
Therefore, such library publishing projects could be self-funding over the long term, though short-term financial hiccups would certainly occur. This system would enable free access to readers for a relatively low financial outlay, and the costs incurred by it would be borne by the selfsame institutions that are at present spending such large sums of money to prop up the present system. The anticipated correlative financial complexities notwithstanding, library-based publishing projects can indeed resolve the journal situation.

The definition of publishing has broadened somewhat, prompted by a new range of media, and innovative schemes to transmit them, but the journal, as central metaphor in the realm of scientific communication seems set to remain unchallenged in any significant way. [9] However, the present system of publishing journals does face challenges from several corners. One of those corners is occupied by SPARC, which offers a unifying ideology for change in scholarly communications.

However, not-for-profit publishers are by no means immune from market forces. Every publishing venture, whether commercially orientated or not, must have a viable business plan. Library-based e-journal initiatives tend to be offshoots of digital library projects, and the *Journal of Insect Science*, published by the Digital Library Initiatives Group at the University of Arizona, is no exception. [10] *JIS*, now in its third year of publication, covers all aspects of the biology of insects and other arthropods from the molecular to the ecological, and their agricultural and medical impact. It was the first SPARC partner to be published by a university library.

6.3 Journal of Insect Science

Dr Henry Hagedorn (right), an eminent biologist working at the University of Arizona, hopes that that one day all scientific research will be available on an open access basis to both individuals and institutions, thus forming an intellectual commons online. It is a hope that he shares with Dr Carla Stoffle, the innovative research library leader who has been a leading light within SPARC, and who is also based at Arizona. It was following a meeting between faculty and library staff that Hagedorn, then executive editor of *Archives of Insect Biochemistry and Physiology*, a journal of note in the field of entomology, became aware of just how costly scientific journal subscriptions could be. Indeed, he was shocked to discover that the journal he edited was one of the worst offenders.



'The journal was originally founded by Allen Press, and . . . the cost of the institutional subscription was about 250 dollars, . . . they were publishing about 65 papers a year. By the time I took over the journal in 1999 the cost was 2000 dollars, and they were still only publishing 65 papers. Hence, there was no justification for that increase based upon increased service.' [11]

Hagedorn, after giving the matter some thought, felt compelled to resign his position as editor of *Archives*. It was Stoffle's creative management style that gave the initial impetus to *JIS*. She initiated a discussion on the topic of academic institutions using their in-house facilities to publish the kind of scientific journals that research libraries are now becoming unable to afford. Hagedorn rather liked the idea, and investigated the possibility of publishing a journal in cooperation with the Digital Library Initiatives Group based at the University of Arizona Library. There is ample scope for some librarians to specialise in publishing, for there is an immense administrative burden in organising the output, refereeing, editing, formatting, and distribution of a journal, and there are also specialist skills required in graphic design, typography, and web page design. The library team had to start from scratch, building

a publishing structure to reflect the agenda for the proposed service. Having a vision is one thing, but realising it is something else.

The library team, with the assistance of Hagedorn, put together a proposal for SPARC, but were unable to procure funding. Thereupon, Stoffle decided to get the *JIS* project off the ground by funding it out of the library budget, and was instrumental in obtaining permission to publish under the SPARC imprint. Hagedorn was then left free to build on this foundation. Stoffle sees SPARC's role as, '*mostly being entrepreneurial, and selling to people, and helping them to see ideas that they might not see readily at first.*' [13]

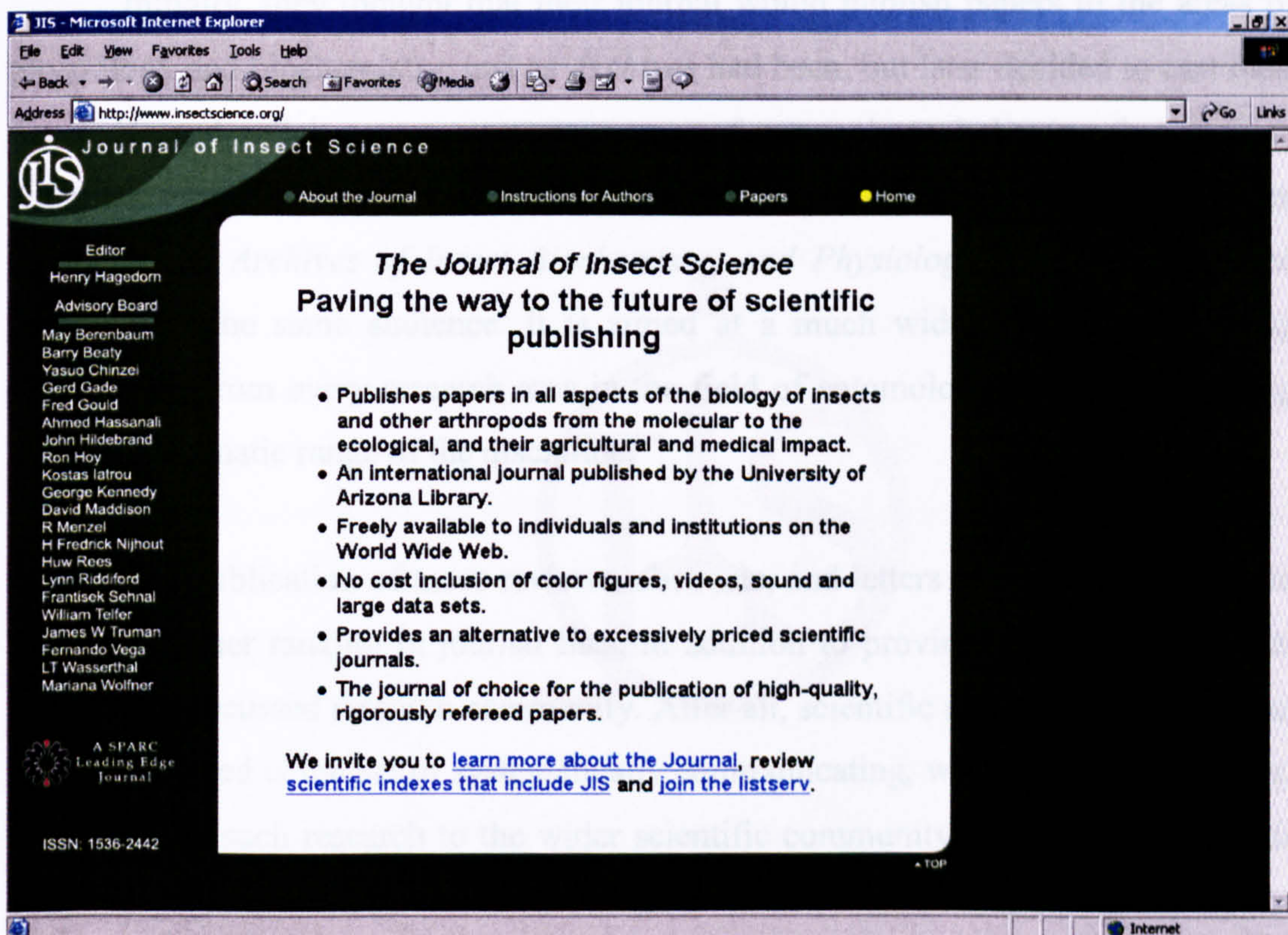


Illustration 6.3: *Journal of Insect Science* home page

The librarian's role is changing. She believes that to get the job done, in the face of unremitting budgetary pressures, an entrepreneurial approach is crucial. It was having such unequivocal support from library management that enabled a relatively swift transition of *JIS* from an experimental model to a production model. The other commitment, a crucially important one, is that made by Hagedorn himself. There is a fair amount of time invested by the editor, but not any more than is usual in this line

of work. Therefore, in terms of time management, he found that whether one is working for an independent academic journal or a commercial publisher's journal is immaterial.

Indeed, this type of unpaid labour is looked upon as an essential part of academic life, and neither editors-in-chief, nor their editorial boards, need significantly change their ways when working under the aegis of SPARC. Hagedorn, in an understandable desire to proselytise, has explained to a number of academic audiences that the problems of publishing online are not as great as he originally imagined.

Initially, they thought that their journal would publish papers in the areas of physiology and biochemistry, just as *Archives* had been, but later decided to cast their net wider and solicit papers on every aspect of entomology, believing that such an approach would be more likely to meet with success. *JIS* is not intended to be an alternative to *Archives of Insect Biochemistry and Physiology*, for it is not aimed primarily at the same audience. It is aimed at a much wider audience, accepting manuscripts from *every* research area in the field of entomology, thereby embracing the entire thematic range of the discipline.

The publication of more reviews, abstracts, and letters is a strategy that could lead to a higher ranking in journal lists, in addition to providing a welcome virtual forum for a focussed research community. After all, scientific research is a communal effort, as indeed is the act of systematically communicating, without let or hindrance, the results of such research to the wider scientific community. [12] Indeed, it is this essentially Baconian view of scientific discourse that underpins the very concept of open access journals.

JIS provides a PDF version of every paper in order to comply with guidelines set by the International Commission on Zoological Nomenclature, and deposits paper copies of its publications in no fewer than seven research libraries. In addition, copies of *JIS* volumes, on paper that meets the minimum requirements of American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, are securely archived at a number of other locations, including the

University of Arizona Library. *JIS* is also archived, as securely as evolving file formats permit, as part of the University of Arizona's Digital Library Initiatives Program.

The Digital Library Initiatives Group appears to be an adjunct of the University of Arizona Press in everything but name. (The University of Arizona Press proper does not itself publish journals.) The staff members can put a paper online within days of it being accepted for publication, though the average time from submission to acceptance and publication is three months, within a range of one to eight months. This in itself provides good reason for authors to submit their papers to *JIS*, for some publishers can take anything up to a year or more to publish after acceptance.

The *JIS* team, with its appropriate use of video and audio files, its active links to external data-archive facilities that house larger data sets, and its attractive and easily navigated Web site, offers an electronic journal publishing service that is at least the equal of what many commercial journals have to offer, and is indeed better than most.

The interaction between SPARC and its partners has been mutually beneficial. SPARC is demonstrating that it is in the interest of libraries to act in concert, and the



logic of collective action is obvious to almost everyone involved in library publishing today. The group attitudes that once were so closely associated with the production of texts in scriptoria are now beginning to reassert themselves once more.

Indeed, Stuffle (left) believes that the wheel is now turning full circle back to the days when the scriptorium and library were one and the same institution. [13] *JIS*, and its SPARC partners, are pointing the way to an amelioration of, if not quite a solution to, the ongoing serials situation. Of course, hundreds of SPARC partners publishing journals are needed before commercial publishers can be unhorsed, and that will not happen overnight.

The University of Arizona Library's journal publishing venture is an adventure in ideas. Arizona has restored the symbiotic link between librarianship and scholarly publishing that was broken with the closure of the *scriptoria*. The wheel has turned full circle. *Plus ça change, plus c'est la même chose*.

6.4 *Journal of Insect Science* production

Currently, this portion of the University of Arizona Library's involvement in the Journal has one student worker and one full-time staff member assigned to it. The average time required to publish a paper is ten hours. Six hours of this period is covered by student labour, and the remaining four hours by a full-time member of library staff.

Adam Engelsgerd, whose job description is that of library specialist, has responsibility for site maintenance, site design, and transforming accepted manuscripts from their submitted formats into the final version that the reader can view onscreen. However, the site maintenance and design are activities that do not take up a great deal of his time on a daily basis. In terms of routine work, this might include something along the lines of adding or removing a name from the editorial or advisory board, or he might make some changes to the submission guidelines based upon some recent technological development or administrative reform. [14]

The greater part of his working day with *JIS* is spent on transforming accepted manuscripts into the forms in which they are published. This entails two immediate outputs of the XML and the PDF version, one subsequent output of the BioOne formatted content, and one yearly output of a printed volume. [19] (BioOne is a web-based aggregation of research in the biological, ecological, and environmental sciences.) The two immediate outputs, the XML and PDF versions of the papers, take up most of his time. Engelsgerd receives the content, which usually consists of the paper itself, the figures, and the tables, but sometimes also an audio or video clip, through e-mail from Hagedorn. He then usually hands on the paper and tables to a student worker who works from a template to create the online version of them. Large

data sets are stored in separate files. The template from which he works was created with the idea that the content would be accessible across a number of different browsers and operating systems. The length of time taken to process any given paper is entirely dependent on the complexity of the content, but can take between four to ten working hours.

While the student is working on these tasks, it falls to Engelsgjerd to refine the figures using Adobe Photoshop. These upgraded figures files are used in both XML and PDF versions. The requirements for submitting figures have changed markedly since the publication's inception. Initially, *JIS* accepted without question the figures that authors saw fit to submit, believing that it was better to spend time making figures ready for publication than to risk alienating authors, but overall it has proven beneficial to both authors and *JIS* to insist on higher standards of presentation on submittal.

After the figures have been prepared, Engelsgjerd then begins to work on transferring the content into a PDF, which is used as the printable version of *JIS*. Formerly, this process was done using Microsoft Word as a formatting tool. However, after a period of time Engelsgjerd found that he was spending more time than should have been necessary on each transformation due to the limitations of the software. He really needed a product specifically designed to handle text formatting, and chose Adobe PageMaker as he knew it would work seamlessly with other software packages being used by the publication. Indeed, he was so satisfied with the standard of work produced with PageMaker, that he used it to reformat, and in effect upgrade, all the previously published PDFs.

Adobe PageMaker allows for a more modular approach to document creation. Therefore, Engelsgjerd decided to stop inserting tables as Microsoft Word files and instead create separate PDFs for each table, inserting those into the Adobe PageMaker file. It is now the case that this final PDF production process involves Adobe products from start to finish. Adobe programs are designed to integrate seamlessly, which makes it easier to maintain high standards of production. Once the XML and the PDF versions of the paper have been completed, he gives them a final check to make certain that there are no errors. This stage of the process involves not only reviewing the

original submission and comparing it to the post-production versions, but also reviewing it on a number of different browsers. It is standard practice to test *JIS* content on a couple of different versions of Netscape, Internet Explorer, Mozilla, and Opera.

As new browsers come into existence, such as Safari, and Mozilla's new offshoot, Firefox, those get added to the list. Engelsgjerd then notifies the editor, Hagedorn, that the article is now ready for review by the author. The editor then facilitates communication between the author and Engelsgjerd, thereby enabling them to discuss any possible changes to the form or content of the article, though it is unusual for any changes to be made at this late stage in the publishing process.

The *JIS* team sometimes receives audio and video submissions. They see this type of content as the essence of online publishing, but it does present challenges. If the video clips are sufficiently large to warrant streaming they are hosted by the Learning Technology Centre, otherwise Engelsgjerd places the files on the *JIS* server. Audio clips are hosted in a similar fashion, though *JIS* has not had to go outside the Library in order to make that sort of content available. The audio files are served in a Microsoft Wave format.

The Wave file is an audio file format created by Microsoft that has become a standard for PCs. A Wave file is identified by a file name extension of WAV (.wav). Although it is used primarily by PCs, the Wave file format has been accepted as a viable interchange medium for other computer platforms, such as Macintosh. Wave allows content developers such as Engelsgjerd to move audio files freely between platforms, and this does much to facilitate the publishing process.

Wave files are probably the simplest of the common formats used to store audio samples. Indeed, unlike MPEG and other compressed formats, Wave files store samples without any need to pre-process other than formatting the data. The Wave file consists of three segments of information. The resource interchange file format (RIFF) section identifies it as a Wave file. The format section identifies parameters such as sample rates. The data section contains the actual samples.

Once the two immediate outputs have been completed, Engelsgjerd waits for several weeks before submitting the content to BioOne. This timescale is purposefully included in the workflow in order to allow the authors sufficient time to review their newly published content online and request changes and additions. Engelsgjerd follows the specifications required by BioOne during the initial formatting of the content for the PDF version of the paper, which means that images match a prescribed dpi and size, for example. Normally, this lessens the number of modifications to the content, but on occasion a certain amount of double keying has to be done. However, the additional workload is thought acceptable, given the added readership that *JIS* can expect to obtain through being made available by BioOne.

The final production that the *JIS* team handles is to produce a yearly printed volume that is distributed to seven different repositories around the world. Initially, it was intended that *JIS* would be an online production only. However, in order to accept taxonomic papers, and to comply with the stipulations of the Entomological Society of America, they must publish a paper volume of record. This really is a bone of contention with the publishing team. They publish seven volumes on an annual basis, and consequently it is cost prohibitive to outsource this work to a commercial printing house. Hence, they work with in-house print staff, and then send the folios off to be bound.

JIS has realised the goal of becoming a scholarly journal of repute, and been accepted into a number of different aggregating services, thereby increasing its presence and availability quite dramatically. There was a one hundred *per cent* increase in the number of papers published between the first and second year. Nonetheless, there are a number of significant challenges ahead for *JIS*.

The publishing team are now looking at how they could handle the work of up to four journals without any significant increase of staff. The question of how best to lessen the financial burden on the University Library, while holding true to the tenets of open access that brought *JIS* into existence in the first place, continues to be debated. However, none of the various issues involved are in any way insurmountable. It is possible that a decision will be taken to introduce a cost recovery fee for submitting a paper. It is the intention of the *JIS* team to continue to advocate, by

means of example and discussion, for a change in the scholarly communication system. The student employee works on transferring the content from RTF into an HTML template. The full-time staff member works on transferring content from the RTF into PDF, in addition to formatting the figures for both HTML and PDF use.

6.5 Journal of Insect Science workflow overview

In general, the following steps are taken when a JIS article is published.

1. The manuscript, figures, tables, and data sets are sent by the editor, Hagedorn, via e-mail to a full-time member of staff in the University of Arizona.
2. The manuscript, in RTF, is then handed on to the student employee, who transfers content into the HTML template.
3. It is then the task of a full-time staff member to try to improve the quality of the images, re-sizing if necessary, to ready them for publication.
4. The full-time member of staff then begins to transfer content from the manuscript, in RTF, to PageMaker, which is then transformed into a PDF using Adobe Acrobat.
5. The HTML and PDF documents are reviewed for accuracy in both content and display.
6. The documents are published, which is to say they are made available online.
7. Textual emendations, at the behest of the authors or the editor, are made if needed, though this rarely transpires.

The details of this overview process will be discussed in the following sections.

6.6 *Journal of Insect Science* workflow: RTF to HTML

When the student employee receives the RTF, his job is to transfer that content into a pre-made HTML template. There are several features of a published paper that he must take into consideration.

- All diacritic marks must be re-coded such that they appear the same in all the browsers listed in the aforementioned software section.
- Any special symbol that the browsers listed in the software section do not support must be replaced with a small image of that symbol called a Graphics Interchange Format (GIF) file.
- All textual formatting must be coded. For example, italicising Latin nomenclature, or indicating exponents in either superscript or subscript.
- All figure, table, or data sets must be made ready to appear online.
- All references made to the paper's figures, tables, or data sets must be linked to the corresponding items.
- All citations made within the body of the paper must be linked to the corresponding reference at the end of the paper.

The content layout and appearance is controlled by the use of Cascading Style Sheets (CSS). The student has access to what is called a Clip Library in TextPad. This allows him to insert relatively long strings of code by simply double-clicking the appropriate clip. For instance, in order to italicise a Latin word in the body of a paper the following is required:

```
<span class="latin">Drosophila</span>
```

It is not a time-consuming process to type these two pieces of code for a single occurrence of a word, but due to the nature of the papers being published Latin nomenclature appears on a regular basis. The use of a clip library in such instances saves a great deal of time, and it also eliminates the occurrence of typing errors in this context. The figures are placed inside figure HTML templates, and the tables are recreated in HTML and transferred over into page templates.

6.7 *Journal of Insect Science* workflow: RTF to PDF

The use of Adobe products has made this problematic process significantly easier. Those involved with the Digital Library Initiatives Group had two major obstacles to face when they first began working with *JIS* material. The first was formatting the document to give it the appearance of a print publication facsimile. It was found, after a process of trial and error, that Microsoft Word was an insufficiently powerful tool to control the text in the manner they wanted. However, adopting Adobe PageMaker gave them the control they needed to build pages of a satisfactory quality.

The second problem was improving the quality of the figures. The HTML version of the paper made it easier to produce high-resolution images to acceptable dimensions. It was much more difficult to create high-resolution images, albeit smaller in size, for the PDF version. The primary issue was an unacceptable degree of degradation that occurred when files were transferred between Adobe PhotoShop to Microsoft Word, and subsequently to Adobe Acrobat. At each successive step in the process the images lost resolution, and some simply became unusable. However, by replacing Microsoft Word with Adobe PageMaker they were able to transfer the images in their PhotoShop format directly into the paper.

Nevertheless, when a PageMaker document is converted to a PDF there is some loss of file integrity, for although PDF is a recognised program it does not by necessity produce reliable image content and structure. PageMaker does utilise Acrobat Distiller, which is a robust interface that enables the team to produce high-quality documents. This has resulted in large file sizes, but the publishing group and Hagedorn have jointly agreed that this is an acceptable price to pay for a high-quality document. It is hoped that the improved quality of reproduction will encourage authors to submit to *JIS*. A small number of authors had earlier expressed concern in respect of this matter, but now feel that it has been addressed to their satisfaction. It should be noted that the hard copy reproduction overleaf is of inferior quality to the images as they are displayed online. The original photograph was submitted by Dr Norman Davis, who is a colleague of Hagedorn.

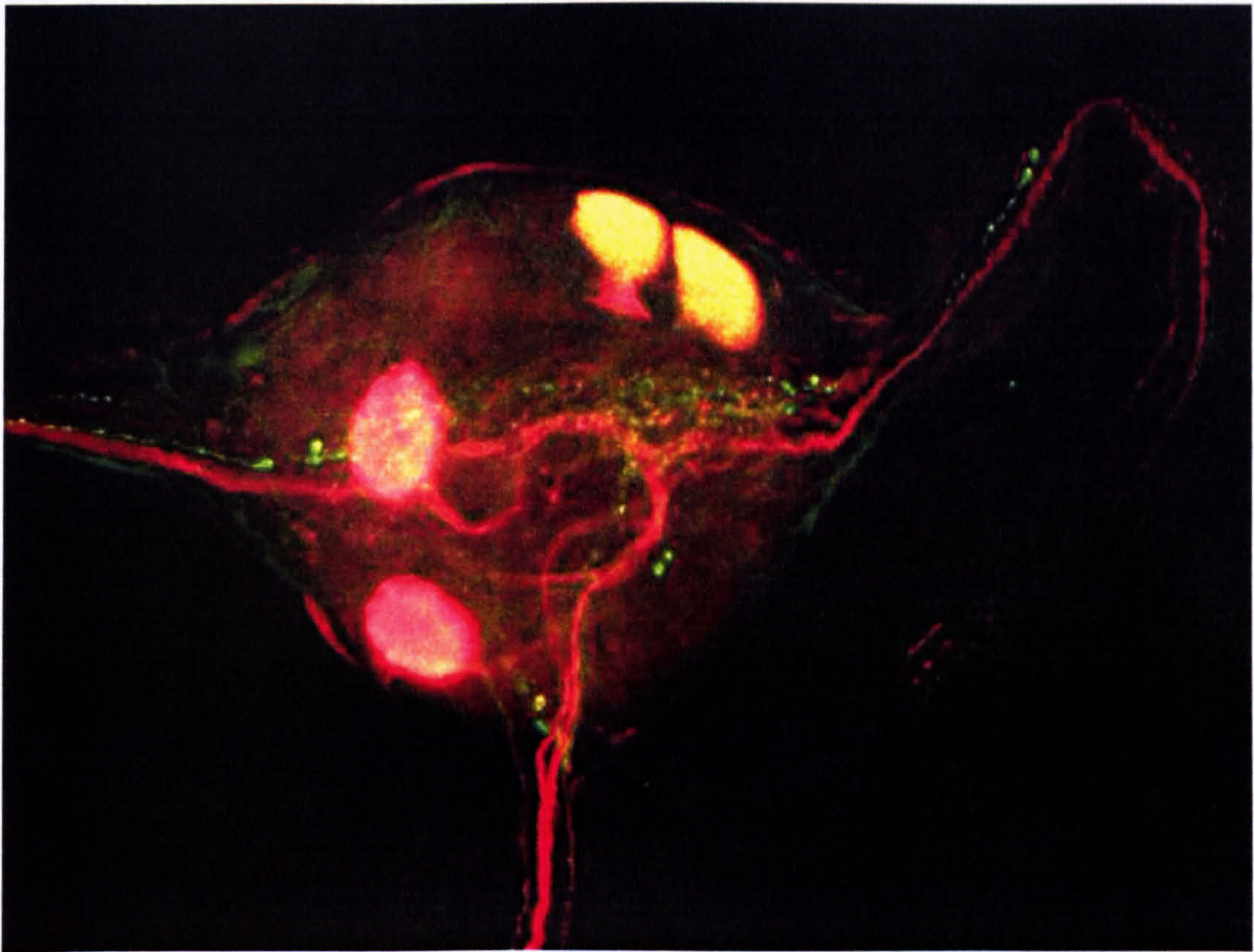
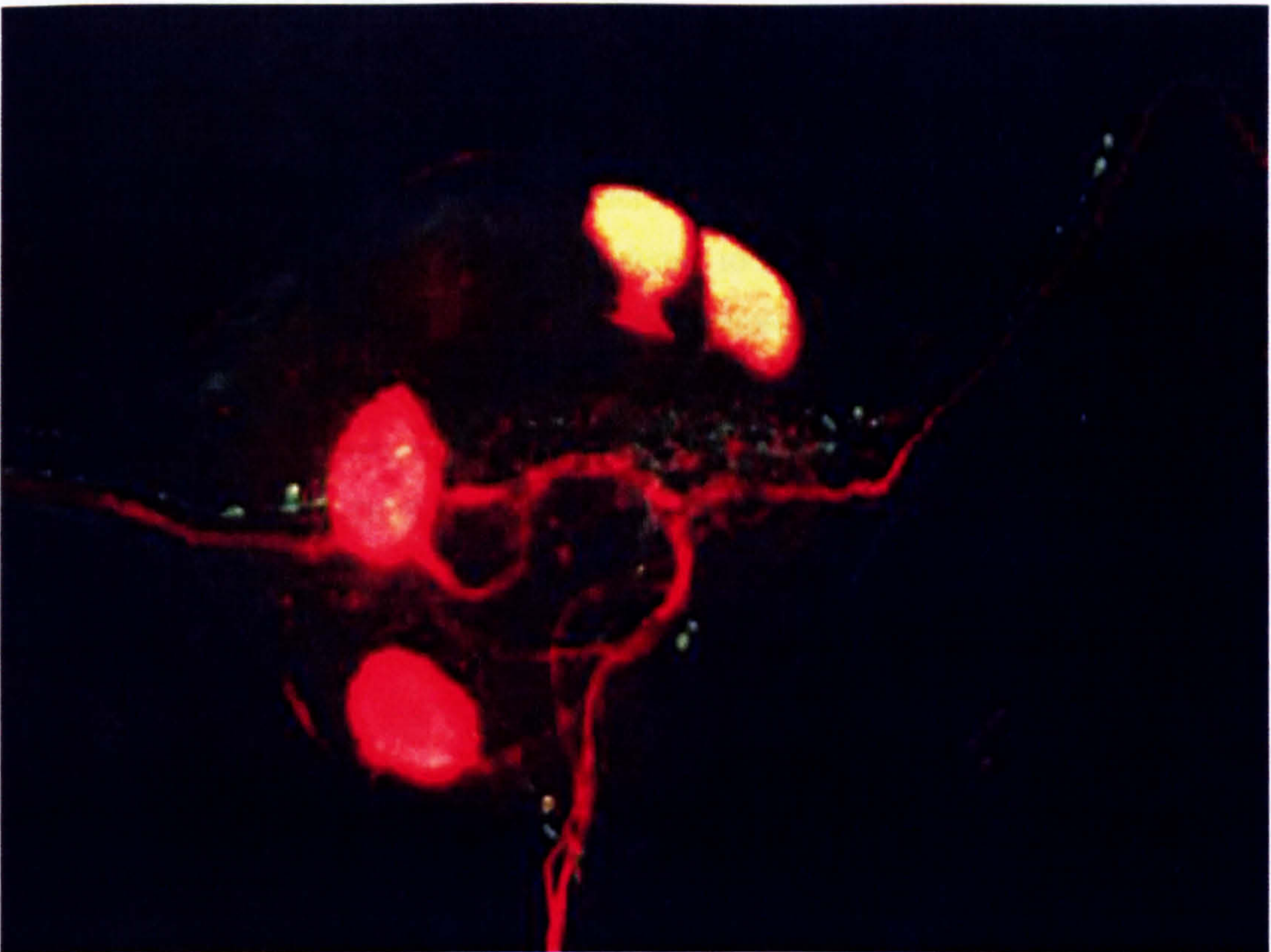


Illustration 6.8: *A digital submission of a caterpillar ganglion submitted to JIS.*

Illustration 6.9: *The same image after it had been scanned for publication by JIS staff.*



6.8 Working with figures

Figures are submitted to JIS in a number of different formats. The publishing group accept figures in the following:

- **Graphics Interchange Format (GIF)**

This is a computer graphic file format, produced by CompuServe, which incorporates Lempel-Ziv-Welch (LZW) compression. It has gained popularity with web page designers due to its small file size, but its restricted palette (8-bit colour) renders it unsuitable for any work requiring high definition.

- **Tag Image File Format (TIFF)**

It was designed primarily for raster data interchange. It is a platform-independent format, which is supported by numerous image-processing applications.

- **Portable Network Graphics (PNG)**

This was designed to supersede the simple GIF file, and the more complex TIFF. It is technically superior to both.

- **Joint Picture Experts Group (JPEG)**

A data compression algorithm named after the group of people who developed it. A graphic file format with a compression scheme to minimise the size of graphics files using full-colour images (24-bit colour) of near photographic quality.

- **Encapsulated Postscript (EPS)**

A commonly used MS-DOS file extension used to identify an encapsulated postscript file, which is a specialised form of postscript. This format usually describes a single page that contains an illustration meant to be included in a large document.

- **PhotoShop**

This is widely used Adobe software that enables high-resolution illustrations to be used and stored.



Example 1
GIF file
100 per cent
magnification

Example 2
JPEG file
100 per cent
magnification

The GIF and the JPEG versions appear almost identical until the magnification is increased, and then the differences are readily discernable.



Example 1
GIF file
700 per cent
magnification

Example 2
JPEG file
700 per cent
magnification



Example 1
GIF file
Cactus bush

Example 2
JPEG file
Cactus bush

One of the main difficulties in this part of the work is producing a clear image that maintains its integrity in terms of the data represented, for submitted figures suffer from pixilation, or fuzziness, around data points, text, and images. The staff member, whenever possible, seeks to eliminate this problem, while maintaining the data intact. This may involve some re-keying of text, in addition to redrawing axis lines, and erasing pixilation around images. The main goal of this work is to get a PhotoShop formatted image that is scalable. Images for the HTML version of the paper are generally re-sized in order that their width does not exceed 725 pixels. Images for the PDF version are re-sized so that their width does not exceed 3.8 inches.

6.9 Marketing *JIS*

Customer relationship management skills are key to establishing and maintaining contact with authors and readers. There is little point in having an online journal if potential readers and authors in the field are unaware of it, or have the wrong impression of it. SPARC promoted *JIS*, of course, but Dr Hagedorn and the DLIST team knew that *The Journal of Insect Science* did not yet have name recognition, and that to raise awareness, and establish a reputation, they themselves would be required to take the initiative. Karen Williams, DLIST team leader, assumed the task of generating publicity for the new publication. Her remit was not only to raise awareness of *JIS*, but also that of the open access movement in general. [15]

DLIST supplies a service, the promotion and distribution of scientific research material in the field of entomology, and promotes a brand, *The Journal of Insect Science*. Williams was marketing, but not selling. The assumption that the marketing team works on is that authors and readers are for a journal that best suits their requirements. Hence, in promoting their online journal they must define those requirements, and identify how they have been met. Williams identified a number of points relevant to both producers and consumers of scientific research material.

- The journal is open access, therefore it is not a strain on a library budget. The library profession can be informed by mass e-mailing, and speaking at library conferences.
- It is a dedicated online journal, and as such occupies a place in the global marketplace for scientific information. It can be accessed 24-hours a day by anyone with a web connection.
- It uses cutting edge online publishing technology, and can be of assistance to authors who wish to utilise this facility but lack the necessary technical knowledge.
- It is relatively common for authors in the field of biology to be asked to pay a fee for publication. Authors may be charged on the basis of character, word, or page. However, *JIS* has no author fee.
- *JIS* sits comfortably with the traditional ethos of the research library, but everyone knows that it must compete against commercial publishers for papers and site hits. *JIS* is not trying to sell a service to customers, but instead is providing a service free of charge. Nevertheless, *JIS* must compete effectively against those who do have scientific articles to sell to readers, and prestige to sell to authors.

Williams and her team saw this through a relationship marketing perspective. They maintained close personal links with authors and readers, and believed that they understood their requirements, while nevertheless being aware that such things in themselves are not sufficient to guarantee success. A loyal patron base was essential to *JIS*; authors who submitted articles on a regular basis, and readers who access the site regularly. Williams knows that retaining authors and users is important, for it is easier to acquire an understanding of a stable user community. *JIS* can then begin to learn the services that users need, and respond in a suitable manner.

Williams confesses that it is sometimes difficult to know where marketing ends and service delivery begins. This is marketing and service delivery in one. It is a tailored marketing communication that makes recipients aware of the service that is on offer, affording an opportunity for developing relationships, and creating positive impressions. Hence, it is by this means that marketing, or the idea of raising

awareness, becomes embedded in the overall strategy of service provision. Some recipients have responded positively as authors, by submitting their papers, while others have responded by regularly visiting the site, and by citing the articles published there in their own papers.

It perhaps goes without saying that it is to the advantage of authors to have their research work made available to the maximum number of potential readers. This is made possible not only by traditional marketing methods, but also by having the journal listed in all the secondary sources used by the potential readership, such as abstracting and indexing databases. Williams has worked with SPARC, and with PubMed Central, and with BioOne to get *JIS* into indexes. It proved comparatively easy to gain admittance to most of the major indexes. Indeed, Index Medicus approached *JIS* with a view to listing the publication. Williams says that there are certain advantages to being part of the open access movement, and that some of the people who work for the major indexes have proved very supportive.

The DLIST marketing team make an extensive use of e-mail to establish dialogue with authors and readers. They send targeted e-mails to potential authors and readers, but the team have found it difficult to assess the effectiveness of their marketing strategies. The *JIS* online community provides an opportunity not just for interaction with DLIST staff members, but for authors and readers to communicate among themselves. The library cabinet members have budgeted for marketing costs, but sooner or later they are expected to ask for some return on their investment. The DLIST team needs to be able to justify a further request for marketing funds. Moreover, they freely confess that they are still at the stage of learning on the job, and collecting evidence of the effectiveness of their work. They have identified a number of different methods for the creation of a sustainable budget.

- The adoption of an author-fee system.
- A percentage of income to be set aside to fund marketing.
- The budget for marketing to be flexible.
- The marketing budget should be sufficient to fund the stated objectives.

Of course, measuring the impact of any form of promotional activity is somewhat problematic, but the number of hits on the site is one form of objective measurement. However, the *JIS* technical team cannot measure hits to the site when it is accessed through secondary sources, such as PubMed Central, or BioOne. Nevertheless, such resources do help to promote *JIS* in four fundamental ways.

- They provide for much greater exposure of the intellectual content, thereby widening the audience base by a considerable degree.
- A number of these resources allow interlinking between the unabridged texts of citations and *JIS* articles.
- CrossRef, which serves libraries at no charge, has now dropped its DOI retrieval fees for members and affiliates. This is particularly significant for secondary publishers, as DOI links from citations and bibliographical databases to full text articles are likely to increase greatly as a result.
- These resources act as an additional venue for the archiving of *JIS* papers, thereby improving long-term preservation.

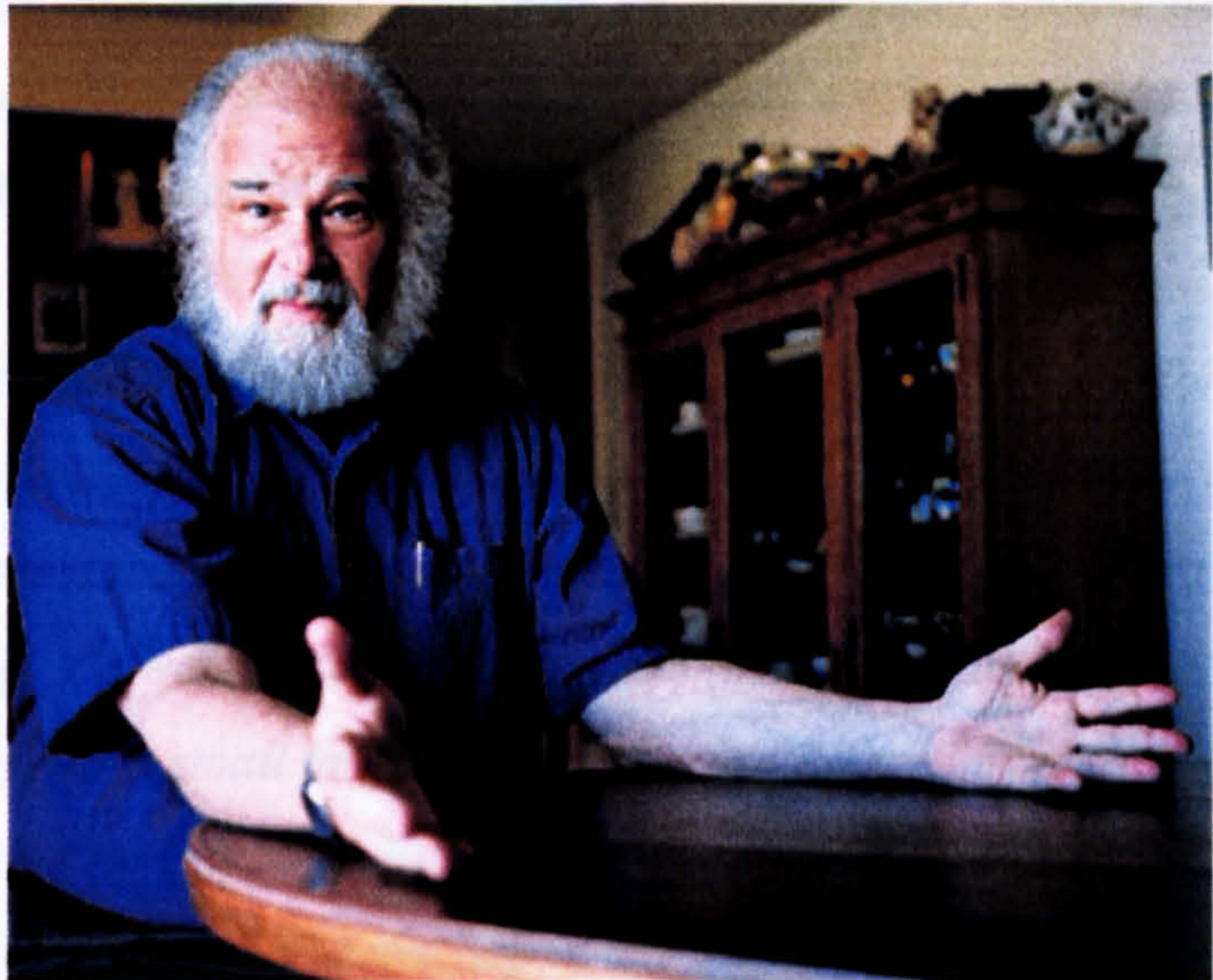
It can be problematic to objectively measure the impact of their promotional activities, for there is the question to consider of how to differentiate between the user response after any form of promotion, and what the user response would have been had no such promotion taken place. Moreover, it is difficult to distinguish between the degree of influence effected by the *JIS* promotion on the audience targeted and various other components of the promotional effort, such as the fact that *JIS* is open access, does not ask for an author fee, and employs a variety of distribution mechanisms.

Online publishers have a number of methods for collecting user data related to site visits, the nature of any transaction performed, and user profiles. In addition, there is non-proprietary software available that enables comprehensive analysis of the raw data, thereby offering perspectives of user behaviour that would be difficult to ascertain by manual means. It is difficult, if not indeed impossible, to record how often a print journal has been consulted. Nevertheless, Williams admits that it is difficult to ascertain the behaviour and attitudes of users in the context of a public

service operation. The means of measurement used are more esoteric, more subjective, more qualitative. Williams seeks to gauge the level of reader engagement with the service provided, and to relate that to online visibility, which is altogether problematic. The DLIST team members seem to be aware that there are no straightforward answers to the problems they face in promoting their publication, nor indeed in presenting their findings. It is all too easy to confuse with graphs and statistics, blinding readers with abstractions, instead of conveying the required information in a cogent manner. Williams thinks it important to report what they do not know, as well as what they do.

6.10 Evolutionary Ecology Research

Dr Michael L. Rosenzweig (below), a professor of ecology and evolutionary biology, believes that the results of scientific research should be accessible to the largest practicable number of people. He publishes a journal titled *Evolutionary Ecology Research*. Rosenzweig is rightly proud of the fact that his journal is funded solely by its subscribers. He has made it plain that he is not publishing in pursuit of financial gain, which implies that his journal is essentially operating on a cost recovery basis.



'The mission of Evolutionary Ecology Research is to run a first-rate journal of the

highest quality, with an international board of editors that can stand up to any other journal in the business and hold its head high, but to do that while maintaining a small profit margin, because we want to show commercial operators that they can make profits from journals that are fair profits, and not exorbitant profits.' [16]

Rosenzweig, in the act of founding of his journal, took *The Journal of Vegetation Science* as his exemplar. It is a learned society journal, which is published by The Opulus Press, though under the auspices of the International Association of Vegetable Science. Joost van der Maarel, and his colleagues, founded The Opulus Press in 1989 because they wished to improve ease of access to high-quality scientific research literature, while charging the lowest possible subscription fees. The Opulus Press does indeed turn a small profit, but its guiding purpose is to serve the publishing needs of the international scientific community. Rosenzweig has said, '*The Journal of Vegetation Science is our role model. It is the pioneer we will try to emulate*'. [16]

He has two decades of experience in editorial work, and he was formerly the editor of *Evolutionary Ecology (EE)*. However, Rosenzweig was unhappy with the way that things were going and, in November 1998, he saw fit to tender his resignation, along with the entire editorial board, from that journal. This did much to change a number of people's perceptions of scholarly publishing. A Rubicon had been crossed. The affable, though formidable, Dr Rosenzweig faced various difficulties of a legal nature in regard to his departure from Wollters Kluwer, but eventually came out on top. It takes courage to take such a stand, and Dr Rosenzweig should be applauded. There are invariably difficulties in initiating and editing a refereed journal, even for one as experienced in the field as Dr Rosenzweig.

'SPARC has been an absolute requirement for our success. SPARC, for us, was a marketing organisation. They marketed our journal very simply by telling other librarians trust them, they're worth trusting, support them, they're worth supporting. We were able to attract enough subscriptions in our first year so that we only lost a small amount of money. We didn't have a large amount of money available to us to lose. By the second year we were in the black. Without SPARC it just wouldn't have happened. Especially given the climate, where library after library has had to say, no new journal subscriptions . . . no new library subscriptions unless you tell us which journals to cut. You can trade, but you can't add. Even in that climate we were able to attract subscriptions because of SPARC.' [16]

Rosenzweig's testimony proves that it is advantageous to have the SPARC seal of approval on the front cover of a learned journal. If SPARC has been good for Rosenzweig, and it rather seems that it has, then Rosenzweig has been equally good for SPARC. Carla Stoffle gives full credit to him for assisting SPARC.

'Michael Rosenzweig . . . was someone who was clearly doing the right thing, and he was doing it with his own money. He wasn't even asking us for money. He went on to be a great advocate for SPARC, and has been all over, talking about what he's done, and what the issues are.' Indeed, *The New York Times*, in its December 8, 1998, issue went so far as to describe Dr Rosenzweig as 'the poster child of the movement', and went on to report that, '...although the battle is being fought over subscription prices, what is really at stake...is the scientific process itself'. A number of SPARC's subsequent partnerships resulted from this article, with academics involved in editorial duties for commercial publishers making inquiries in regard to the possibility of following Dr Rosenzweig's example. [16]

Rosenzweig would like to demonstrate that scientific journals do not need to be handled by large commercial operations, which have an inclination to maximise profits derived from publishing. He believes that it should be handled quietly, professionally, and successfully by relatively small groups of people. Academics and professionals in association, running operations that incur comparatively small overhead costs. Rosenzweig was told that he would lose economies of scale when he moved from a big publishing house to a single journal, but he thought that he had more to gain than to lose. The price of *EE* increased by 19 per cent a year during the period that Rosenzweig occupied the editorial chair, much to his consternation, and indeed that of his editorial board. In January 1999, they launched their own journal published by a new corporation created by Rosenzweig. A subscription to *EER* was priced at \$305, which was less than half the \$800 dollar subscription price asked for *EE*, which was seen as its main competitor.

In addition, *EER* managed to break even in its first year of publication. Allowing for the annual inflation rate of journal prices, it is now possible to purchase both journals for less than the price that *EE* would have been had its price increased at

the same rate as most other journals. In fact, *EE* has been compelled to reduce both its subscription price and the number of issues *per* volume. Rosenzweig has promised that *EER* will remain as inexpensive as possible. The table below compares the publication records of both journals.

	<i>Evolutionary Ecology Research</i>	<i>Evolutionary Ecology</i>
1999	Published 63 papers (Volume 1)	Published 45 papers (Volume 13)
2000	Published 66 papers (Volume 2)	Published 42 papers (Volume 14)
2001	Published 69 papers (Volume 3)	Published 38 papers (Volume 15)
2002	Published 81 papers (Volume 4)	Published 38 papers (Volume 16)
2003	Published 86 papers (Volume 5)	Published 32 papers (Volume 17)

Table 6.2: *Comparison of published papers*

Authors were clearly willing to submit their papers to the new journal. Indeed, over 90 per cent of authors withdrew the papers they had submitted to *EE* after Rosenzweig and his editorial board resigned, which went some way to enabling *EER* to publish over 1000 pages in eight numbers in 1999, and publish over 1050 pages in eight numbers in 2000. These figures are indicative of the wholehearted support that Rosenzweig received from the authors and editors involved in his area of research. *EER* was included in the major indexes sooner than was originally hoped, and this gave yet further impetus to the journal's development. Dr Rosenzweig occupied the chair of editor-in-chief of *EE* for twelve years. Hence, he has a good track record in this area, and is familiar with the complexities of business administration in a large publishing house, though his insights are sometimes more intuitive than analytical.

'I know that a big corporation has a lot of wheels that need to be lubricated. A lot of meetings have to be held, a lot of decisions have to be taken collegially, a lot of people to satisfy with budget divisions.' [16]

His own publishing model is much more flexible, and perhaps more cost efficient, too. He says that because there is not a lot of money involved they can afford to adopt a more relaxed attitude. There are many employed in the publishing

trade, particularly the old hands, who would agree with Rosenzweig's philosophy. The argument that a publishing house functions more smoothly when run as a cottage industry still has its proponents. Indeed, for a good many years journal publishing was a cottage industry, albeit with a touch of the gentlemen's club about it. Macmillan published *Nature* for more than a century without making a fortune, and sometimes even incurred a financial loss.

The *EER* project is also demonstrating that there is, perhaps perforce, a symbiotic relationship between e-journal and e-print. Scientific publishing seems to be moving toward a focus on individual papers, as opposed to an individual journal issue of collected papers. Publishing in an electronic environment does not in itself obviate the need for regular periodic issues, but it does bring that hitherto standard practice into question. It is becoming more common for scientific papers to be published on an article-by-article basis, and that indeed is the practice adhered to by *EER*.

Rosenzweig sees information technology very much as a means to an end, which is the improvement of scholarly communication, and not an end in itself, which means using it merely because they know how. He has a no-nonsense approach to scholarly publishing.

'First of all, let me just tell you what we are not. We are not a cutting-edge innovator of presentation, nor are we innovative in page design. If you choose to visit our Web site, you will see a clearly laid out display, which is easy to follow. There are no flashing icons, and there are no zippy graphics. We don't have any of these fancy, drop-down menus. We haven't implemented an electronic submission system, and we don't use XML. We don't hyperlink the references in our journal's articles, or even produce much of an indexing capability. Now, I'm not going to promise never to do any of these kinds of things. There may be the need to change the way we do things at some point in the future, but that remains to be seen.' [16]

Moreover, Dr Rosenzweig admits that future changes in publishing methods used by *EER* may simply be driven by associative changes in the way that biologists

choose to present their research findings. To that extent, he knows that he must be ready and able to respond to market forces, and indeed intellectual fashion. *EER* may see online versions that include author-written software. Readers could use such software on their own data sets, and they could use mathematical expressions with interactive input and output. He is also interested in using colour to expand the dimensionality of the pages in the printed edition.

'We could view video files of courting fishes, and listen to audio files of birdcalls. We haven't done any of this yet, but we may choose, or perhaps we may feel compelled, to go down that road in the not-too-distant future, but the storage of multimedia would have to be safe and reliable, and I just don't believe that's the case at present.' [16]

EER has been, and continues to be, remarkably successful in attracting submissions from scientists of repute. The earliest possible publication of a peer-reviewed scientific paper is a compelling attraction to authors. The *EER* team has an *Early Initiatives* policy, which facilitates swift publication of research findings, by posting peer-reviewed papers on the Web site before they have been published in the monthly print-on-paper issue. This brings author-revised, journal-approved information to readers approximately six to eight months before they would otherwise have it. The paper journal seems to retain a symbolic role in authentication; though online papers are easier to find and access, they are less certain in status. The rejection rate for *EER* is around the 50 *per cent* mark, which is fairly typical for a journal in the field of biology.

'I was advised when I became a journal editor that a good journal has a very low rate of acceptances. I am in a science in which a lot of people actually assess the value of a journal by looking at the rate of rejection, and the higher the rate of rejection the better the journal must be. I know of ads that have gone in for some journals, Ecology Letters, as an example, which help trumpet their very high rate of rejection, as if it were an advantage. I think that speaks volumes about the group of scientists I belong to, who are interested in pleasing numbers.' [16]

Rosenzweig admits that initially he thought it would take a year or two before he could actually publish in paper, and perhaps even longer online, but the development phase was to move at a faster pace than he expected. Rosenzweig's provisional publishing plan, what he describes as his *'intermediate position'*, did not include an online version of the journal, but the typesetter was providing the PDFs, and consequently he decided to opt for a system of parallel publishing.

'At first we planned to be print only. We thought we'd produce an online version in 2000 or the following year. Then a number of things happened to change my mind. For only a little extra, our typesetter could give us PDFs for an online version. The State of Arizona's tax office looked favourably on us if we had an Internet service, allowing us to reduce the journal's price by another five per cent. Librarians were using the Internet to help battle costs; some would be happiest if they could subscribe to an online version and forego the printed copies entirely. So, we took the plunge. We set the online subscription rate at \$272, and the combination at \$305 with postage.' [16]

It cannot be gainsaid that the passive voice is a signal feature of scientific discourse, unless one chooses to publish in *EER*, of course. To be sure, Rosenzweig is at his iconoclastic best when he enjoins authors to, *'Use the active voice when you can'*. In addition, *EER* authors are advised to employ personal active subjects, particularly the first persons 'I' and 'me', if it promotes accuracy. Rosenzweig wishes to promote clarity of exposition, and if that means flying in the face of tradition so be it. The editorial and production standards of *EER* are intended to facilitate comprehension to the greatest degree.

Rosenzweig is, by any standard, a singularly industrious and conscientious individual, but there are only so many hours in a day. A great deal of his time in the months immediately preceding the launch of his journal was taken up by innumerable negotiations with players in the system and, of course, with administrative work of a comparatively mundane nature.

- Finding a reputable Internet service provider, and then negotiating a contract.

- Negotiating a mutually acceptable settlement with the publisher of *Evolutionary Ecology*.
- Becoming acquainted with the labyrinthine rules of the United States Postal Service in order to obtain the mailing privileges to which periodical publishers are entitled.
- Soliciting bids from typesetters, copy editors, and printers, in addition to having prolonged discussions with successful bidders.
- Discussing business practices with a lawyer and an accountant.
- Spending many days posting articles to the Web site of *EER*.
- Keeping library Internet protocol number access lists up to date.
- Compiling lists of suitable recipients for mail shots.
- Assisting SPARC to inspire confidence in serials librarians that these new journals are worthy of support, and are worth the price of their subscriptions.

Rosenzweig regards the print-on-paper issue of *EER* as imperative to the journal's success, but admits that it is an expensive option, for about half of the costs are associated with producing the paper version of the journal.

'I would love to see the day when authors did not decide to send their work to a journal only if it had a paper version. Most ecologists today will go online, look for articles, search for them, take them, download them, print copies, and be perfectly happy to do that, but when they look for an outlet for their own work they want something in black-and-white. It's almost a price of admission. If we didn't have a black-and-white to go with our electronic I think we'd fail. We're printing EER on acid-free paper. The print version will surely last for centuries.' [16]

While a new equipoise in learned publishing is gradually evolving, Rosenzweig is acutely aware of how problematic it may be to change the established order. The coming years may indeed see the print journal lose its talismanic power, but it would not do to hold one's breath. The inertia of the traditional publishing paradigm should not be underestimated. [17]

'The leaders in ecology are going to be a small number of journals with established reputations, like the American Naturalist, like Ecology, like the Journal of Animal Ecology, like the Journal of Ecology. When these great society journals are willing to cut themselves off from paper editions we'll know that journals like Evolutionary Ecology Research can also cut itself off from paper. Until that time we can't.' [16]

The *EER* Web site, the home page of which is shown below, contains a number of articles on academic publishing in general, most of which are authored by Rosenzweig himself. It can be seen that his interest in scholarly communication goes far beyond the scope of his own publication.

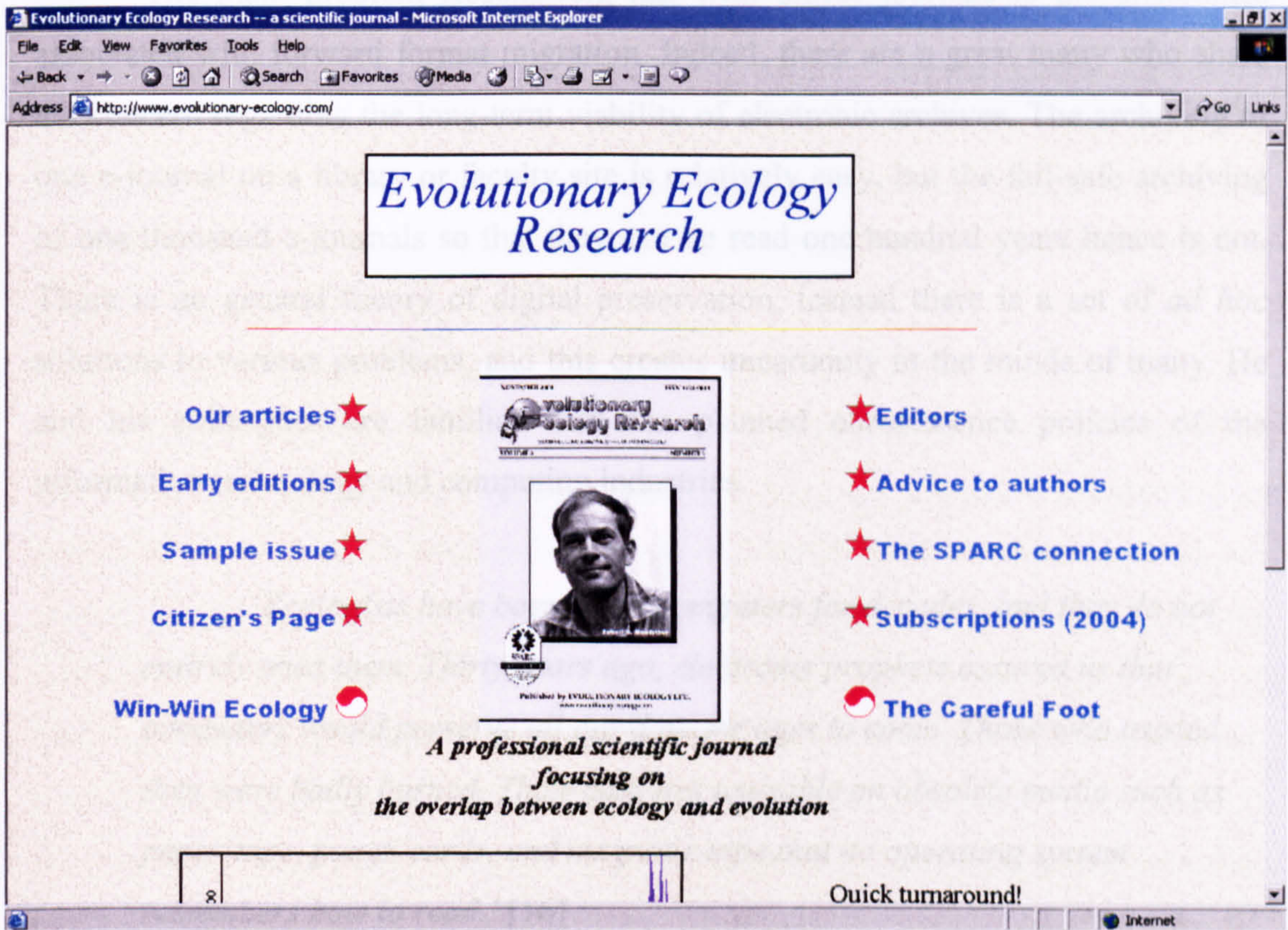


Illustration 6.13: *Evolutionary Ecology Research* home page

Rosenzweig explains that biologists have a venerable model for the rigidity of the present system. When a new taxonomic entity such as a species is discovered, it is described and named in print, but if too few copies of the publication are available,

the description and naming are set aside as irrelevant, and the publication viewed as if it had never happened. He says that he will know electronic archiving has matured and succeeded when taxonomists allow new species to be described in dedicated electronic publications. However, where does that leave cutting-edge journals such as *Journal of Insect Science*, publishing audio and video files that cannot be converted to a paper-based medium? Arguably, in pole position, for sooner or later authors are going to learn how to use these facilities to improve the presentation of their research papers, and when that time comes, as it surely must, *JIS* and those like it have a head start. The ability to transcend the limitations of the printed page may well change the way research findings are compiled, and how those findings are presented to the scientific community.

The main problem Rosenzweig has with online journals is the difficulties associated with forward format migration. Indeed, there are a great many who share his concern regarding the long-term viability of electronic archives. The archiving of one e-journal on a library or faculty site is relatively easy, but the fail-safe archiving of one thousand e-journals so that they can be read one hundred years hence is not. There is no general theory of digital preservation, instead there is a set of *ad hoc* solutions to various problems, and this creates uncertainty in the minds of many. He and his colleagues are familiar with the planned obsolescence policies of the information technology and computing industries.

'Ecologists have been using computers for decades, and they do not entirely trust them. Thirty years ago, electronic prophets assured us that computers would preserve all our data for ages to come. Those who trusted then were badly burned. Their data lies unusable on obsolete media such as paper tape, punch cards, and magnetic tape that no operating system remembers how to read.' [16]

Rosenzweig notes that the preservation of e-journals poses a number of key challenges.

- Software needed to view e-journals can easily become obsolete, and requires to be continually updated.

- Hardware required to view e-journals can become obsolete.
- Many view electronic storage media as inherently unstable, and such storage media may become corrupted, if not lost completely, without any forewarning of external damage.
- The context of an e-journal article, and its relation to other works, could easily be lost.

Rosenzweig, speaking *ex cathedra* regarding this question, places himself firmly in the paleolibrarian camp, employing the fail-safe device of bound paper volumes on library shelves, while making the valid point that members of the library profession cannot guarantee to preserve digital material they do not own in the first place. SPARC makes a strong case for institutional repositories, while supporting 'a broad pan-institutional effort', and regards publishing and archiving initiatives as equally important in its quest to reform scholarly publishing. [18] Preservation remains a significant unresolved issue of electronic publications in the minds of many, and one of the key factors in the widespread acceptance of dedicated online journals is the creation of electronic archival systems that can guarantee research papers to be available in perpetuity.

Nowadays, with so many journals being available solely in an electronic format, and being archived on university systems, the academic community is rightfully concerned that their published work, mostly research articles, which are indeed the mainstay of scientific publishing, should not be lost. SPARC publishers are now intent on building confidence among researchers that their archives are just as viable over the long term as any other format. There is one aspect of the academe-based publishing system that has caused Rosenzweig some disappointment, and that is the reluctance of senior colleagues in the discipline to submit their papers to online journals.

'Those people who are not concerned about academic advancement anymore. Who don't need to publish that article in order to get the next grant. Who don't need to worry about the promotions, because they've had all of their promotions. They have not, most of them, focussed enough on where they

publish. They are still supporting journals that do not allow free access, and that try to tie up scientific information. I wish they would take the situation more seriously, and in their own scientific lives support this. I really think that this is of crucial importance to society. ' [16]

Rosenzweig forgot for one moment that *EER* is not, has never been, and does not plan ever to be, open access, though the subscription he asks is easily affordable to research libraries and biologists. Indeed, he offers the entire contents of the first three years of *EER* on a compact disk for the 'measly sum' of 10 dollars. Rosenzweig, and a good many others, believes that the library profession, and the research communities, are insufficiently supportive of the not-for-profit e-journal initiatives. However, this apparent lack of support from certain members of the discipline has not prevented his e-journal becoming a success in terms of subscriptions, Web site hits, downloads, and citations.

6.11 Conclusions

My analysis of the nature of these two publishing projects leads me to the conclusion that journal publishing in academic environments has been a success, though that is not to say that such projects may not face problems at some point in the future. Nonetheless, such e-journal publishing projects are increasing in number, and there is indeed strength in numbers. *JIS* and *EER* have not really learned anything from each other, nor have they made any attempt to work together. They remain two autonomous operations that are happy to do things their own way. It is not that they avoid interaction; they apparently have never considered it. There is certainly no animosity between them, but rather more an attitude of relaxed indifference. It is surprising that they do not take more interest in each other's work. After all, they are based in the same department, and they are both members of SPARC.

These publications are long-term investments in time and resources that, in conjunction with a plethora of similar projects, are causing commercial publishers some concern. Hagedorn and Rosenzweig hope that their journals can be among the

pebbles that eventually precipitate an avalanche of open access publishing. However, many academic staff members seem to be as yet uninformed of the immense change in the scholarly communication system that lies ahead. Surprisingly, some members of the library profession do little to assist the advancement of open access journals, and of SPARC journals that charge affordable subscriptions. There are many research libraries that do not link to open access journals, and this realisation causes the editors of *JIS* and *EER* not a little anguish.

JIS and *EER* employ rather different means to achieve similar ends. A study of these two scholar-led publishing initiatives shows that there can be no one-size-fits-all formula for publishing scientific journals. The publishing process is too multifaceted to be moulded into a unitary scheme. Academic libraries, and faculty members, have in effect been pushed into restructuring their work practices by a dysfunctional scholarly communication system. However, it may yet prove to be a blessing in disguise. It seems that, at least in the context of scholarly communication, SPARC is teaching academe to rely on no other party but itself.

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CHAPTER SEVEN

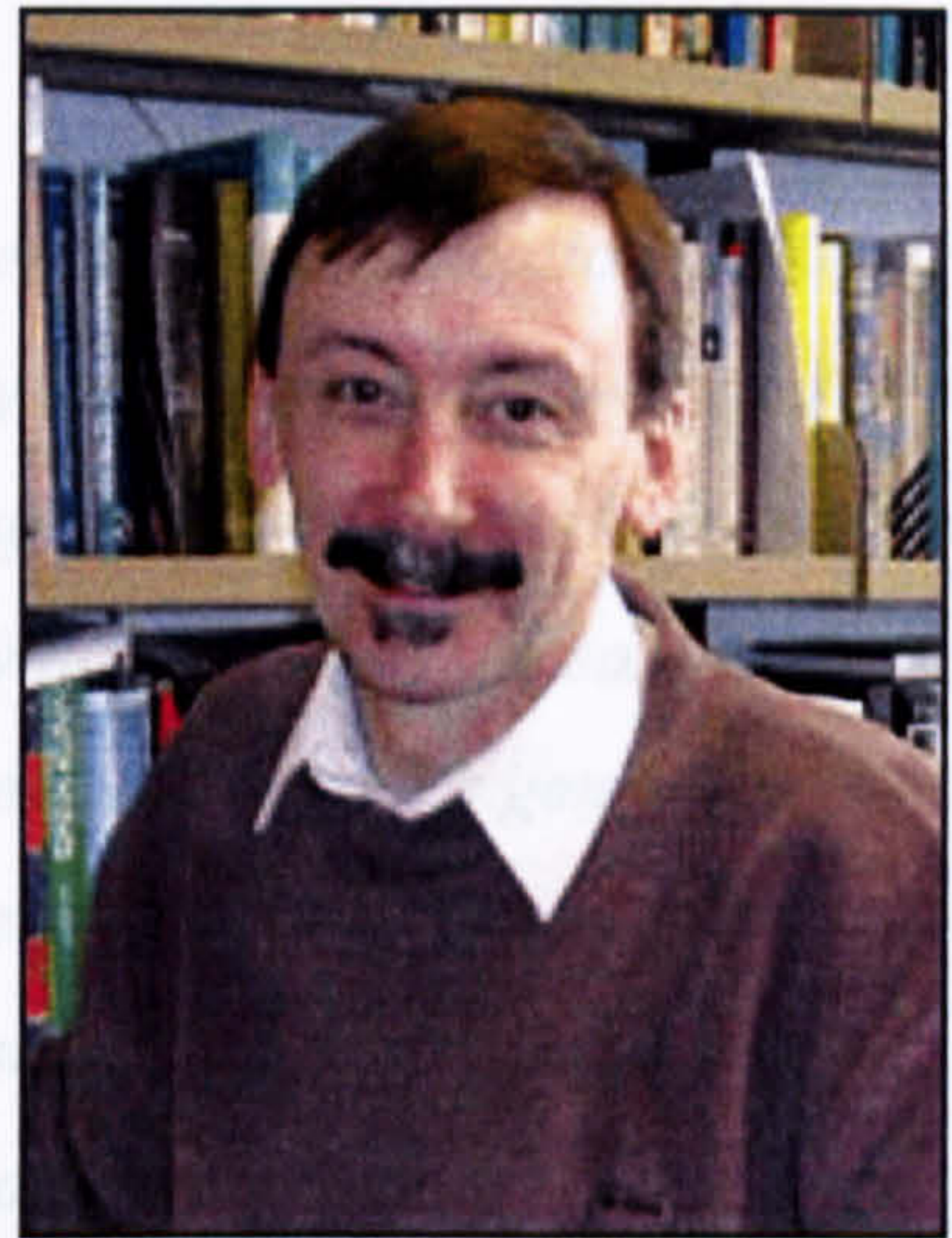
Journal of Digital Information

7.1 Introduction

The Journal of Digital Information (JoDI) is radically different in concept from the two biology journals studied in the previous chapter. There follows a case study of an e-journal whose editor looks upon experimentation as the *raison d'être* of the publication's existence. *JoDI* may be a little more *avant-garde* in its modes of presentation than most, but it nonetheless eschews novelty for the sake of it. Innovation is to be applauded, but *JoDI* does not let this aspect impact upon the academic rigour of its content. *JoDI* is a good example of a successful academe-based e-journal publishing operation. It charges neither subscription nor submission fees, and has flourished from its inception by nurturing a cooperative mindset among all those involved in its publication.

JoDI is an open access, peer-reviewed scholarly journal that is a joint initiative by the Department of Information Science at Loughborough University, and the University of Southampton Multimedia Group. The British Computer Society and Oxford University Press (OUP) have both financially supported *JoDI* since its inception. It was typically circumspect of OUP, a rather conservative publishing house, and the twelfth largest publisher of scholarly journals, to experiment with open access by means of a proxy. [18] OUP will move one of its own journals, the prestigious *Nucleic Acids Research*, to a full open access publishing model from January, 2005. *JoDI* has played its part in demonstrating that open access can be a viable publishing model, while publishing articles on the management, presentation, and the use and usage of information in an electronic environment. *JoDI* has several thousand registered users and, although there is no longer a need to register in order to obtain free access to *JoDI* articles, there has nevertheless been a steady growth in the number of registered users. [30]

Editorial staff members believe that this indicates they are reaching a new readership as the theme structure continues to grow, and as *JoDI* expands its coverage of the discipline by means of special issues that target specific areas of interest. *JoDI* wishes to be seen as a confluence of every stream of research in its area. [3] It is intended by its founding editor, Professor Cliff McKnight, (right) to be ‘used electronically’, in contrast to being merely read from a monitor screen or printed, though each paper has a printable version made available. [1] In the main, reading is a passive process; using implies some level of interaction. [19] *JoDI* supports, ‘...interactive data manipulation and comparative analysis, giving the user information to act on...’. [26] It is this desired element of interactivity, as yet in part an aspiration, that differentiates *JoDI* from other journals in the field of information science. This means that the facility to intervene, in a deliberate manner, within various forms of digital information is the ultimate goal. [28]



JoDI provides a platform for experimental scholarly publishing, thereby championing what the Association of Research Libraries has described as the ‘*emergent model*’ in scholarly communication, which is the use of computing and information technology to transcend the limitations of the printed page by offering innovative modes of presentation such as hypermedia. [2] This electronic publication was founded in 1997 as an outlet for research material in such fields as ‘*hypermedia and digital libraries*’. [3] The editor declined to publish a journal targeted at any specific subdiscipline, believing that an eclectic approach would ultimately prove more likely to attract submissions in what was, and indeed still is, a protean area of intellectual inquiry.

7.2 The ethos of *JODI*

McKnight, being a psychologist with an interest in how information is generated and used, was aware that the embryonic hypermedia culture could have a profound

influence on the way that researchers compiled and presented their research findings. [26] There are profound differences between oral and written discourse, and between the written and the printed word. Cursive script has its obvious advantages, but it is no substitute for the printing press. Illustrations drawn by hand are possessed of an aesthetic appeal, but their photographic counterparts are more convenient, and have myriad other advantages besides. These technological innovations forever changed the manner in which scientific research material was compiled, presented, and distributed. Indeed, they changed the culture of scientific inquiry itself. It is a prospect worth considering that hypermedia and digital libraries could yet effect a change similar in scope. [4] [16]

As befits a true electronic journal, the entire communication chain from author to reader is handled electronically using software developed at Southampton University by Wendy Hall's group. Authors submit their articles by uploading the relevant files to a directory within JoDI. At the same time, they fill in a metadata form and nominate a theme editor. This generates an alert to the theme editor that includes a unique URL for an editorial page, through which the article can be managed. Also included on this page is the facility for the editor to nominate referees, who are then automatically e-mailed with an invitation to view the article, and submit their review online. The reviews appear on the editor's page, and editors signal their decision to the production staff through this same page, e-mailing comments and suggestions to the author. [70]

JoDI was founded on the premise that digital publishing and open access would together prove to be the twin pillars of a revamped scholarly communication system. A successful open access movement may succeed in effecting a transformation of the publishing industry, compelling it to move from being product-based to being service-based, which would mean that publishers would sell services to authors and institutions. This would be a sea change in scholarly publishing. However, how should an e-journal be defined? McKnight offers his definition. [1]

'A lot of publishers, when they started to talk about electronic journals, were basically putting out paper copies that were PDFs. That to me

is not an electronic journal. PDF for me is a print-on-demand format. It is meant to be printed out. It is based on PostScript, which is meant to be sent to a printer. For me, an e-journal is one that is used electronically as well as stored electronically.'

Nonetheless, this kind of e-paper journal is exactly what a lot of readers want; it depends very much on the attitudes and opinions of those working in a particular discipline whether anything more than that is perceived as being useful. Some researchers, for example, economists, have very traditional views in respect of scholarly publishing, while other researchers, such as those working in the realm of information science, are demonstrably more willing to embrace innovation. [29]

Ariadne, however, which is published at the University of Bath, and *Information Research (IR)*, which is published at the University of Sheffield, are two information science journals that have a similar institutional background to *JoDI*, but which nevertheless take a decidedly more conservative approach to online publishing. [73] [74] *JoDI* seems to be closely focussed on the confluence of technological and psychological issues, whereas *Ariadne* and *IR* seem to have adopted a more generalised approach. *EJournal*, published at the University of Calgary, seems to be closer in spirit to *JoDI* than either *Ariadne* or *IR*. [71] [72]

A lot of readers want PDF files, and publishers can hardly be blamed for giving their readers what they want. (Nevertheless, they do not feel a similar need to give their paying customers, the serials librarians, what they want, which is lower prices.) However, the editorial staff members wish *JoDI* to be much more than an e-journal *per se*. The type of articles published in most journals have a value insofar as they are current awareness tools, but the *JoDI* team wishes to push the envelope somewhat, and take the e-journal into new areas. There is a stated desire to experiment. The *JoDI* Web site lists seven themes under which its content is organised, but the overarching theme of the journal is innovation. A bar chart illustrates these themes on Page 227.

McKnight says that he has been forced to make concessions, and allow authors to submit PDFs. Indeed, a survey published by *JoDI* reports that, 'people

prefer not to read at length on screen'. [20] Moreover, this reluctance to read at length on screen has been verified by research carried out at Cornell University. [41] However, one can do a great deal more with PDF files other than use them for textual documents. It is possible to use audio, video, virtual reality, and animation while still having the improved presentation that comes with PDF files.

Adobe Systems, creator of PDF, has released a version of Adobe Reader that features embedded media playback capabilities, which means that PDF can now function like a Web browser, allowing media such as Flash and QuickTime to be embedded. Multimedia content can stream straight into a PDF document. In addition, a PDF can be e-mailed. However, McKnight believes that PDF is not seen as desirable by most authors who submit to *JoDI*.

'Not a lot of people want PDF. It tends to be people who have contents that they want to have control over. What we have to do then is to create what we call a wrapper document, that comes up as HTML, so that if someone selects that article the first thing that shows is an HTML page, which allows them to choose to download the PDF. It's a compromise I had to make in order to try to get us established. For me, PDF suffers in many ways anyway, particularly for JoDI. There are articles in JoDI that couldn't be rendered in PDF. There's stuff with film clips in, and there is hypertext. By and large, JoDI is still true to what I want it to be, the PDF thing is much more concessionary. [1]

A number of journals offer HTML and PDF files in tandem; they are not perforce mutually exclusive. Indeed, according to one estimate the use of PDF exceeds HTML by as much as four-to-one. [6] There are a mere 19 PDF files listed in the *JoDI* archives out of a total of 155 published papers. Any personal computer user can view a PDF file by using Acrobat Reader. However, there are two problems commonly associated with PDF, which are an inability to append instantaneous links to external sources, and delays in downloading to a printer. Interactive PDF offers dynamic addition of links, and enables a significantly faster download. PDF is commonly presented in a portrait display to allow for printing, but a landscape display, filling the entire monitor screen, is now being used to utilise multimedia in

the manner of a CD-ROM, though delivered *via* the Internet, or broadcast *via* email. McKnight's negative opinion of PDF files does seem puzzling, though he is by no means alone in his views. I should think that most e-journals offer electronic facsimiles of print journals in the form of PDF files simply because they facilitate reading. [41]

On the other hand, I am unaware of any publisher offering printed journal facsimiles of HTML web pages in an A4 landscape format, for that would do the reader no service whatsoever. (Previously, in order to obtain readable copies from the *JoDI* Web site the Page Setup function had to be changed from portrait, which is the default, to landscape. However, there is now a printable version of each paper.) A number of surveys have demonstrated that many readers treat the e-journal as a networked print-on-demand system. [41] [42] [43] [44] [45] Nonetheless, editors often have very different ideas in regard to the shape and form that an e-journal should take, and that is by no means a bad thing.

The fact remains that e-journals still compare unfavourably with p-journals in terms of legibility, readability, and portability. Readers can highlight and annotate a printed page, and thereby assist the process of knowledge assimilation. [42] There are those who believe that people read much more slowly from computer screens than from paper. [19] [32] However, *JoDI* seems to envision a scholarly journal in a way in which the sum would be greater than its parts. [15]

This would be a synthesis of *all* media, including the printed page, which would be multimedia in the fullest sense of the term, though there are doubtless those who would prefer to describe such publications as mixed media. [13] This would be a reification of the concept of total multimedia, in which publishing a scholarly paper would undoubtedly present challenges of a technical nature to the author. [10] Hypertext is a good example of this willingness to embrace a non-linear approach to the dissemination of knowledge. There are a number of different approaches to this question.

- The textual article. A linear text, though hypertext introduces the concept of non-linearity, which can be read from a screen or from a printed page.

There are also small datasets that can be incorporated into an article. In addition, active links to external archival facilities where larger datasets are stored could be provided. [25]

- The visual article. An article that is dependent on a video file to explicate fully the results obtained from research, or the views expressed by the author. It also supports the VRML format for authors who wish to publish virtual reality displays. It is possible to use animated graphics to demonstrate changes in both observed and modelled phenomena. [25]
- The aural article. An aural guide to everything that can be seen on screen, though it could be switched off if thought unnecessary or unhelpful. Audio files can do much to improve understanding of video, animation, and virtual reality. Authors themselves could narrate these features. It would be helpful to have accompanying audio files for entire articles, and not just because it would assist the visually impaired. Sometimes just hearing someone explaining something can improve understanding. [66]
- The interactive article. There is a very great deal of computational power behind Web sites, and many users now take it for granted that they should have some level of interactivity with the content that they have accessed. Three-dimensional displays that a reader can rotate and view from any angle can prove useful to any number of disciplines. Live mathematics is a term used to describe equations that can be manipulated interactively online by means of a mathematical analysis routine such as Stephen Wolfram's *Mathematica*. [11] [12]

One of *JoDI's* special issues, *Interactivity in Digital Libraries*, published in 2002, explores this theme of seamless media integration in depth. [14]

The problematic situation facing digital library design and use can be stated as a set of basic research questions: What is an interactional digital library? How will people use interactional digital libraries? How can

interactional digital libraries enhance and augment human capabilities? These questions can also be reframed as three challenges for further digital library development. [14]

Nicholas Negroponte, author of *Being Digital*, ventures opinions on the concept of information spaces that are of a piece with the content of *JoDI*.

Information space is by no means limited to three dimensions. An expression of an idea or train of thoughts can include a multidimensional network of pointers to further elaborations or arguments, which can be involved or ignored. The structure of text should be imagined like a complex molecular model. Chunks of information can be ordered, sentences expanded, and words given definitions on the spot... [54]

McKnight has offered a provisional definition of this concept, '*...the objects (real or virtual) to which the individual turns to acquire information.*' [59] These objects are presented to enhance and facilitate learning. Usability of digital information is central to an information space, there being a crossover of skills acquired by users that, one author believes, are sufficiently eclectic to be compared to the dominant ethos of the *Renaissance*. [60] Users can dovetail their learning skills with objects. Digital technology can utilise paratextual devices in a more effective manner than traditional print technology, while nevertheless employing traditional print surface preparation as metaphor. [61]

The design of learning spaces is perhaps an emerging key theme in *JoDI*. There is a language and path dependence in the construction of learning spaces that hypertext is purposefully designed to explore. [62] However, learning space is normally thought of as something rather more commonplace, such as a classroom or a lecture hall. *JoDI* provides an online learning space. There is no longer a necessary connection between a learning activity and a physical space.

There are also interaction spaces. How are we to understand the objects that are to be found in digital libraries? Objects are acted upon, or transformed in some way, by the actions of users. It could be ambient learning by means of a ubiquitous

information network. *JoDI* contains some good discussions of how an open hypermedia system would work. In addition, there are a number of papers that question the current model of interaction architecture. Obviously, some technologies allow higher levels of interactivity than others. Some may see the study of how individuals interact with computers as more of an art than a suitable subject for systematic research, but there is nonetheless a considerable volume of research being done. The most important aspect of interactivity, however, is what goes on inside the head of the user. McKnight, as a psychologist, would surely agree.

The Follett Report was of considerable assistance when it advised that for RAE purposes articles published in e-journals would be accorded equal standing with those that appeared in p-journals. [21] [51] [58] The open access movement, though growing by the day, has yet to achieve critical mass, and its impact on the RAE is as yet not completely clear. [57] Nevertheless, there are still not a few members of the scholarly community, though mainly older ones, who are reluctant to accept e-journals, citing lack of credibility as a stumbling block. [5] [7] Unsurprisingly, Professor McKnight disagrees with this view. [1]

That may have been true in the Eighties. When we were doing BLEND, (Birmingham and Loughborough Electronic Network Development) and people were nervous about submitting papers. 'It's an experimental thing, why should I give you all my good papers.' The way you handle that at the time is to say that it is peer reviewed anyway. If you give it to BLEND you can still publish it in another journal. In fact, it may even help, because it'll have gone through a refereeing process. (The BLEND project aimed to study whether e-journals were feasible, and also to investigate whether the scholarly communication system in its entirety could be sustained by computer and information technology.)

When the BLEND project came to an end all the files were to remain stored on a hard disc at the University of Birmingham. Eventually, however, the machine went down, and BLEND went down along with it. Of course, Professor McKnight had taken the precaution of backing up the BLEND files on five-and-a-quarter floppies, but a few years ago he realised that he no longer had access to a machine

that could read them. Paradoxically, or perhaps not, the sole version of BLEND extant is the paper one that was submitted to the British Library. [67] Nevertheless, this is by no means an unheard of phenomenon. Information stored on a tangible medium can be stored safely for centuries, or even millennia; information stored in a digital format may not prove to be so enduring. Of course, the root of the problem is technological. A computer must first interpret digital information before it can be read.

The Phaestos disc (both sides shown below), unearthed during an archaeological exploration of a Minoan palace on the coast of Crete in 1908, dates from around 1600 BC, and is made of a ceramic material. The text is written in Linear A, which is the earliest known Greek language. [8] Apparently, someone forgot to migrate the format forward to Linear B. As a consequence, the text stored on this disc is unable to be deciphered, and seems likely to remain a conundrum to classicists for the foreseeable future. [9] This is surely the earliest example of a read-only disc that cannot be accessed.

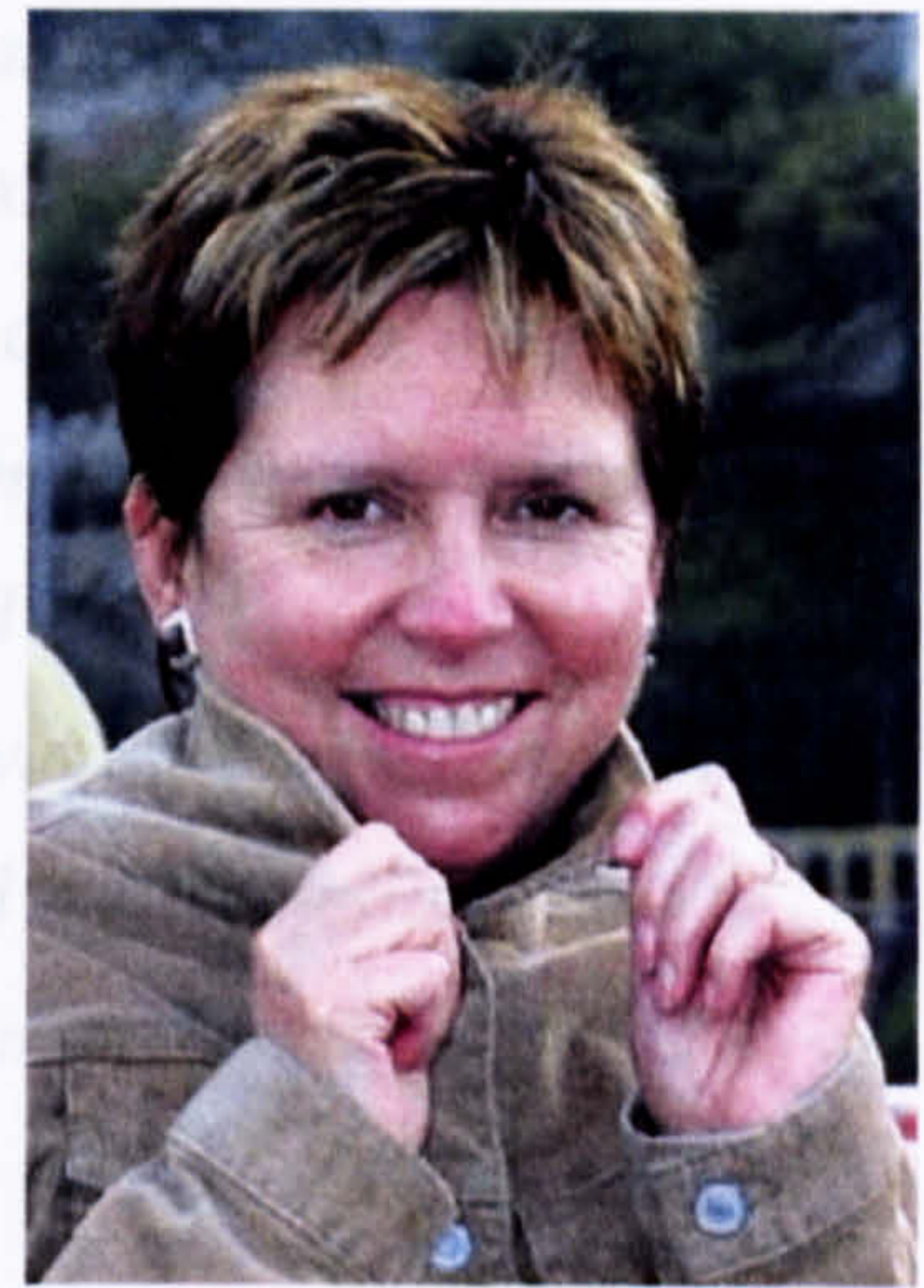


Illustration 7.2: *The Phaestos disc*

However, *JoDI* operates in a field in which a large proportion of researchers are comfortable with innovative publishing models such as open access, e-prints, multimedia and so on. [69] Digital archiving does not appear to conjure up any marked degree of uncertainty in the minds of authors working in computer and information sciences. Anyway, such researchers seldom use sources that are more

than a few years old. They much prefer to consult the very latest published work. [17] McKnight previously had an involvement with a publication titled *Hypermedia*, which was published three times a year in paper. He pressed for the publication of a fourth issue, and suggested that it could be issued as a CD-ROM. However, the publisher decided to change his publications into review journals, which meant that they were published but once a year.

Unsurprisingly, McKnight thought it utterly ludicrous to publish on an annual basis only, and solely in print editions, too. Indeed, it was this dissatisfaction with the state of play that triggered the founding of a new journal. He talked to Wendy Hall (right), a computer scientist who works at the University of Southampton, about the unsatisfactory situation in regard to the system of paper journals, and together came to the conclusion that they should publish a journal of their own.



'Wendy is a computer scientist, and one of the things that are interesting about the whole digital library concept is that it needs a lot more than just librarians and publishers. It needs computer scientists; it needs a whole different infrastructure. Wendy had the infrastructure available. She has the capacity on the machines. So, it was basically piggybacking on projects and machines that she already had going, and that's why it was Southampton.' [1]

They both agreed on the research area they wished to cover, and they intended that their journal would have a much wider remit than *Hypermedia*.

'We wanted to cover much more than hypermedia. We wanted to cover all kinds of digital information operations. So, we came up with Journal of Digital Information. Wendy and I were the ones who found the papers.' [1]

Hall approached iText, which is a joint venture publishing company set up by the British Computer Society (BCS) and Oxford University Press (OUP), and asked

them to fund the publication of a new e-journal that would fully explore the potential offered by the medium. BCS currently publishes its own membership magazine, *The Computer Bulletin*, through iText. It was this funding from iText that enabled *JoDI* to get off the ground, and iText has continued to provide financial support ever since. However, McKnight and Hall are aware that they cannot depend on such funding for an indefinite period.

'This last year we've been looking at how to create a business model that would actually make it self-financing. Now, I have certain desires for that business model. As I said, I'm not really business-minded. I want a journal that is free at the point of use, but I realise that it has to be paid for somewhere along the line. I am very grateful to iText. I do recognise that there has to be a point when the journal is generating its own income, but I don't want that to mean charging the users. We know from the two surveys we've done that usage would just drop off to nought. I still think that it would fit in with a traditional library subscription model, and what in fact we've been doing over the last couple of years with this in mind is getting librarians to sign up to the journal, so that anyone in their IP domain can then access it automatically.' [1]

It can be seen that *JoDI* is beginning to prepare for the future evolution of its business model, and is trying to ameliorate this predicted transitional period by establishing good relationships with members of the library profession. Nevertheless, McKnight is a vocal advocate of the open access movement.

'We have recognised all along that it needs to be financed. It's not a charity sort of thing. I genuinely think that when we started we didn't know how to make it pay for itself. We've been around various sorts of mental loops. Things like micropayments, and the idea that the reader pays only ten cents a page. I mean, it's such a low price, but again I don't want the reader to pay anything. It's more likely to be useful, and to be used by people, and it's more likely to be cited, if they don't have to pay for it. Anyway, that pay-per-view barrier type of thing is not what I want for JoDI.' [1]

However, there is the option of submission fees. BioMed Central has proved that such a system is commercially viable. Public Library of Science is intent on proving such a system viable.

'We've thought about submission fees as well. I can see places where that would work, in a sense that if we were moving to that sort of scheme wholesale it would be built into grants. For example, when I apply for a grant, built into that is three hundred pounds, or whatever it costs, to publish a paper. Now, that would be hard to accept, especially in the humanities, where there's not a lot of funding available. There is a lot of research that is not funded. There are people in the humanities who spend years doing research, and they have no funding. How are they going to do it?' [1]

The collection of revenues essential to the continuance of publishing operations is a bridge that every publisher of an open access journal must confront sooner or later.

'What I don't want to see is a system whereby only the people with money can get published, because that would be the end of research as a knowledge venture. It's tricky getting it to pay for itself. As I say, I tend to favour the library model, because people understand it, and we know that it works.' [1]



JoDI went online in July 1996, and the first published paper was a report on the Center for the Study of Digital Libraries, Texas A&M University. The second was a transcript of a presentation given by Tim Berners-Lee (left) on the occasion of him being awarded a distinguished fellowship of the British Computer Society on July 19, 1996 at the British Library.

These papers pointed the direction that *JoDI* wished to take. The theme of digital libraries is the most common in the *JoDI* archive. Nonetheless, there does

seem to be a difference between digital libraries, however they may be defined, and libraries that seek to make optimal use of digital content to improve their range of services. [24]

There are indeed signal differences between the library culture and the digital information culture, though their relationship is arguably of a symbiotic nature. Initially, librarians had little to do with the development of digital libraries, and computer scientists were left to do a great deal of the pioneering work. [23] It should come as no surprise that librarians and computer scientists do sometimes disagree on how the term 'digital library' should be defined. [25] McKnight says that, '*...the idea of digital information is developing all the time*'. [1]

The library profession seems to view this development of digital libraries as a gradual process that can be managed, while computer scientists see digital information technology as an intellectual volatile field that cannot possibly be managed. It is this dichotomy, one of evolution *versus* revolution, which lies at the heart of the debate on digital libraries. [22]

JoDI is organised around various themes or special editions. This is an approach that evolved over a period of time in order to facilitate organisation. Each theme has a dedicated editor who receives the papers submitted in that field, organises the refereeing process, and makes all the relevant editorial decisions. McKnight explains how this situation developed.

'One of the things that I like, that we've stumbled across, is the theme idea. I think that within that theme idea we could continue to evolve, to react to changing circumstances, because evolution is all about reacting to changing circumstances. So, if we're going to survive we really need to learn to cope with new ideas that come along. We need to learn to let old ideas die off. I'm not committed to keeping everything that's there now. In twenty years' time I would hope that the themes, or some of the themes, would be quite different. Some have developed, and some have now gone past the need to develop.' [1]

There are seven themes, under which 155 articles are organised, three of which have no theme title appended. As the following chart indicates, more than two-thirds of the articles are in the areas of hypermedia, hypertext, and digital libraries, though many are linked to more than one theme. The most commonly published theme is digital libraries. It should be noted that the chart is but a crude reflection of the eclectic nature of the *JoDI* content, wherein a platform is provided for many, and often divergent, viewpoints. In addition, articles may impinge on a number of themes

JoDI has only recently found an editor for Social Consequences. Papers in this subdiscipline are scattered throughout a number of publications, which is a reflection of its multidisciplinary nature. [76] However, it would be of inestimable benefit to researchers in the field if a single publication could become a hub for this theme.

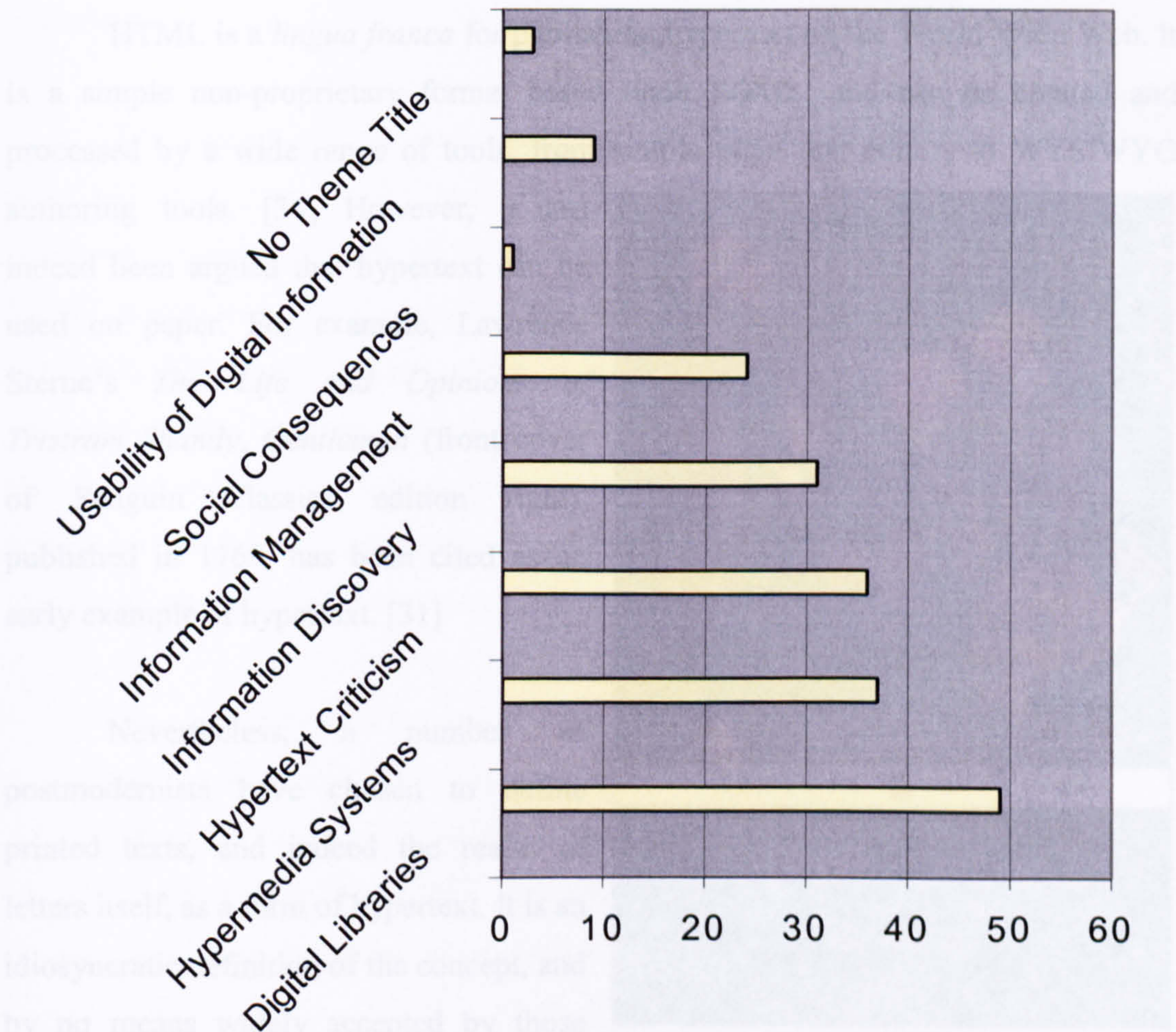


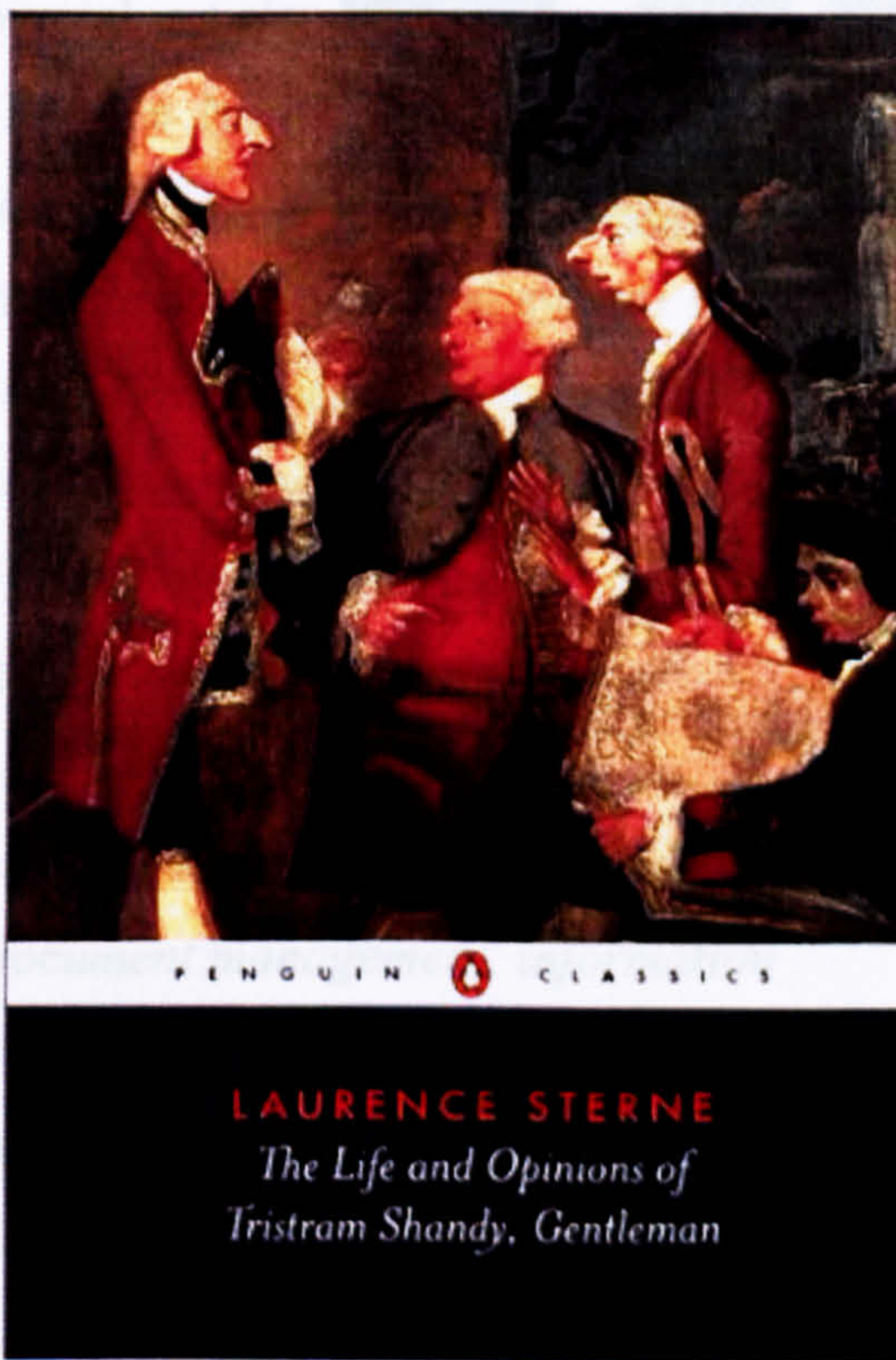
Figure 7.1: *JoDI* Themes

7.3 Hypertext

As can be seen from the themes chart, no fewer than 40 papers have appeared on the subject of hypertext. This is an example of the benefits of e-journal technology, for hypertext cannot be replicated in a paper journal. [33] Hypertext, at its most basic, is a database management system that allows users to connect screens of information using associative links. [66] At its most sophisticated level, hypertext is a software environment for collaborative work, communication, and knowledge acquisition. [35] George Landow, a pioneer in this field, believed that hypertext could be designed to mimic human cognition by enabling the user to store and retrieve information by referential links, thereby facilitating timely and intuitive access to relevant information. [34] However, this view would now be regarded by many as naïve.

HTML is a *lingua franca* for publishing hypertext on the World Wide Web. It is a simple non-proprietary format based upon SGML, and can be created and processed by a wide range of tools, from simple plain text editors to WYSIWYG authoring tools. [34] However, it has indeed been argued that hypertext can be used on paper. For example, Lawrence Sterne's *The Life and Opinions of Tristram Shandy, Gentleman* (front cover of Penguin Classics edition right), published in 1760, has been cited as an early example of hypertext. [31]

Nevertheless, a number of postmodernists have chosen to define printed texts, and indeed the realm of letters itself, as a form of hypertext. It is an idiosyncratic definition of the concept, and by no means widely accepted by those working in the field of computing and information technology, even though it is postmodernists who dominate most of the theoretical discussion of hypertext.



Common sense, the metaphysics of savages as some would have it, surely dictates that meaning is primarily conveyed through syntactical structure. Hypertext, for all its inherent non-linearity, is perforce plaited with the linearity of a printed text facsimile. Indeed, the linear and the non-linear are not perforce mutually exclusive. [75]

Hypermedia extends the range of hypertext to include video and audio files, animation, and other forms of presentation that can prove useful in the explication of textual data. [34] Therefore, hypermedia is essentially an extension of hypertext. It supports a digital environment that attempts to mirror the cognitive processes of a human being, enabling users to make associations freely between chosen topics, in preference to the sequential accessing of topics in the manner of an alphabetic list. [68] In addition, it connotes a higher level of interactivity than that implicit in hypertext.



The concept of hypertext, though it was not so described at the time, dates back to a pivotal article written by Vannevar Bush (right) titled ‘As We May Think’, which was published in *The Atlantic Monthly* in July 1945. [28] In this seminal article, Bush outlined a theoretical system for storing information that he chose to call a ‘memex’. It was designed to enhance human memory by enabling the user to store, and to retrieve by random access, documents linked by context and association rather than categorical indexing. It was an innovative idea that foreshadowed what is now known as hypertext.

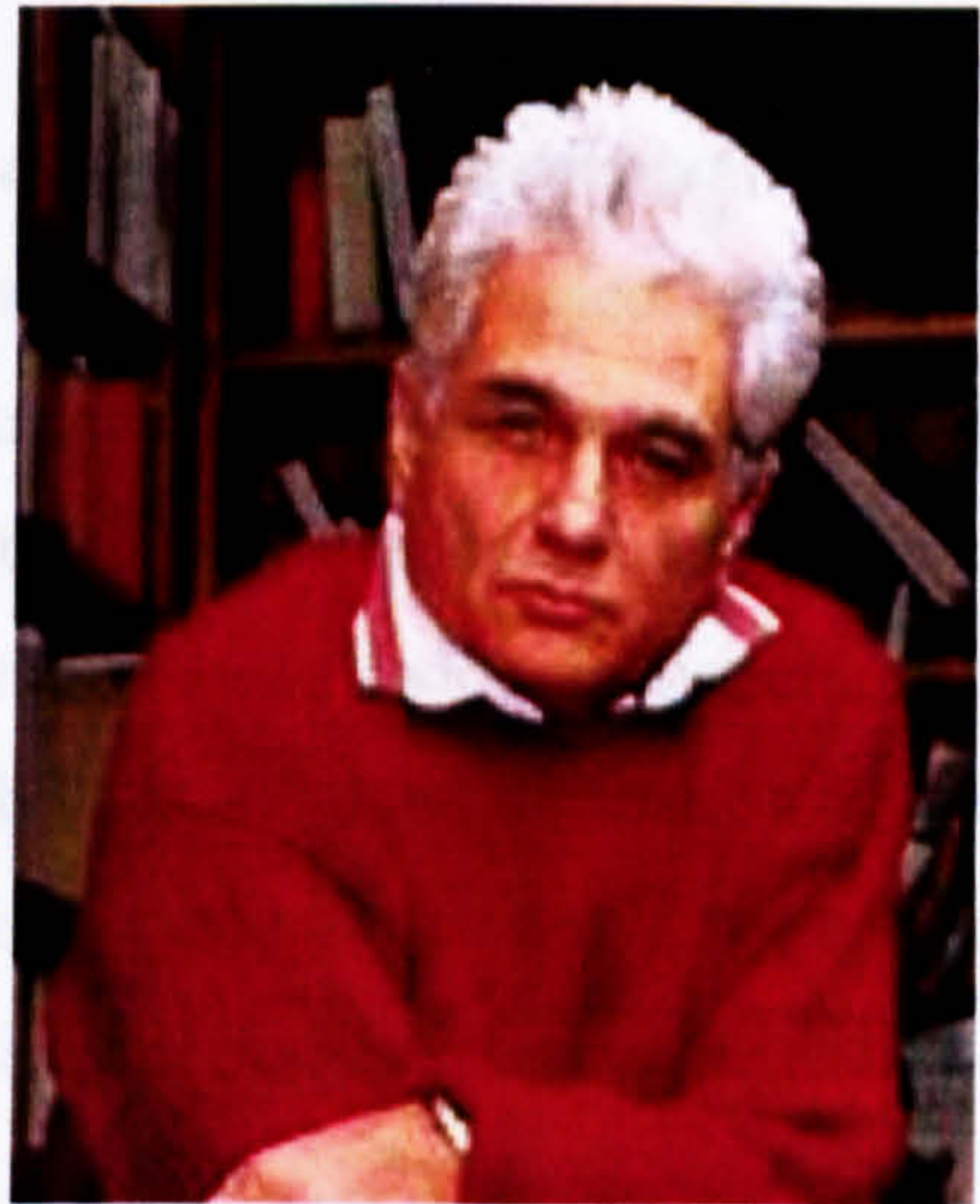
Hypertext fills a conceptual niche related to, but separate from, fields such as databases, digital libraries, document management, information retrieval, multimedia, object-orientation, semantic networks, user interface design, and the World Wide Web. Many of these either use hypertext, complement hypertext, or can be used to implement hypertext components and features. [36]

Bush also proposed the idea of textual documents joined by links, linkages, trails, paths, and webs to describe his ideas on how textual documents could be related

and retrieved. Bush employed the analogy of navigation to explain the use of hyperlinks. [34] Indeed, as Bush wrote himself, '*The process of tying items together is the important thing.*' [28] However, hypertext suffers from some of the same problems that afflict other academic disciplines.

In many academic disciplines, there seems to be a gap between practice and theory, so that practitioners rarely talk to theorists or theorists to practitioners. This can result in two totally isolated fields where exchange becomes nearly impossible. The study of hypertext also suffers from this problem, though there are exceptions. Although hypertext authors and theorists are on friendly terms and talk to one another at conferences, the production of hypertextual works and the theory surrounding them seem to have gone their separate ways. [35]

Nevertheless, this state of affairs may not prove to be in anyway disadvantageous given that Jacques Derrida (right), *doyen* of Continental obscurantism, has seen fit to attach himself to the subject area. [37] [38] To be sure, Derrida is not alone in his folly, but I would single out his published views on literary theory in general, and hypertext in particular, as an example of intellectual obfuscation on a grand scale.



Indeed, this aforementioned bifurcation of theory and practice may yet prove to be a veritable blessing in disguise. In all fairness, however, it should be mentioned that Derrida has been cited more than 14,000 times in journal articles over the past 17 years. [46] Yet, one cannot help but wonder how many among those who have cited his works have ever actually read them. One study has estimated that just around 20 *per cent* of citers have taken the time and trouble to read the original. [65]

There are comparatively few fora available to those who would wish to examine the role of hypertextual literature, and the utility of literary criticism pertaining to it. [35] However, it does appear that the central plank of the remit *JoDI*

has assumed is to expand that selfsame remit whenever such a possibility presents itself. *JoDI* is very much an attempt to rethink what an e-journal should be and, while some of McKnight and Hall's views do focus on generic scientific communication functions, they do seek innovative ways to provide a selective dissemination device of optimal efficiency. McKnight explains how he would like to see *JoDI* develop, while implying his awareness of the systemic interdependencies that exist in scholarly publishing.

*I mean, one of the ideas that Wendy and I had was...what the journal becomes is an overlay on the e-print archive. So, the e-print archive is mass select. What the journal does is select and group together a set number...the journal wouldn't be isomorphic with the print archive, it would be a subset based on a particular concept. So, there was a big computer science database, and Wendy and I said, *JoDI* could actually be a subset of that, and publish as a journal. People could still get it through the archive, and you could come through *JoDI*, but *JoDI* would become known as the place to look for articles in this field. So, yes, like a portal with a sort of focussing device. [1]*

Therefore, *JoDI* would remain separate and distinct from the archival system in order to function more effectively as a digital window on its subject area, and would be a point of entry to an area of specialised knowledge. *JoDI*, being dedicated to digital information in a general sense, inhabits the borderlands between the humanities and the sciences. The Hypertext Conference award-winning papers that are regularly published have proved to be popular. There is an added dimension to the administrative tasks associated with the editorial process when planning a hypertext review. Susana Tosca, who is the hypertext theme editor for *JoDI*, explains the issues.

Editing such a diverse issue posed several organisational challenges: the dozens of submissions each had to be peer-reviewed by several referees, and each submission consisted of several nodes that had to be reviewed separately...After we had selected the contributions to appear in the issue, we produced an initial version of the hypertext, then we sent back to the authors for a second round. The authors read the whole issue and suggested possible connections and crossovers between the nodes they had written and the

others...We clearly underestimated the time and effort that such a double-phase project requires... [35]

Tosca hopes that the work feature in *JoDI* will serve as a landmark in the way that everyone with an interest in the field regards hypertext criticism. In fact, McKnight regards the hypertext articles as very significant in the continuing development of *JoDI*.

Susana Tosca's work on the hypertext criticism theme has been excellent. I mean the publishing as hypertext kind of thing. It was something that we always wanted to explore, and it was something that appealed to Susana. She did a special issue for us, and we said that worked well, how about making it a theme, and she said that would be fine. It's allowed her, and her co-authors, to explore something that they could not have done on paper, and that's something I like. [1]

The ability to add hyperlinks within documents, and between documents, is one of the key features of an e-journal. It is on this ability that the hypertext concept is predicated. Basically, there are three different types of links. There are intradocument links, which enable users to navigate a lengthy document by linking to other parts of the document. These may include links to figures and tables, though more commonly perhaps to headings and references. The mechanisms for marking up these types of links in documents are well established in the practice of markup.

There are interdocument links, which enable a connection to other documents. For example, links between articles in the same journal, a link to a specific section of another article, such as a figure or table. A letter may be linked to replies that appear in subsequent editions. In addition, an article may be linked to a commentary, or to any possible corrigenda. It should be noted that interdocument links are markedly more difficult to encode than intradocument ones. In general, the maximum amount of metadata possible should be encoded to enable the target to be found. The mechanics of creating the hyperlink from the source to the target will have to be left to an outside process. If digital object identifiers (DOI) are assigned to content at a sufficiently

granular level, it may be possible to encode the link with the DOI number as the attribute value.

There are extradocument links, which connect to files or resources outside of a document. These may include links to uniform resource locators (URL), file transfer protocol (FTP) addresses, any given DOI, or e-mail addresses. The visual immediacy that is the hallmark of the e-journal is dependent on hyperlinks. *JoDI* has experimented with hyperlinks to the maximum degree by publishing a large volume of hypertext articles.

7.4 Multimedia

JoDI has, perhaps surprisingly, published just one article that includes audio-visual content, though in that example multimedia does prove to be of inestimable benefit in explaining points made in the text. This article, by Adrian Miles, and titled, *Hypertext in the Dark: Cinematic Narration with Links*, was published in December 2000. The web logs of the journal reveal that it has a remarkable pattern of usage.

Rather than showing an early peak within days, usage grew consistently from publication to reach a peak in April 2002, which was 16 months after publication. Usage remains high even now. We cannot explain the pattern fully on the evidence of a single paper, but it is likely to include some effect that is particular to the format and structure of the paper, which only an e-journal could present. [3]

There are a number of factors that can influence the number of times a paper is accessed. *JoDI* has found that if there is a high number of downloads on the initial publication of an article, then that pattern is usually sustained over the long term. There are seven extracts from feature films that are discussed in Miles' article, and it is a good example of how the use of multimedia can be used to enhance an article, and thereby clarify concepts in the mind of the user. The author's introduction is self-referential, and his opening paragraph describes his experiment. [39]

This essay is an experiment in academic writing that I tend to think of as a performative hypertext. This simply means that it does what it describes. It contains a simple series of nodes that contain the major argument—this is its canonical text—and while it can be read serially, it is densely interlinked.

A great many different kinds of ‘papers’ are now being submitted to scholarly journals, and multimedia is increasingly more common among them. However, in a survey carried out in 1998 only 32.5 per cent of respondents believed that the inclusion of multimedia in a research paper would be of benefit to them in their chosen discipline. [26] In addition, just 18.5 per cent of the respondents reported that they possessed the requisite skills necessary to produce multimedia content. It may be some time before the level of technical knowledge needed for such submittals can be taken for granted.

7.5 Digital Libraries

Over a quarter of the articles published in *JoDI* are concerned with digital libraries. However, McKnight confesses that he has ‘*a very limited interest in libraries.*’ [1] His main interests lie in the psychological and social aspects of information use, and in particular hypertext, but the content of *JoDI* does not totally reflect his own experience and biases. [47]

‘If you had said to me ten years ago that I would be editing a journal that has economics in it, at least under the JoDI model, I would have said, I’m not interested in economics. The people who are doing the economics are interested in it. What binds us together is an interest in digital information, which is why I wanted JoDI to be a truly electronic journal, and avoid compromises like PDF.’ [1]

Indeed, the emergence of digital libraries as a research discipline has presented a number of challenges, and they are not exclusively technological ones. Digital libraries are dependent on people, not all of who are librarians, and it is somewhat

difficult to arrive at a satisfactory definition of the term. Article Number Three of *JoDI* discusses the problem.

...it is not at all clear what one means by the term 'digital library.'
The term is rarely defined, or even characterised. It has been applied to an extraordinary range of applications... [48]

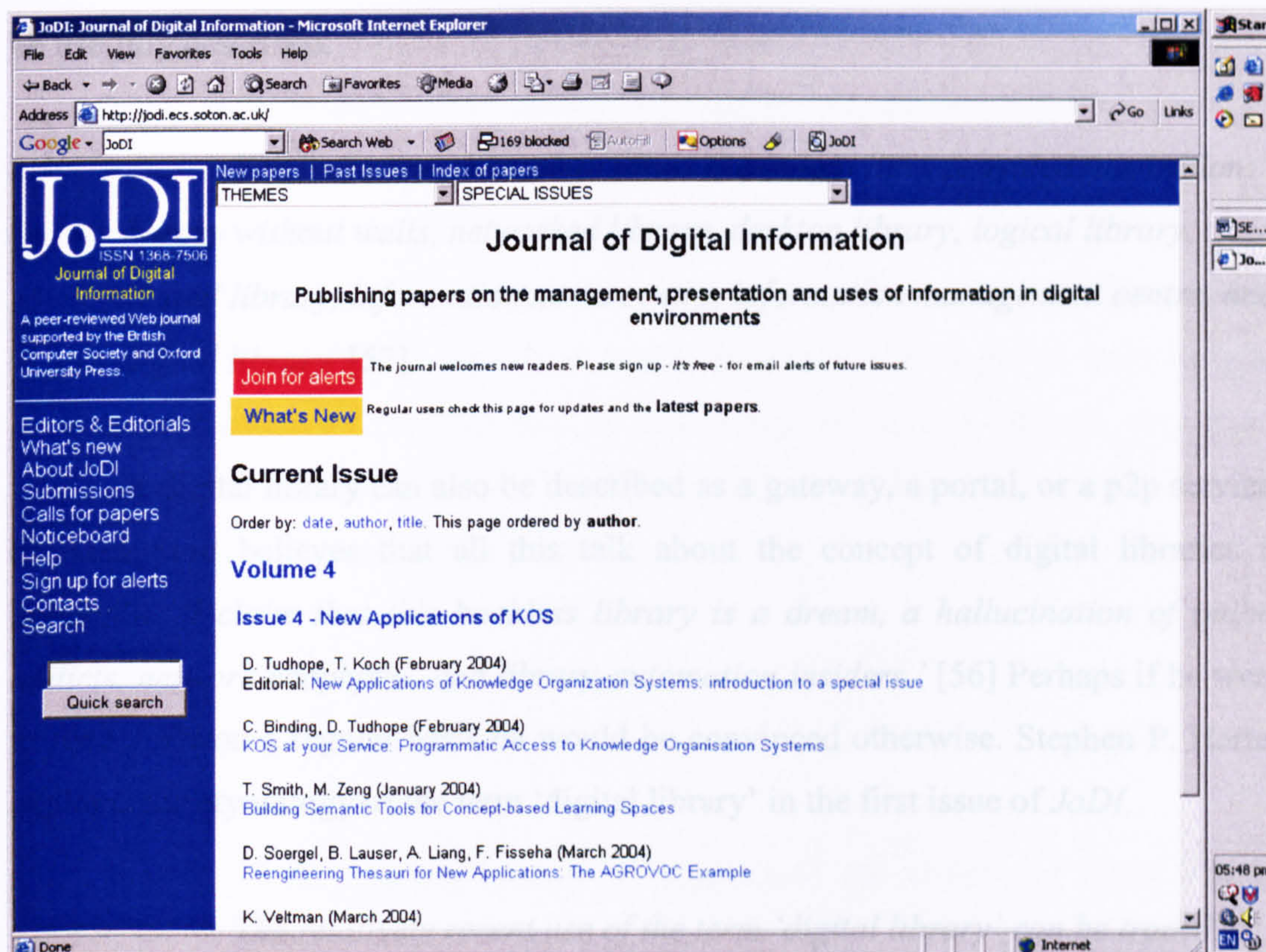


Illustration 7.8: *Journal of Digital Information* home page

Indeed, one British academic has argued that, '*...others might agree that the real electronic library is not a library at all, but a data warehouse.*' [49] Electronic library can be taken as synonymous with digital library. Many of those writing about digital libraries in *JoDI* seem to regard the term as a useful umbrella term under which a number of concepts may be fruitfully discussed. This is, however, a frame of mind that is not unique to *JoDI* authors. Charles Oppenheim, a colleague of McKnight at Loughborough, offers the following definition of a digital library. '*...an organised and managed collection of information in a variety of media (text, still image, moving image, sound, or combinations thereof), but all in digital form.*' [53]

This is a definition that would apply equally well to *JoDI* itself. Some people are simply reluctant to offer a definition.

The term, 'electronic library' means many things to many people, and in any study of the literature the reader must be aware of the regional interpretations that are applied to it... [50]

Others offer a lists of terms under which the functions of a digital library can be usefully described.

The literature abounds in terms that might have provided inspiration: library without walls, networked library, desktop library, logical library, virtual library, information nerve centre, information management centre, and digital library. [52]

A digital library can also be described as a gateway, a portal, or a p2p service. Clifford Stoll believes that all this talk about the concept of digital libraries is unhelpful. *'I claim that this bookless library is a dream, a hallucination of online addicts, network neophytes, and library-automation insiders.'* [56] Perhaps if he were to read *JoDI* on a regular basis he would be convinced otherwise. Stephen P. Harter explains the etymology of the term 'digital library' in the first issue of *JoDI*.

The relatively recent use of the term 'digital library' can be traced to the Digital Libraries Initiative funded by the National Science Foundation, the Advanced Research Projects Agency, and the National Aeronautics and Space Administration in the United States. In 1994 these agencies granted 2.4 million dollars to six universities for digital library research, impelled by the sudden explosive growth of the Internet and the development of graphical web browsers. The term was quickly adopted by computer scientists, librarians, and a number of others. Thus, while the term 'digital library' is relatively new, work in bringing digitised information resources to libraries (or thinking of digitised information resources as libraries) have a history spanning several decades. [48]

Walt Crawford, who overall takes a rather traditional view of how libraries should operate, and of the ethos that should predominate, has made his scepticism plain.

Digital libraries are non-libraries, and presume a whole set of improbable assumptions about the future. That does not mean that libraries should not be involved in digital imaging projects, or in establishing and improving control and access over material primarily, or only available in digital form...Digital collections enhance and extend libraries. They do not replace physical libraries and physical collections of print and other media. That is an important distinction. [55]

JoDI provides a publishing platform for people who have very different ideas about what a digital library actually is, and indeed into what shape or form a digital library could evolve. The fact that so many papers on this subject, sometimes articulating divergent views, have been submitted and published is evidence that a broad spectrum of thought is encouraged.

7.6 Conclusion

JoDI is part of an ongoing attempt to restructure the culture of STM journal publishing. It remains steadfast in its support of open access. The fact that *JoDI* wishes to be seen as a journal that experiments with modes of publication distinguishes it from most others. There are obviously a lot of people who share the founding editor's view that an e-journal should not be looked upon as merely a more efficient way to deliver a p-journal. Every journal is different; some are more different than others.

Hypertext is still viewed by many as a mode of discourse that has yet to find a recognised place on the continuum of scholarly publishing formats. The longstanding conventions of print convey legitimacy, but hypertext is possessed of a flexibility that is closer to the way readers actually think when they make connections, and draw

analogies, in an effort to improve understanding. Hypertext is a useful tool in a cognitive box of tricks, and *JoDI*'s advocacy of it should prove prescient. McKnight and Hall see change as a challenge to be met, and they have not shunned the risks that come with innovation.

JoDI has now entered its seventh year of publication, and has established a solid reputation in its field. To be sure, *JoDI* is the type of publication that will evolve incrementally with information technology itself. It is this very willingness to embrace change that should ensure its survival. McKnight believes that it is not always helpful to think of a journal as a tangible object. [1] *JoDI* is an electronic folder containing articles that cannot be transferred to a paper medium. *JoDI* is helping to redefine the term, 'journal'.

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- * The society journal, published by the European Economic Association, has chosen to work with a sympathetic university press, which is a route that might well be taken by some academic publishing projects in future.
- * *Economics Bulletin* is published by a university library, which provides some funding. It is open access, unlike the other three journals examined.
- * *Review of Economic Theory* is to be published by an academic department. It is an ambitious attempt to found a new publishing house that specialises in economics.
- * The Berkeley Electronic Press is run by academic staff members, but is funded by venture capital, and sells customisable manuscript management software in addition to journals.

Now, it is a truth universally acknowledged that economists disagree with each other. They disagree about costs and prices, theory and practice, governmental policy and market forces and so on and so forth. Economists even disagree about why it is they actually disagree in the first place. [22] However, it seems to me that the practitioners of this most fractious of disciplines are in agreement that they regularly

CHAPTER EIGHT

Economics Journals

8.1 Introduction

This chapter shows how economists have taken different routes to publishing. A professional society's journal is included in the comparison to illustrate the options available. The chapter indicates that economists' attitudes toward scholarly publishing are a reflection of their attitudes toward the fundamental tenets of their own discipline, which is to say that while some may favour a highly regulated system, there are others who favour a distinctly more *laissez-faire* approach. Four journals are compared, for all four publishing operations have different strategies.

- The society journal, published by the European Economic Association, has chosen to work with a sympathetic university press, which is a route that might well be taken by some academic publishing projects in future.
- *Economics Bulletin* is published by a university library, which provides some funding. It is open access, unlike the other three journals examined.
- *Review of Economic Theory* is to be published by an academic department. It is an ambitious attempt to found a new publishing house that specialises in economics.
- The Berkeley Electronic Press is run by academic staff members, but is funded by venture capital, and sells customisable manuscript management software in addition to journals.

Now, it is a truth universally acknowledged that economists disagree with each other. They disagree about costs and prices, theory and practice, governmental policy and market forces and so on and so forth. Economists even disagree about why it is they actually disagree in the first place. [22] However, it seems that even the practitioners of this most fractious of disciplines are in agreement that the scholarly

publishing market is a dysfunctional one. One eminent economist, Albert O. Hirschman, has cogently stated what he judges to be the necessary response of consumers to such a dysfunction in a market system.

Each society learns to live with a certain amount of such dysfunctional behavior; but lest the misbehavior feed on itself and lead to general decay, society must be able to marshal forces which will make as many of the faltering actors as possible revert to the behavior required for its proper functioning. [1]

Hirschman argues that when faced with a declining standard of service, whether it be actual or imagined, individuals and institutions invariably react in one of two ways, which is that they either desist from using the current service or they continue to make use of it while lodging any number of pertinent complaints. Now, as long as there is an amalgam of these two responses the service provider will be granted sufficient leeway to respond to consumer demands.

Conversely, if all customers were to go elsewhere the service provider would find it difficult to regain market share, and as a consequence could well be forced out of business. However, if customer loyalty were unaffected by a continuing poor standard of service there would be little or no incentive to make improvements to it. Hirschman's thesis, applied to the framework of services supplied by commercial publishing houses, underlines the role of academic staff members in effecting radical change in the scholarly publishing system.

To be sure, there are widely divergent views, and strongly held ones at that, in respect of the scholarly publishing market in general. On the one hand, there are those who believe that it takes an economist to understand fully the economics of scholarly journal publishing. On the other hand, there are those who believe that it takes a publisher to understand fully the economics of scholarly journal publishing. [21] However, it is considerably easier to level the charge of bias against the latter; the former making much of their reputation for disinterested intellectual inquiry. [5]

The fact that so many learned persons have taken it upon themselves to bandy about so much in the way of recondite knowledge on this question, and that they have done so in a not inconsequential number of fora, is some indication of the heat, and indeed the light, that has been generated by this most public of debates. [33] There are now a number of journal publishing projects in the discipline of economics that have been initiated, and subsequently managed, by academic economists in direct response to the financially onerous constraints imposed on the scholarly publishing system by commercial publishers. [37]

Theodore Bergstrom, Professor of Economics at the University of California, Santa Barbara, has copiously documented the exponential rise in the number of economics journals published in the English language from almost 30 in 1960 to over 300 in 2004. [2] [3] However, more economics journals do not perforce equate to better economics journals. Indeed, academic support for the founding of new economics journals is by no means unreserved. Andrew Oswald, a Professor of Economics at the University of Warwick, opines that though competition is by and large a good thing, it is not at all an unalloyed blessing.

'We already have hundreds of scholarly journals in economics. My subject, like so many others, is simply being swept away in a tsunami of them. The flow of clear information is now swamped by the muddy water from new journals that no one reads. Every person who wants to start an academic journal has first to find two that are willing to shut down. That goes for electronic journals, too. The best would then survive.' [4]

Initiatives such as the Dutch Electronic Grey Files on Economics (DEGREE), and Research Papers on Economics (RePEc), have used e-prints, and the services associated with them, to promote the dissemination of research material in economics, but with limited success. The economics profession has deeply conservative views in respect of scholarly publishing, and there is a consensus of opinion that the journal, preferably a printed one, is the optimal mode of dissemination. However, there are a number of academic-led e-journal publishing programmes that are intent on winning hearts and minds.

8.2 *Journal of the European Economic Association*

The journals with the highest impact factors in economics are in the main published by learned societies, and as a corollary are easily affordable to research libraries and individual subscribers. In addition, the price of such journals is often included in the membership fees for learned societies. The European Economic Association (EEA) was one learned society that declined to publish its own journal, instead choosing to enter into an agreement with a large publishing house. It was a decision that the EEA was subsequently given cause to regret.

Elsevier Science began publishing *The European Economic Review (EER)* in 1969, and it is still owned and published by this firm to the present day. In 1985, the EEA addressed the issue of how to publish a learned journal. It was thought that a new economics journal might not be economically viable, and the advantages of being associated with an existing journal seemed to be evident. As a consequence, the EEA Council decided to subcontract the publishing process, and entered into a legally binding agreement with Elsevier that involved it designating *EER* as its official journal. This was to take effect from Volume 30, 1986. It was planned that this agreement would be reviewed, and renewed, at successive five-year intervals. This merger of interests resulted in an improvement in the academic quality of articles published in *EER*. The connection with the EEA granted Elsevier's journal automatic circulation to every member of the association, which has almost 2000 members.

The enhanced quality of the journal's contents resulted in a steady increase in the impact factor of *EER*. Indeed, *EER* has consistently been numbered among the twenty most highly cited economics journals worldwide, and is at present rated fourteenth. [3] All the same, the success enjoyed by this joint venture could not compensate for the anomalous situation whereby a large and increasingly prominent professional association neither owned, nor directly governed, its own journal. In addition, there was also mounting dissatisfaction with the pricing policies adopted by Elsevier. [8] In fact, *EER* was one of the most expensive economics journals in the market place. [3]

In the light of such legitimate concerns, the EEA decided to rescind the agreement with Elsevier. In effect, this meant that *EER* ceased to be the official journal of the EEA as of January 2003. The EEA decided to start a new journal, which would be titled the *Journal of the European Economic Association (JEEA)*. It has partnered with the Scholarly Publishing and Academic Resources Coalition (SPARC), and has been designated a 'Leading Edge' journal, which in this case means that it is judged to have an innovative business model.

The MIT Press has published the journal since March 2003, and it has now supplanted *EER* as the official journal of the EEA. It is intended to publish six times *per annum*. [6] [7] Indeed, the MIT Press also publishes *The Quarterly Journal of Economics*, which was established in 1886, and is the oldest professional journal of economics in the English language. The MIT Press claims to sell a higher proportion of its products outside the United States than any other American university press. [39] Rick Johnson, SPARC Enterprise Director, believes the MIT Press to be a good partner for any not-for-profit journal.

MIT Press has pledged itself to publishing journals from distinguished societies with a commitment to self-ownership and competitive pricing. The Journal of the European Economic Association is a promising example of what happens when researchers realise that their commercial title does not serve their community, and they decide to act to change the status quo. It has found a worthy home at the MIT Press. [9]

A substantial number of the Elsevier journal's editorial board, who have long shown concern regarding that publisher's pricing policies, will transfer to the *JEEA* editorial board once their contracts with Elsevier expire. Elsevier's journal is priced at US \$950 for the print edition. The *JEEA* is priced at \$325 for print and electronic subscriptions in North America, and \$355 for print and electronic subscriptions outside of North America. Electronic-only subscriptions are priced at £295. [10] The significantly higher price charged by Elsevier indicates interests that are inimical to those of the academic community.

This illustrates how a professional association can use a university press to beat the commercial publishing house trap. It is a lesson that has been learned by other academic economists. However, this is not to disparage commercial publishers as a whole, for there are some who continue to publish society journals at affordable prices. [40] The recourse to a sympathetic university press is one way to solve the problem of extortionate pricing, but is by no means the only one.

Academic staff members working at institutions in St Andrews, Warwick, and Illinois have been more innovative than the professional associations. There are academic economists who believe it unnecessary to involve university presses in the publication of professional economics journals. Moreover, they have shown that academic departments can put their ideas into practice.

8.3 *Economics Bulletin*

John P. Conley, Professor of Economics at Vanderbilt University, which is situated in Nashville, Tennessee, and Myrna Wooders, Professor of Economics at the University of Warwick founded *Economics Bulletin* as a SPARC Alternative journal in direct competition with *Economics Letters*. The University Library of Illinois publishes the journal online. Elsevier Science (the usual suspect) publishes *Economic Letters*. The Elsevier journal's subscription is priced at 1,823 US dollars for institutions (2003), which places it firmly among the top ten most expensive professional economics journals. *Economics Letters* is at present the twenty-first most highly cited journal in its field. In comparison, *Economics Bulletin* is a comparatively new journal and has therefore not yet been indexed.

Economics Bulletin is an open access journal, with modest submission fees covering the cost of the Web site. Conley and Wooders wish to do their part in addressing the situation of high journal prices restricting access to valuable research material. Indeed, they and their colleagues have themselves contributed a sum of 50,000 US dollars from their own pockets with which to establish the journal, and

provide it with a financial cushion. Conley explains the philosophy that underlies *Economics Bulletin*.

We are really quite different from Bepress and ELSSS. We are philosophically dedicated to open access. It's not that we're socialists, or opposed to making money as such. Our view is, while you have to collect a revenue stream, it would first of all be very labour intensive, and secondly it would be diametrically opposed to the very reason for starting the journal. If you charge subscription fees, you necessarily limit access to the content, and that is not what we want to do. If you charge submission fees you tend to reduce the number of submissions received. It's not really clear how you can get a revenue stream without endangering the mission of the journal. [31]

The mission statement of *Economics Bulletin* is set out clearly.

The mission of the Economics Bulletin is to foster free and extremely rapid scientific communication across the entire community of research economists. In order to meet this goal, we will rely on the technology of the World Wide Web. Economics Bulletin will publish original notes, comments, and preliminary results. We are especially interested in publishing manuscripts that keep the profession informed about ongoing research programs. Submissions in these categories will be refereed, and our objective is to make a decision within eight weeks. Accepted papers are published immediately. It is expected that in many cases, manuscripts published in these categories will form the foundation for more complete works subsequently to be submitted to other journals. [11]

There is no Ingelfinger rule applied at *Economics Bulletin*, and no restrictions in regard to the word count of papers accepted for review. *Economics Letters* states that papers must not exceed a maximum of four printed pages. *Economics Bulletin* states that the average lag for refereed contents over the last 12 months is 31.3 days. This figure is displayed prominently on the journal's web page. This is in sharp contrast to *Economics Letters*, which claims that its manuscript turnover time is a maximum of four months from submission to publication, though given the lengthy

publishing lag of most professional economics journals that is in itself a significant improvement.

However, this four-month lag only came about due to a need to compete with *Economics Bulletin*. Indeed, previous to this the submission date on a manuscript was generally eight to twelve months prior to the publication date of the issue. *Economics Bulletin* receives submissions on a daily basis, and in 2003 received over 400. The journal has an acceptance rate of around 40 *per cent*. The objective of a letters journal is to promote widespread circulation of research that is still in progress.

It is regrettably the case, however, that the business models, and the formats, adopted by most publishing houses make this goal an unrealistic one. The business model of almost every publishing house is based on limiting access to the contents of their journals to those who have paid subscription fees. *Economics Bulletin* publishes articles online immediately they have been accepted for publication. The table below enables a comparison of both journals.

ECONOMICS BULLETIN	ECONOMICS LETTERS
SPARC alternative	Elsevier
Open access	Subscription 1,823 US dollars
Authors retain copyrights	Authors surrender copyrights
No limit on length of articles	Maximum of four printed pages
Average publication lag 31.3 days	Average publication lag four months
Articles published on acceptance	Articles published monthly

Table 8.1: *Comparison of Economics Bulletin and Economics Letters*

Economics Letters is published on a monthly basis. *Economics Bulletin* simply asks that authors grant the journal the right to publish when an article is submitted. Authors retain their copyrights, and are therefore free to make use of their works in any way they please. *Economics Letters* insist that authors transfer the copyrights of accepted papers as a precondition of being published. There can be no doubt as to which journal is providing the better service to the academic community. Professor Conley explains what has motivated him to become involved in the publishing process.

'The problem as we see it is that the current business model employed by commercial publishers does more to inhibit than foster scholarly communication. Our hope is that the Economics Bulletin demonstrates that it is feasible to take back control of the publication process and produce high-quality, peer-reviewed journals on an open access basis within the academic community itself.' [12]

Economics Bulletin has been published continually since April 2001, and is now indexed by e-JEL, EconLit, and IDEAS. The University Library unconditionally supports the objectives of *Economics Bulletin*. If the *Economics Bulletin* should ever cease publication, the University Library of the University of Illinois at Urbana-Champaign has committed itself to archiving the journal in perpetuity, and to make its archived issues publicly available over the Internet.

The University Library is a member of the DSpace Federation, which is essentially a joint initiative organised by Massachusetts Institute of Technology Libraries and Hewlett-Packard Laboratories. Google is currently involved in collaborative work with universities using the DSpace archival system. The project is being developed in conjunction with the Online Computer Library Center, which was formerly based at Ohio State University. DSpace is an open source digital library system that stores, indexes, and redistributes research material. [38]

There are over one hundred institutions around the world using the DSpace platform to archive the scholarly output of their academic staffs. DSpace takes a customised approach to each academic discipline, which is a groundbreaking approach. The level of interoperability provided creates a far more valuable resource than an individual system ever could. Conley regards it as an important step forward in digital archiving. [32]

The marketing of Economics Bulletin was carried out almost exclusively by means of personal recommendation within the academic economists' community. It has done well to compete with a long-established journal that has a distinguished editorial board. Nevertheless, it still publishes much less than half the volume of articles than that of its competitor. It takes time for any academic journal to acquire

prestige. The editorial team are engaging in a long war of attrition with their commercial rivals. The Economics Bulletin home page is shown below.

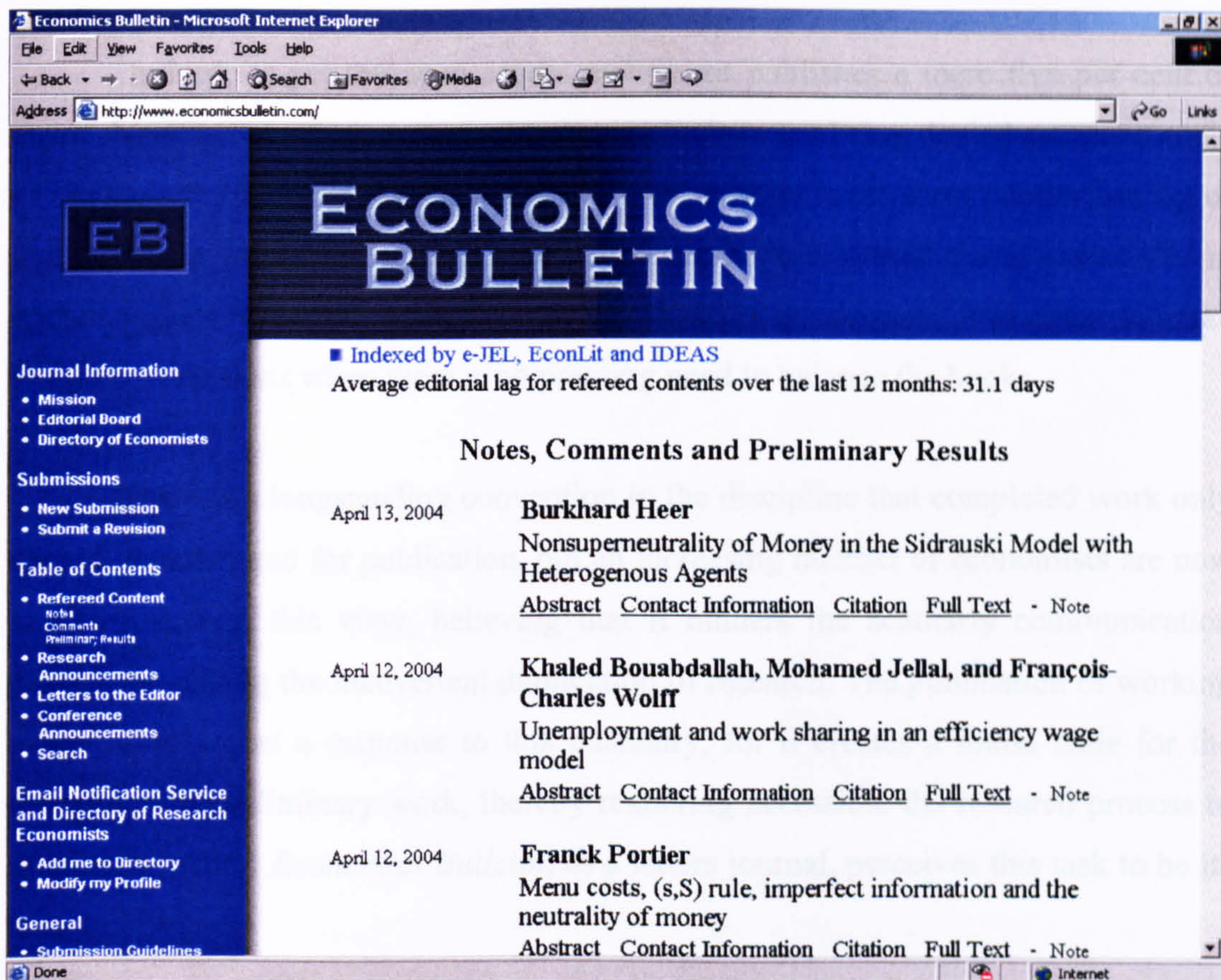


Illustration 8.1: *Economics Bulletin* home page

If it were ever necessary to charge money to circulate the knowledge that's created, well that would just be the cost of doing business, and historically that was true. I don't think that this is any reason to charge anything for access. It does cost something to set up the infrastructure, but it doesn't cost too much. It was more money than we would have liked to find. After all, it came out of our own pockets. My view on this is that it is really a bit more than any private individual would wish to spend, but it's not so much that you can't just go ahead and do it. [31]

Economics Bulletin is a relatively small-budget initiative that is in the main driven by the enthusiasm of Conley and Wooders. It has three main advantages over

the competition. The first is the fact that it is open access, which means that papers published in *Economics Bulletin* are more likely to be read, and thereby cited. A not insignificant volume of published research is not open access.

Indeed, as yet the open access movement publishes a mere five per cent of research paper output. As a consequence, researchers are being denied access to some of the higher quality research material. [13] The second is the short publication lag of just over four weeks, which is of crucial importance to a journal that is essentially an update service. The third is that the level of funding is adequate. It is easier to make long-term decisions when there is no pressing need to balance the books.

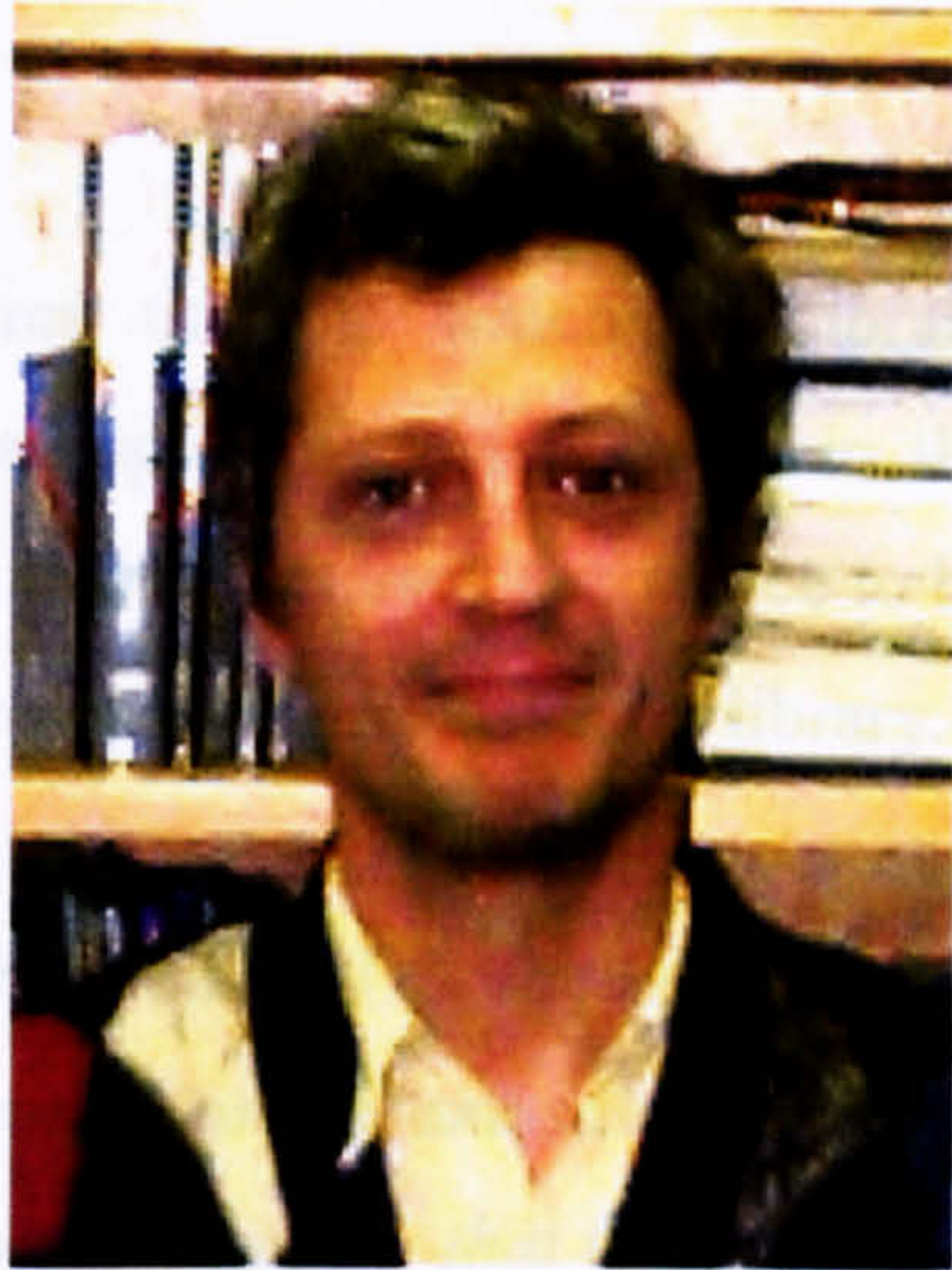
There is a longstanding convention in the discipline that completed work only should be submitted for publication, but an increasing number of economists are now at variance with this view, believing that it hinders the scholarly communication process by risking the inadvertent duplication of research. The publication of working papers is in a part a response to this quandary, for it creates a round table for the discussion of preliminary work, thereby rendering accessible the research process to interested parties. *Economics Bulletin*, as a letters journal, perceives this task to be its *raison d'être*.

The purpose of letters journals is to keep their research communities abridged of work-in-progress. It does much to improve the prospect that other researchers may offer suggestions on how to proceed, and it generates new opportunities for co-authorship. In addition, *Economics Bulletin* offers a better service to authors, and readers, and libraries than its rival commercially published publication.

8.4 Review of Economic Theory

The Electronic Learned Society for the Social Sciences (ELSSS) was launched in November 2000 by the despatch of unsolicited e-mails to over six thousand economists the world over. The e-mail contained facts and figures relevant to the publication of academic journals, and an invitation to members of the economics profession to register an interest in the establishment of new journals that would be in direct competition with the well-established, though over-priced, journals produced by commercial publishing houses.

It was Manfredi La Manna, Reader in Economics at the University of St Andrews (right), who was the author of this tentative e-mail. He was to be completely taken aback by the phenomenally enthusiastic response to his clarion call. There is now no prominent Department of Economics in the world that does not number ELSSS supporters among its staff. Indeed, a few winners of the Nobel Prize for Economics have agreed to join the board of editors. La Manna knew from the outset that the support of his peers was crucial to the success of his project.



...as an economist, my speciality being industrialisation, industrial economics, economics of research and development, all that kind of stuff. I was just astounded by the crazy economics of academic publishing. A handful of publishers have been able to exploit this communication problem, and have got away with murder for so long, and will continue to do so for the foreseeable future. [14]

La Manna thought it of overriding importance to make plain that he envisaged a not-for-profit venture that would provide a high level of accountability. He is well aware that members of the economics profession are not interested in replacing a big monopoly with a small one. The ELSSS Advisory Board included many of the

leading names in economic theory. However, La Manna did not always have such a strong interest in scholarly publishing process.

'I became interested in journal publishing by accident. What happened was...we were asked by our library representative to go through yet another round of cuts of library journals, and I thought that this was just impossible, because we are a reasonably well-resourced university, and we didn't have a huge portfolio to begin with.' [14]

La Manna obtained a printout of the journal titles to which the library subscribed, and almost instantly believed that he had spotted a discrepancy in the prices. He thought that it was due to a software glitch that had caused each price to be multiplied by ten. Therefore, without further ado, he contacted the university library.

'I got in touch with the librarian, and said look, all those journals, the prices have been multiplied by ten. He had a quiet chuckle, and said no, there is no mistake. These are the actual prices we pay. I said, no, that is not real. They were nearly all Elsevier journals, and like most of my colleagues I was not aware of the issue of journal pricing, because we don't pay the price. For the first time, I realised the huge swindle that was going on...I said to myself, let's look into this, and that's how it all started, completely by accident.' [14]

The ELSSS project has proved to be enormously time-consuming for La Manna, even though he has been in receipt of some assistance from the University's Library and Information Services staff members. Of course, the university library system is primary to the academic journal market. [30] Over the past 15 years the University of St Andrews Library has cut the number of journals to which it subscribes from 3600 to 2700 as prices have soared. Hence, the Library is sympathetic to La Manna's cause.

A great many people have contributed helpful advice, but it is essentially La Manna himself who has been the driving force behind the project. He has worked in a yeomanly manner to convince his profession that the dominant publishing paradigm constrains the ability of economists to carry out research, and thereby serves as an

artificial brake on the growth of economic knowledge. ELSSS is a laudable initiative, but it is also an extremely ambitious one, for if it were to be successful it would transform the document supply system.

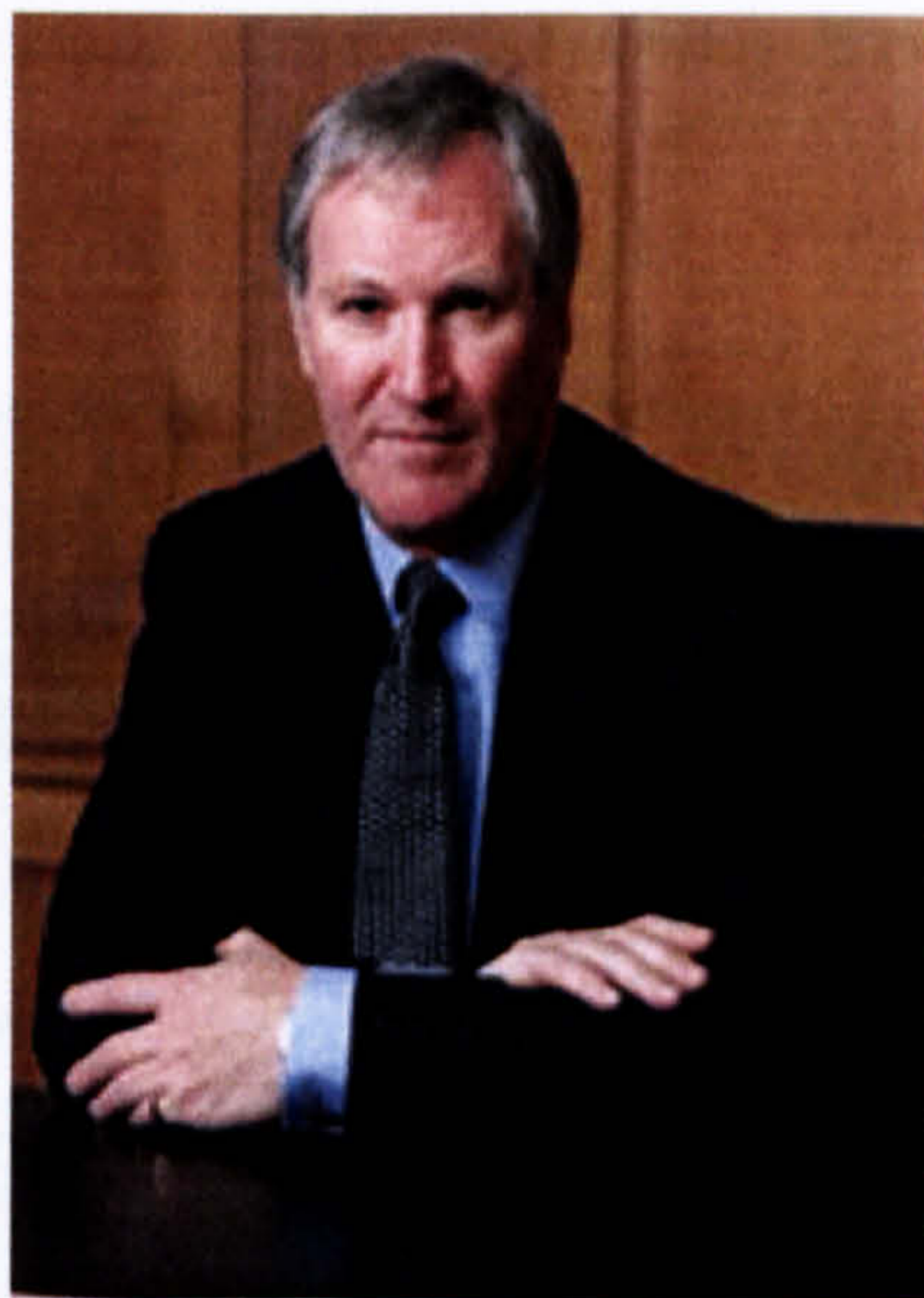
However, the first step was to obtain the necessary funding to begin work. ELSSS received a very great deal of support, both institutional and financial, from the University of St Andrews, the Royal Economic Society, and Scottish Enterprise Fife. In fact, the support of Scottish Fife Enterprise has proved to be *'absolutely crucial'*. [14] In addition, the Consortium of University and Research Libraries also proved very supportive. La Manna has strong views on this subject.

'There is a lot of money available for initiatives in this area, and in my view about ninety-five per cent of it is completely and totally wasted on projects that are of no value whatsoever. Whereas if even half of the money available were directed and targeted to initiatives that could make a difference in specific areas, and create a kind of cloning effect, we wouldn't be in the kind of mess. Everybody in this sorry saga, the funding councils, the Department of Education, the academics, the universities, the libraries, and the various foundations and charities bear some blame.' [14]

Of course, in the early days, La Manna sought support from the obvious candidates, one of which was the Joint Information Systems Committee (JISC). They replied that though it appeared to be a very interesting project they were unwilling to fund it, due to the fact that JISC had done electronic publishing three years before when the Electronic Libraries Programme (eLib) was running. La Manna felt frustrated and disappointed by this response.

'That's how it works, you know? So, you come up with something that has a lot of support, and that is a viable proposition, but that requires a little money, and the answer is we did electronic publishing three years ago. That's it. ...What I find maddening are the amounts involved. If you consider the amount of money that the UK government donates to the coffers of Elsevier, Kluwer and so forth, one per cent of that would be enough to solve the problem...' [14]

La Manna then approached the Scottish Development Agency (SDA), only to be told that it was not a specifically Scottish problem, and therefore they could not consider offering financial support. He was also unsuccessful in his application for funding to the European Union. Fortunately, the University of St Andrews proved to be extremely supportive from the Principal downwards. It was most certainly a happy coincidence that soon after ELSSS was launched a new Principal, Dr Brian Lang (right), was appointed to the University, for he had previously been the manager of the British Library. As a consequence of his previous position, he was already aware of the various issues that related to ELSSS, and could appraise the merits of it. The support he provided was to prove invaluable.



There is a unit at St Andrews called the Research and Enterprise Services, whose purpose it is to assist the commercial exploitation of research results and intellectual property that have their origins within the University. However, ELSSS is best described as a not-for-profit, or perhaps co-operative, organisation. Nonetheless, they gave ELSSS the same level of support that they would a commercial enterprise. They recognised the benefits that could accrue to the University in terms of reputation, and gave helpful direction to sources of funding.

One of the mistakes La Manna admits he made was concentrating on the potential readership of the planned economics journal; it is not they who purchase economics journals, but serial librarians. However, librarians are adept at discovering sources of information, even while still in the planning stages, and they discovered ELSSS without any assistance from him. La Manna has since made amends for his initial unwarranted neglect by speaking at a number of library conferences, and confesses that he is constantly surprised by the support he receives from the library profession.

It is intended that *The Review of Economic Theory (RET)* will be an outlet for theoretical and empirical research material that have relevance to the global economic

climate, and that it will compete with the most successful commercially published journal in economics, which is Elsevier's *The Journal of Economic Theory (JET)*, the home page of which is shown below. It is the only commercially published economics journal in the top ten. La Manna hopes that his journal will ultimately supplant *JET*, but he is aware that such a radical change cannot be effected within a short timeframe. He feels that his journal can prevail by a process of attrition, and that is his long-term objective.

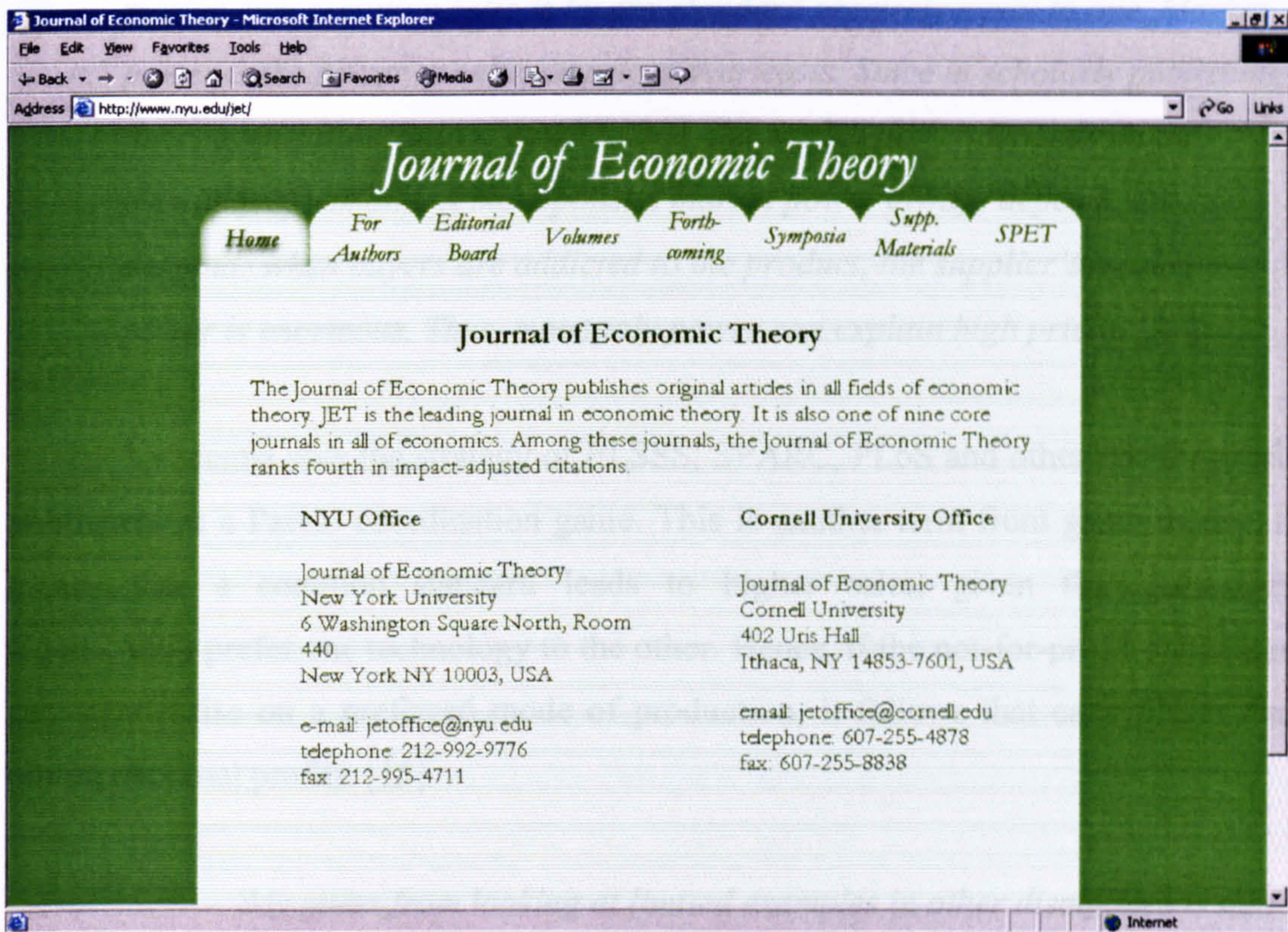


Illustration 8.4: *Journal of Economic Theory* home page

'Economists care about prices in general, and they write innumerable papers about prices, but when it comes to the prices of journals they publish in they are completely ignorant. They do care about other things, such as refereeing lags, publication lags, dissemination of the journal and so on. The idea is that The Review of Economic Theory should be regarded as being better not just in price, but also in all other dimensions.' [14]

La Manna wants to make publication in *RET* not just the best thing to do in terms of the economics research community, but also for each individual researcher to

make this submittal choice as part of what game theorists call the dominant strategy. [35] A strategy is dominant if, regardless of what any other players do, the strategy earns a player a larger payoff than any other. Hence, a strategy is dominant if and only if it is always better than any other strategy, regardless of what opponents may do. If a player has a dominant strategy then he or she will always play it in equilibrium. Also, if one strategy is dominant, then all others are dominated. [15]

For each and every article a publisher owns the copyrights of, the market concentration ratio is by any standard precisely equal to one. Market power is the power to enhance prices over costs. Since in scholarly publishing the concentration ratio is equal to one, the market power depends on the elasticity of demand. A monopolist's market power always depends on demand: when buyers are addicted to the product, the supplier's market power is enormous. Thus, monopoly power can explain high prices. [20]

La Manna sees the strategy of ELSSS, SPARC, PLoS and other not-for-profit publishers as a Pareto coordination game. This is another term from game theory. It means that a common standard leads to higher sales, given that customers significantly prefer one technology to the other. Hence, if the not-for-profit publishers can standardise on a preferred mode of production, it follows that each player can obtain maximal profits. [15]

'My guess from looking at limited examples in other disciplines is that again one should look at it as a game of co-ordination. In a typical game of co-ordination there are two equilibria, one of which is good and the other bad. At the moment we are stuck in the bad, and that is a very difficult equilibrium to dislodge. If somehow you can perturb the system, and move to the good equilibrium, then it's kind of like the flip of a coin; people just move from A to B. So, the transition can be quite dramatic, because once you reach a critical mass everyone else wants to jump on the bandwagon.' [14]

This is La Manna's hypothesis. However, it remains to be seen if theory can underpin practice. He believes that the first test of that theory will come with *The Journal of the European Economic Association*.

'I think for the first time Elsevier, without being prompted by anyone, had to cut substantially the subscription price of what was an established title, The European Economic Review, simply because everybody moved to a different journal. It really is quite something. I know of people who have withdrawn accepted papers. Now, for an economist to withdraw a paper that has been accepted only after years of waiting is a major step. They regard...The European Economic Review...as being incomparably worse than the new journal from the European Economic Association.' [14]

La Manna has spoken to a number of economists about the situation, and the general consensus of opinion is that Elsevier will continue to publish *The European Economic Review*, but that within two or three years it will have become a third-rate journal. Elsevier does not print subscription rates in its journals, but *EER* is known to cost three times more than *JEEA*. Of course, this journal is protected to some degree from the rigour of market forces by reason of its inclusion in the Elsevier bundle. *JET* costs over 2228 US dollars for a subscription, and is by far the most expensive Elsevier journal in the economics field, but it is also shielded from the full effects of competition by being bundled. In comparison, *RET* will cost 350 US dollars. Understandably, La Manna believes the bundling system to be disadvantageous to research libraries, though he is by no means alone in that view. He sees his own role as a catalyst for change in this system. Bas Savenije, University Librarian at Utrecht, offers a useful analogy to explain the rapid growth of e-journal publishing in universities.

...all kinds of arrangements have been made between universities and publishers to facilitate the harmonious exploration of their new roles. However, there is a considerable danger that they will remain fixed in the traditional chain. This danger becomes all the more evident as soon as an attempt is made to describe the development of the information chain in terms of the so-called synergy model. This model, which we have borrowed from chemical theories on dissipative structures, is often applied to organisations and systems. According to the model, the control of processes within an organisation remains stable until a notable interior or exterior factor alien to the accepted pattern agitates the configuration. An unstable situation can

arise if these disturbances increase in number or extent. In this situation, allsorts of events may occur that are not compatible with the existing order. This state is usually referred to as chaos. Sooner or later a new order will emerge out of the chaos, a constellation that is able to warrant renewed stability under altered circumstances. If, however, a new order fails to arise, the result will be regression: stagnating development, and a more or less random disintegration of structure. [15]

In economics almost all of the top journals are published by societies. In general, learned societies did not see the pressure to publish that was producing ever more papers, and they did not expand their portfolios. In effect, they handed the market to the commercial publishers. There are some reasonably priced journals in economics with sterling reputations.



For example, *Econometrica*, which is published by The Econometrica Society; *The American Economic Review*, which is published by the American Economic Association; and *The Quarterly Journal of Economics*, which is published by The MIT Press for Harvard University are all society journals that have affordable subscription rates. *American Economic Review* is, according to Thomson ISI, the most highly cited journal in the field of economics. It has an annual rejection rate that is sometimes over 90 per cent.

However, over the course of the last calendar year the number of submissions published exceeded 10 per cent, which was due to a marked increase in the volume of submissions the publication attracted, and the consistently high standard of their content. [16] The most highly cited commercially published journal is Elsevier's *JET*, which is currently rated fourth. Elsevier publishes no fewer than 67 economics journals, with most of these being narrowly based publications that have limited readerships and small circulations.

In order to break into this market, and to maintain market share once that has been achieved, ELSSS must offer a service that is at least the equal, but it is hoped better, to that provided by commercial publishers at present. The appointment of distinguished economists as editors is essential to the commitment that ELSSS will publish papers of the highest quality. Editors and reviewers will receive stipends that are commensurate with the task they are assigned, though the precise amount has yet to be determined. (*AER* pays 55 US dollars for every paper reviewed.) ELSSS provides, through its manuscript management system, a mechanism that simplifies and automates much of the administrative burden of editing.

The editorial process at the *RET* is a co-operative endeavour. Once papers have been received at the St Andrews base they can then be distributed to the appropriate co-editor for a decision in regard to publication. It is then the task of the co-editors to select a suitably qualified reviewer. This part of the process is entirely decentralised. If and when a paper is accepted for publication, it is returned to St Andrews for final editing. ELSSS has a '*fairness to authors*' policy, whereby authors retain full copyright to their material. It is hoped that *RET* will have a significantly shorter submission to acceptance time lag than other journals. It is somewhat difficult to compare the claims of *RET* with other journals, for it seems that there is no economics journal that makes public knowledge of all the following information.

- When submissions are received.
- How long it takes to assign co-editors.
- When papers are accepted for publication.
- How long editors spend on revision.
- When articles go online.

Indeed, it is quite possible that some publishers do not even bother to record such information. *JET*, for example, has an average submission lag of 17.6 months, which La Manna regards as being totally unacceptable. However, *JET* is by no means the worst offender. *Games and Economic Behavior* has an average submission to availability online lag of 39.4 months, which is surely indefensible. *AER*, the most highly cited journal in economics by far, has a receipt to publication lag of 32 months.

One economist responding to a survey related his experience of having a manuscript take seventy-five months from the time of its initial submission to its appearance in print, which is admittedly an extreme example, but illustrates how the system can badly fail the profession. [34] The continuing existence of parallel publishing certainly exacerbates this lag, for a dedicated e-journal has no restrictions in respect of word count and can simply post articles online immediately upon acceptance.

Online journals are free of the spatial constraints of print journals. The economics journals have shown no inclination to push the envelope in regard to how they employ e-publishing technology. There is apparently no desire to use hypermedia. In fact, some economists do not seem to want e-journals.

'...somewhat surprisingly for a profession that has been changed almost beyond recognition by the use of computers, economists are extremely conservative... We are in 2003, and some economics journals have no online version, which is simply unbelievable. In a sense, we have to take one step back here, and consider the fact that it's difficult to move people away from paper... The transition from paper to an electronic journal, even that small change in the context...is going to be a struggle. Again, you've got to prove that you can do things online that you can't do on paper. The immediate reaction when I asked members of the profession if we needed paper journals was, almost to a man, yes, we need print.' [14]

It is proving hard to convince economists that journals can do things online that cannot be done on paper. *American Economic Review* may be the number-one economics journal in content, but it is very basic in form. There is no use of colour, and it would not be unfair to describe many of the diagrams as being clumsily reproduced. La Manna believes that in ten years' time or so some interactive simulations may be introduced in certain specialised areas of the discipline, but first economists have to learn how to use the technology.

Furthermore, he believes that mainstream economics journals, and certainly the twenty most highly cited, will look exactly the same in ten years as they do now.

However, La Manna is not fully conversant with multimedia, and it is likely that computer literate economists may prove him wrong at some point in the future. La Manna is much more interested in reducing the publishing lag than using multimedia.

'In fact, one of the main planks of the ELSSS project is to create what we modestly call 'the perfect journal'. Now, this 'perfect journal' will be a journal that is published according to the highest levels of peer review, and quickly, and that appears in a form that allows people to interact. Our future plans include turning the journal into what it was originally supposed to be, which was a platform for an exchange of views. It isn't at the moment, for the simple fact that economics research is published years after it has been submitted, and therefore by the time it is published it is obsolete, so there is no need to discuss things once they appear in the journal. Now, if you can reduce those lags, and people can react immediately to what they read, they can think of new ways in which authors and readers can interact.' [14]

La Manna calls *RET* a journal, but he really wishes to take his online publication beyond that concept, and into an interactive communication forum. He believes that the lengthy publishing lag in economics means that an economics article should be looked upon more as a matter of record than a contribution to debate at the time of publication. A very great deal of scholarly publishing in economics is merging into scholarly communication, with e-mail being used to distribute preprints to colleagues in order to solicit informed comment. These documents contain discussion of live issues.

The reaction to La Manna's ELSSS initiative had not been uniformly positive. There is a great deal of inertia in the system, and there are members of the profession who wish very much to maintain the *status quo*. La Manna explains the sort of negativity he has encountered.

'One of the most disheartening experiences I had when I started this thing was when I went to a big conference of a society that must remain nameless. I pointed out the problems, and suggested possible ways in which they could be resolved. After the discussion, I was approached by the society's

treasurer of twenty-five years standing, because these are self-perpetuating oligarchies, and he looked at me as if I came from Mars. He asked me why I wanted to rock the boat. The society's journal has been doing very well. We publish a journal that we give to all the members, and to libraries at a reasonable price. So, why do you want to rock the boat? They are doing fine, thank you very much, and they don't care if the rest of the profession pays the price.' [14]

One significant exception to this sort of unhelpful attitude is the Royal Economic Society (RES). In fact, without the support of the RES, it is unlikely that ELSSS would have been able to get off the ground. The RES, which was founded in 1890, is one of the oldest and most prestigious economic associations in the world. It publishes two journals of its own, *The Economic Journal* and *The Econometrics Journal*, which are both highly cited. Indeed, it was the RES that funded the development of the ELSSS software for the online and print journals, and La Manna is particularly pleased with this exercise in cooperative publishing. He considers online journals and their print counterparts to be complementary, fulfilling at one and the same time like and unlike functions for readers.

'If you start printing and binding journals, and putting them in envelopes, and sending them around the world, that's where it gets really expensive. Our solution is extremely simple, and I'm told revolutionary. The journal is simply sent in a file for the university or library to print off and bind as it wishes at no extra cost.' [18]

(La Manna's paper journal system may well be revolutionary in his own field of economics, but its development was predicted in a research paper published in 1994 by participants in Project Elvyn. It is described therein as an electronic-cum-paper journal.) [28]

Nevertheless, it is not entirely clear why it was necessary for ELSSS to have its own software. ELSSS is a singularly ambitious publishing project, and a manuscript management system such as the Electronic Publishing and Resource Service (EPRESS) would perhaps have served ELSSS just as well, at least in the

initial stages of its development. There are a number of commercially produced manuscript management systems, but they can be prohibitively expensive.

EPRESS, based at the University of Surrey, was originally an eLib project, and seems to possess a similar range of attributes to the ELSSS Publishing Template (EPT). EPRESS is aimed at promoting the publication of e-journals in the social sciences and humanities, and offers support to individual groups wishing either to publish new titles, or transfer paper journals with small circulation figures into an electronic format. Indeed, JISC operated a special fund specifically to grant financial support for the latter task, though this was closed in February 2004. However, EPT has the following features, though many of them are indistinguishable from other systems that are widely available.

- The electronic submission and manuscript tracking systems are easy for authors and referees to use.
- Accepted papers each have a choice of depth, or level, for the reader. There can be a brief synopsis; an extended synopsis; a media briefing if deemed appropriate; a full version of article, which is also published in a print format; an extended version with additional data sets, appendices, and other extras that are solely available online.
- There are multiple layers of interactivity; readers can contact authors by e-mail, post comments on a dedicated discussion forum, or submit formal comments, albeit mediated by editors.
- There is citation and download tracking, with regular updating of ELSSS articles that have been included in citation databases, in addition to the recording of access and downloads.
- Universities and Research Centres in countries judged by the World Bank to have developing and transitional economies have free access to ELSSS.
- There will be a strict adherence to Open Archive Initiative standards.

The key idea is to nurture a close relationship between authors, referees, editors, and readers on the one hand, and the technical and administrative staff on the other, in order that ELSSS publications can be tailored to the requirements of the

economics profession. Papers that have been accepted for publication in ELSSS journals can be looked upon as being at an intermediate stage in the publishing process, insofar as they have been peer reviewed and are online. This enables the readership to comment upon the content, and indeed interact with the authors, from the date of publication.

EPT is a manuscript management system that seamlessly integrates the refereeing, editing, production, and dissemination processes. It possesses a package of novel features that are intended to assist and foster debate on the research material that is published in its journals. One interesting aspect of this interactivity section is that users can assemble a post-publication evaluation profile for each and every article. This can be done indirectly by means of hits and downloads, and directly by means of a report form that permits them to rank the article according to specified criteria. A corollary of this is that La Manna is also concerned about long-term archiving.

'Of course, we consider robust archiving to be an essential element of ELSSS as a publishing entity. Indeed, one of the main reasons why ELSSS journals will be available in print form, apart from hard copy being widely regarded as a signal of journal quality, is that paper is still a very robust archiving medium. ELSSS will also participate in various projects to define and implement reliable standards for online archiving.' [14]

La Manna defines a 'document' rather differently from most people, and in light of this there is a complication in the archival process. There are a number of layers in an ELSSS document. Firstly, there is the article. Secondly, there are interactions between author and readers in the form of e-mail exchanges. Some of these may be very significant and will require to be archived. Thirdly, there are a range of options that range from abstracts to lengthy synopses; extended versions of the version that appears in the print journal; and additional material such as appendices, data sets, and links to other relevant papers by the authors. The print edition is plain vanilla, which is just the way that many want it. Print articles constitute only a part, albeit an important one, of the ELSSS system. There may come

a time when the archived e-mail will be of the voice variety, but La Manna does not see that happening in the immediate future.

The concept of the scholarly journal as evinced by La Manna is a fusion of the traditional and the innovative, which seeks to benefit from the best of both. The journal is concerned with certification and record, but it also acts as a virtual forum in which economists can interact in real time. Indeed, La Manna believes that this xenogamous element of the ELSSS system will be pivotal to its success. The open access system does much to reduce the burden imposed on research libraries by document transfer. [36] The interlibrary lending system can sometimes prove to be complex and expensive. La Manna argues that readers accessing ELSSS journals by means of an interlibrary loan would be deprived of the additional relevant material that accompanies articles, and would not be able to participate meaningfully to the online comments and debates. However, La Manna has other grounds for believing that his subscription system is a more viable one than open access.

'There is a more radical reason why we believe that the whole concept of document supply applies to highly priced paper-based material and not to the new journal concept developed by ELSSS, a reason related to the motion of fair access. For open access journals, the issue of lending is immaterial, but ELSSS journals have to recoup relatively high costs of peer review and therefore cannot be open access in the full sense of the term. However, ELSSS journals will be open access for those readers least able to afford the modest cost subscriptions, namely those located in a developing country, as any educational and non-commercial organisations in these countries will be allowed free and unrestricted access to the full functionality of ELSSS journals.' [14]

The long-term aim of ELSSS, and similar projects, is to drive down the costs associated with scholarly publishing to the lowest practicable level. Yet, La Manna proposes to pay editors and referees. Of course, in a great many disciplines editors and referees work without payment, but this is simply not the case in economics. Those who carry out editorial duties for professional economics journals accept a small remuneration, though in the main the motivation for carrying out such work is

one of academic duty and not financial reward. The fees paid are by no means substantial. For example, the *American Economic Review*, the economics journal with the highest impact factor, has paid fees to academe-based editorial staff for quite some time, as has the *Economic Journal*, the prestigious publication of the Royal Economic Society. These journals are both published on a not-for-profit basis. There are no payments made to authors who publish in professional economics journals as such, but there are sometimes prizes awarded for articles that are judged to be of exceptional quality.

ELSSS has carried out a survey in this area, and not a single respondent mentioned the possibility that paying referees and editors could compromise the reviewing process. The prevalent system is one of double-blind refereeing, and the payments are based on the speed of response. It should be emphasised that payments are not related to the verdict on the quality of the papers' content, thereby creating a safeguard against any possibility of bias. The quality of refereeing is related to the level of experience possessed by the person carrying out the task, and is in no way connected to the level of remuneration. La Manna is unaware of any economics journal publishing papers that have not previously been refereed.

Peer reviewing is after all an applied skill—like architecture, flying aeroplanes, or clinical medicine—a practice, rather than a purely cognitive attribute, that is, knowing a lot. All practitioners need to become good at 'reflection in action'; the mix of analytical, judging, and performing skills that is essential for handling the complex, unfamiliar, and ill-formed problems they're called on to handle. [19]

The rejection rate of top-ranking economics journals is significantly higher than their counterparts in some other disciplines. The rigour of the rejection rates, which all the top journals regularly publish in their own pages, is taken as proof of intellectual soundness. It is a matter of record that all of the ten most highly cited economics journals have rejection rates of around 90 *per cent*.

'I believe that much faster progress will be made towards fairer academic publishing when contributors to the debate realise that there is no

one model that fits all disciplines, The quests for a grand solution may be at best illusory, and at worst hamper the efforts of people trying to change things for the better in a gradual and decentralised fashion.’ [14]

La Manna was recently talking to the Editor of one of the top physics journals, *Applied Physics Letters*, who proudly informed him that the rejection rate for his journal was 66 per cent; the journal turns down two out of three papers. However, to go down to 66 per cent in economics would probably mean publishing in a journal around the top hundred mark. Yet, that is neither to slight the aforementioned journal nor the discipline that it serves, rather it is an indication that every academic discipline has its own ideas in respect of scholarly publishing.

In other disciplines there is this concept of page charges, but in economics it simply doesn't exist; it has never existed; it will never exist. In fact, people in the profession react very badly to the idea of a submission fee. Again, submission fees are often an indirect way of inducing people to become members of a society, because if you're a member of a society you don't pay a submission fee. It's more a sort of marketing tool than anything else. [14]

Essentially, La Manna looks upon the business model of *RET* as a cost-sharing exercise. There are the costs of editing, peer review, server space and so on, and all of these costs are to be shared by the people who actually use the journal. La Manna points out that it is typical of a subscription system that the more popular a journal becomes the more profit the publisher makes. However, La Manna sees the *RET* subscription rate as a way for the readership to contribute to meeting the journal's running costs, and these costs are for the most part fixed ones.

La Manna points out that if twice as many libraries subscribe online, the additional costs incurred by ELSSS will be almost zero. ELSSS is unlike many other publishing projects, insofar as it is trying to establish a publishing house that will specialise in the field of economics, and is not just a single journal project. Hence, the start-up costs will be much higher. La Manna has not only experienced great difficulty in raising sufficient capital to establish his publishing house, but has had to combat an enormous degree of inertia in the publishing culture of the discipline.

The editorial board of The Review of Economic Theory is made up of probably the top economic theorists in the world. So, we're talking about the most established, internationally recognised leaders in this particular area. They have had many years of experience in the editing of top not-for-profit journals, and essentially they want to do more of this. It's very good that they want to do this, but just the step from print to online is as far as you can push them. [14]

ELSSS partnered with SPARC in February 2003, but just eight months later a terse statement appeared in the SPARC E-News web page announcing that the partnership had been terminated. SPARC withdrew from the partnership pending a review, initiated by La Manna, of the *RET* business model. The following is a verbatim quotation from the SPARC newsletter.

SPARC has withdrawn from its partnership with the Review of Economic Theory, a publication of the Electronic Learned Society for Social Scientists.

This does not mean the end of the road for *RET*, but it is certainly a setback. ELSSS wishes to publish a raft of journals that can compete head on with their Elsevier counterparts, but this may prove unrealistic. La Manna wishes to break the mould of scholarly publishing, at least in the field of economics. He believes that to publish just a single journal would only add to the problems the discipline faces, and hence be counterproductive.

If *RET* is not to become the first of many journals like it, and a proven template by which to challenge Elsevier, then the project becomes conceptually incoherent. La Manna plans to have ELSSS back on the road in the very near future. There follows a review of the Berkeley Electronic Press, an operation about which La Manna has expressed some scepticism due to the fact that it is funded largely by venture capital.

8.5 The Berkeley Electronic Press

The University of California Berkeley is the spiritual home of an innovative publishing venture that already stands on an equal footing with the scholarly publishing establishment. Berkeley is an academic institution with a reputation for challenging received opinion. The Berkeley Electronic Press, widely known as Bepress, was founded by three professors at Berkeley in 1999, and launched its first journal in December 2000. There is now a small team of paid enthusiasts working in this publishing house, but the founders are still involved on a daily basis. These are the individuals who transformed Bepress from a set of ideas into an academic-driven publishing house.

- Robert D. Cooter, Chief Executive Officer of The Berkeley Electronic Press, is the Herman F. Selvin Professor of Law at the Boalt Hall Law School at Berkeley.
- Aaron Edlin is a professor at the Boalt Hall Law School, and also in the Department of Economics at Berkeley.
- Benjamin Hermalin is a professor in, and also the interim dean of, the Haas School of Business at Berkeley.
- David Sharnoff is a computer programmer who works for Inktomi, a software house. [2]

They founded Bepress out of frustration with the *status quo*. Cooter was incensed by a 400 per cent price increase of the journal he edited, for it was an increase that could not be justified by recourse to financial data. The journal was already well in profit before the increase took place. The change in pricing strategy came about after it was taken over by Elsevier, which is a familiar story. (Elsevier executives seem to believe that whatever they do is right *ipso facto*.) Cooter and one of his colleagues had taken over a struggling law and economics journal and transformed it into a successful one. They did the work; Elsevier took the money. It was this that gave the impetus to the founding of the Berkeley Electronic Press, the home page of which is shown below.

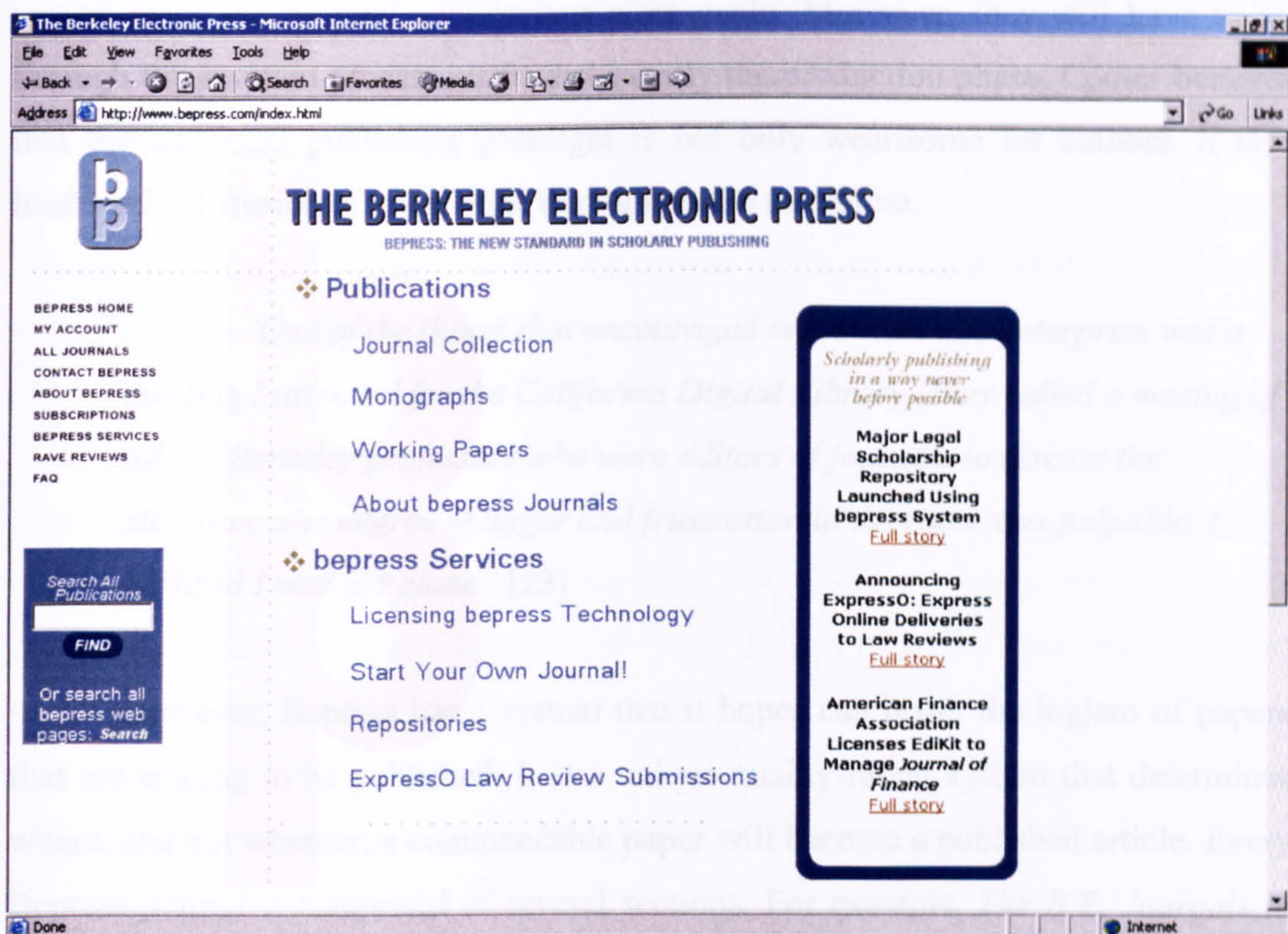


Illustration 8.6: *The Berkeley Electronic Press home page*

I have a particular interest in the developing countries, where the libraries could not afford to subscribe. So, this was very frustrating to me. I also felt that, as an academic, I was much more interested in the development of my science, and the dissemination of the knowledge we were accumulating than I was in the small compensation I was receiving. In fact, my goals and the goals of the publisher, were quite at variance. [24]

It customarily takes around three years to have an article published in an economics journal, and it goes without saying that this is a situation about which many members of the profession feel some disquiet. A commonly employed publishing strategy is that authors submit their papers to the most highly rated general journal, which is the *American Economic Review*, and then there is a wait of between six months and one year before they are informed that their papers have been rejected for publication. They then submit their journals to another journal, usually in a specialised field, in which it may or may not be published. Some economists will only meet with success at their third submittals, but by this time over two years have

passed since the original submissions were made. Moreover, they still have to go through the revision process, and subsequently the production phase. Cooter believes that the dominant publishing paradigm is not only wearisome for authors, it also hinders the diffusion of knowledge throughout the discipline.

'One of the things that encouraged me to start this enterprise was a meeting I attended for the California Digital Library. They called a meeting of all the Berkeley professors who were editors of journals to discuss the situation. The degree of anger and frustration in the room was palpable. I realised I was not alone.' [23]

However, Bepress has a system that it hopes can break the logjam of papers that are waiting to be published. It is a unique quality-rating system that determines where, and not whether, a commendable paper will become a published article. Every Bepress journal is comprised of several sections. For example, *The B.E. Journals in Macroeconomics* is an umbrella publication that comprises four titles, each of which are arranged by academic merit in a manner akin to the editorial practices of the traditional print journal system, which is a tiered one. It is as if an author were submitting a paper for review to several journals at once. This process of simultaneous submissions, rather than the sequential submissions with which everyone in the economics profession is so depressingly familiar, makes the publication of articles markedly more efficient.

- *Frontiers*: Papers that are of a sufficiently high standard to be published in a prestigious, and highly cited, general interest journal.
- *Advances*: Papers that are judged suitable to be published in an outstanding general interest journal, or perhaps a top specialised field journal.
- *Contributions*: Papers that are suitable for publication in a good specialised field journal.
- *Topics*: Papers that are deemed worthy of publication in an academic journal.

Normally, an author is not required to revise and resubmit a paper, but if editors and reviewers have reason to believe that revisions would upgrade the paper sufficiently to influence the choice of journal in which it appears a revised paper is requested. Moreover, authors are permitted to publish their work elsewhere after it has been published by Bepress, but with the *caveat* that it is not published electronically within three years of initial publication.

The Bepress quality-rating system has won plaudits from SPARC, even though Bepress is not a SPARC partner. Bepress has been working with SPARC to conform its journals to its precepts, though SPARC chooses to focus primarily on the STM sector at present. Rick Johnson, the SPARC Enterprise Director, has hailed the Bepress system as a step in the right direction.

The Bepress quality-rating system, in which articles are assigned to one of a range of journals based on an evaluation of their relative merit, is an intriguing one, as is the 'Authors and Reviewers' Bank'. I suspect that the short submission-to-publication time will provide a decisive edge in winning authors and subscribers. [24]

A thorny problem associated with journals that are new to the market place is that authors who have established reputations are hesitant to submit their papers. This is in part due to concerns regarding the overall quality of the publication. However, Bepress claims that difficulty is nullified by the nature of the quality-rating system. An excellent paper would be published in an excellent journal, namely *Frontiers*, for the Bepress system uses absolute, and not relative, criteria to weigh the quality of a paper. It is also said that the Bepress editorial boards are staffed by scholars who number among the upper echelon of the profession, but this is an assertion that is made by a not insignificant number of publications.

Bepress is also innovatory in the review system. It uses a system that is the 'Authors and Reviewers' Bank'. The system is founded on two guiding principles, which are that either authors pay to have their papers reviewed or, after themselves submitting papers for review, they are obliged to provide an equal number of reviews to that which they have received. These reviews must be carried out within a three-

week period, subsequent to which a publication decision is rendered. Bepress take a credit card number, and if the review is not completed in the time allotted, the card is billed. The amount is set by the editors, but the economics journals have set a fee of 500 US dollars. (Bepress publishes thirteen journals, five of which are in the economics field.) Cooter freely confesses that this is a significant sum, but defends it by stating that this is how much it costs to purchase a review from a reputable scholar at short notice. [23]

Bepress economics journals have usually a ten-week turnaround period, from submission to publication, and Cooter regards the Bepress solution as the key to cutting the publication lag time. Indeed, Bepress has demonstrated that the delays associated with review and publication can be eliminated. It is surely only a combination of inertia and the continuance of print journals that has prevented other publishing houses from following suit.

The publishing model pioneered by Bepress is typical of the more flexible and innovatory outlook of the smaller operators. In addition, such smaller publishers are either open access or significantly cheaper than their rivals, and Bepress is no exception. According to *Library Journal*, the average subscription price for an economics journal is 591 US dollars *per annum*.

In comparison, according to the Elsevier's own subscription price list the average price for an economics journal published by Elsevier is 926 US dollars *per annum*. The average subscription to a Bepress economics journal costs 311 US dollars *per annum*. It has become a truism that the not-for-profit publishers offer a better deal to consumers.

They are better in terms of quality. They are better in terms of the number of papers published and, since their prices are lower, and therefore attract many more readers, they are more efficient. The only area where commercial publishers do better is in introducing many more titles. Whether that is good or bad is open to question. [25]

However, this state of affairs may continue *ad infinitum*. Initially, Bepress was open access, but it now requires a subscription. The company is partly funded by venture capital. [22] The four individuals who founded Bepress have each invested financially in the company, but there are in addition some outside investors. It would not be fanciful to speculate that these outside investors may someday press the company to pay a dividend to shareholders. There would certainly be a precedent for this.

MCB University Press, founded in 1967, was an invention of a small number of reputable academic authors who were dissatisfied with the scholarly publishing system. [26] However, after an initial honeymoon period, the company's name became synonymous with high subscription prices. Indeed, the cost of MCB journals was markedly higher than the average in the sectors of management, marketing, and information science. In 1990, MCB acquired New Library World and at once doubled the cost of a subscription, thereby causing the editor to tender his resignation in protest. MCB University Press has now changed its name to Emerald, which is perhaps an attempt to divest itself of a dreadful reputation. Kathryn Toledano, business development director of Emerald, makes no apologies for the company's pricing policies.

'We aren't subsidised, state-run, or institution-run. We need to make profits to reinvest into the business, and we aren't ashamed of that.' [26]

It is conceivable, though by no means certain, that Bepress could go the same way as MCB University Press, although changing market conditions would make that more difficult than hitherto. However, authors have no control over pricing policy, and neither have editors or referees. For example, La Manna is unsure of how Bepress could develop over the long term.

'Now, Bepress has been founded by very respectable academics, but it is in fact commercial. It is actually funded by venture capital. ... There has been the case of a journal, it will remain nameless, that moved from a not-for-profit publisher to Bepress. I was speaking to the editor, I said, surely you

learned from history, and you have made sure that you retain control over all pricing issues. I was not completely surprised when he answered no.' [14]

It cannot be gainsaid that Bepress is more commercially oriented than most other academic-led publishing projects, but only time can tell whether that is a positive or negative quality. Bepress has its own manuscript management software, which is licensed to publishers of existing journals. EdiKit®, the software that lies at the heart of the Bepress system, is touted as a solution to the problems faced by members of the academic community who wish to publish their own journals.

The licensing of EdiKit® has raised additional revenue for Bepress. However, the Public Knowledge Project, which is based at the University of British Columbia in Canada, has an open source manuscript management system readily available for the use of anyone who wishes to publish a journal online. Open Journal Systems (OJS) assists with every stage of the refereed publishing process. [27]

- The online submission of articles, reviews, and other items is facilitated.
- It provides online management for each stage of the publishing process.
- The system comprehensively indexes each article that has been published.
- There is a research support tool for each article published.
- It enables e-mail notification and commentary for readers.

Commercially produced software of this type can cost anything up to 20,000 US dollars, though there are packages available costing less than half of that. In addition, there are annual license fees to pay. There are certainly maintenance costs, but in an educational institution the information technology personnel usually offer their services *gratis*. The EdiKit® licensing fees, comparatively modest as they may be, would still be an unnecessary additional cost for a nascent e-journal to bear. Moreover, Cooter does not claim that the Bepress system uses cutting edge technology.

...there are a lot of funds to do costly HTML work. If you upload articles in HTML you can make them look really beautiful, but it's also very expensive to

do that. Our particular concern is not with doing that kind of HTML work. We publish our files in PDF, which is a simpler system. Any professor can translate a word-processing file into a PDF file and upload it. [23]

Bepress seems to have found it easier to raise capital than ELSSS. There is a proactive, entrepreneurial spirit about in California that clearly has no counterpart in Fife, birthplace of Adam Smith though it is. The Bepress template is now being used by journals in the fields of marketing, law, politics, statistics, and chemical engineering, in addition to the original economics journals. It is a success that ELSSS undoubtedly hopes to emulate.

8.6 Conclusion

Hitherto, the economics of providing access to published research but rarely concerned the economics profession. However, economists are now addressing the problems associated with a dysfunctional scholarly publishing system in a determined manner. The question of control lies at the heart of this debate. The aforementioned journals differ in no end of ways, but their commonalities serve to unite them to some degree. They have proved that they can successfully publish academic journals, but the system that they collectively oppose is still in place, and is likely to continue as a going concern for the foreseeable future.

Bepress and ELSSS do not see their future publishing strategies being restricted solely to the economics field. Indeed, most of the Bepress journals are in disciplines other than economics. Nevertheless, tried and tested economic principles have formed the foundations of their arguments against the present system. These two initiatives are in effect *ersatz* university presses, which begs the question of what university presses of long-standing are doing to support a free and fair scholarly publishing system.

There are now a number of university presses publishing academic journals at reasonable prices. The European Economic Association chose MIT Press to publish

its professional journal, but there is still a need for Bepress, and ELSSS, and *Economics Bulletin* to offer options that hitherto have not existed. These initiatives seem set to assist in bringing about necessary change in the publishing system, but that change may yet be some way off. Overall, it seems that economists take a very conservative view of scholarly publishing, but that selfsame conservatism can take different forms and directions.

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CHAPTER NINE

Mathematical Journals

9.1 Introduction

Mathematics, Queen of Sciences, stands alone. The task of typesetting mathematical material is, and indeed always has been, a complex procedure. Mathematical journals face problems in reproducing their content online that necessitate the use of customised software; it being the case that highly complex two-dimensional symbolic notation is a distinctive feature of mathematical papers. [1] As a consequence, those involved in mathematical research work can sometimes become preoccupied with modes of publication. [64] [67]

Yet, it was not always thus. There was a time, and not so long ago, when print surface preparation for mathematical texts was the sole preserve of the compositor. To be sure, the typesetting of mathematics always did present difficulties to journeymen, whether such type was being set by hand or cast with hot metal. In addition, proofreaders' corrections were on occasion carried out in an unsatisfactory manner, which could lead to a catalogue of misprints, and thereby necessitate the subsequent insertion of corrigenda.

The notational conventions used in mathematics are perforce complex, though that selfsame complexity is inherent in the subject matter, and hence well beyond the scope of a QWERTY keyboard. [12] There is considerably more to placing mathematics on the Web than simply inventing suitable ways of displaying traditional mathematical notation in a Web browser, vital though that may be. [2]

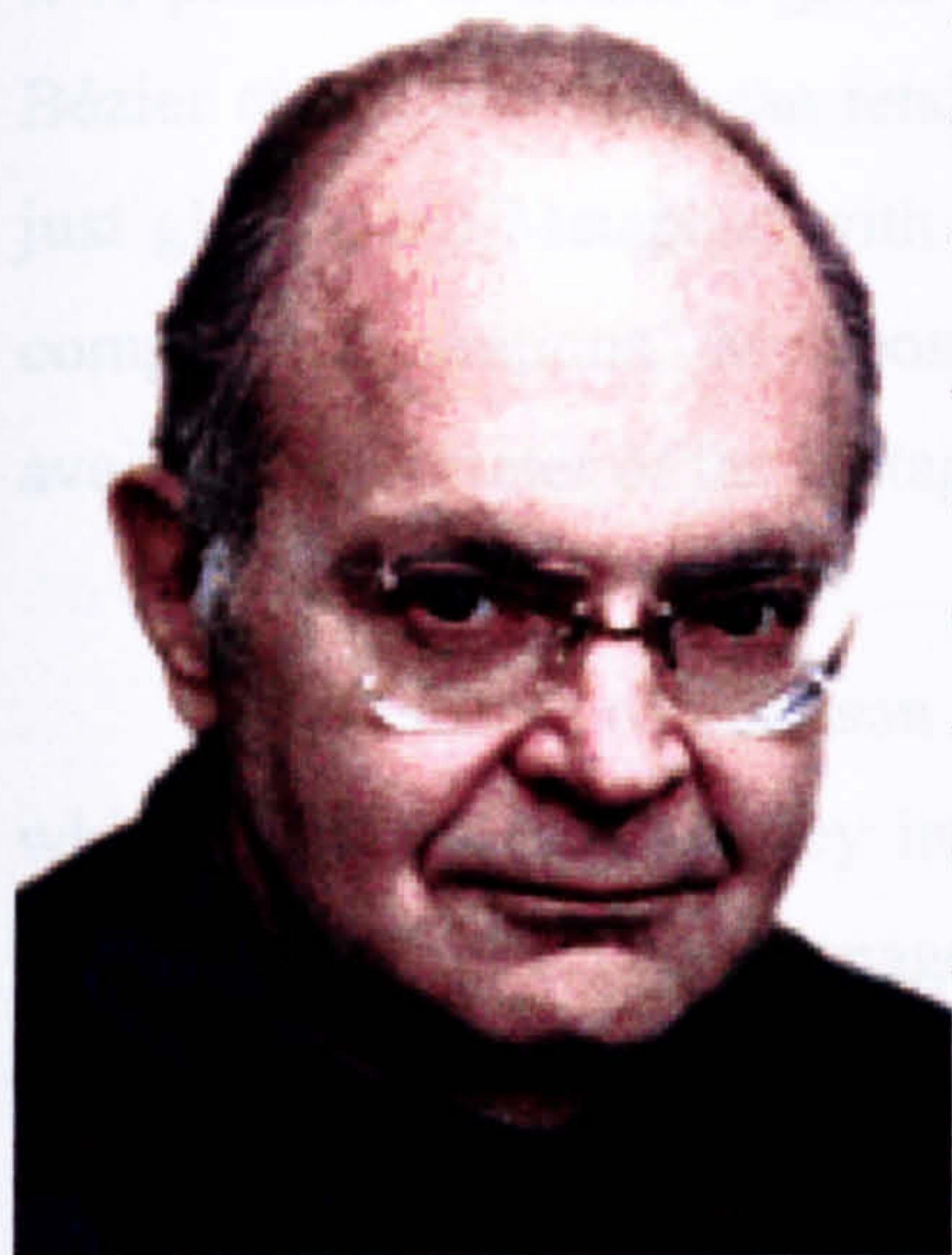
There are quirks and twists involved in the publishing of mathematical papers that serve to differentiate them from other scientific publications, though that has not acted as a brake on the number of titles being published. Indeed, there are over 700

mathematical journals being published at present, at least 56 of which are open access. [2] [31] The Directory of Open Access Journals (DOAJ) lists 45 mathematics journals that it deems to be open access, but Mathematics on the Web, which is published by the American Mathematical Society, (AMS), lists a further 11 that are not included in DOAJ. [32] [33]

9.2 TeX

Nowadays, mathematicians themselves produce almost all the electronic manuscripts used in the publication process, and this is a significant point, for the editorial process is influenced to some degree by the style of composition that is chosen. [3] One of the most common submission requirements of mathematics journals is that papers be set in TeX, though formats are usually altered to suit the established style of a publication after acceptance.

In the late Seventies, Donald E. Knuth (left), who was at that time a mathematics professor at Stanford University, developed a program called TeX. He



had been beset by difficulties related to traditional typesetting during the production of his monumental three-volume *opus*, *The Art of Computer Programming*, which was published in June 1973, and this motivated him to develop a method of encoding text that precisely describes its appearance when printed. (The name TeX is derived from the Greek word *tekhnē*, which means ‘art’, and is also the root of the words ‘technology’ and ‘technique’.)

In October 2003 Knuth, who was at that time editor of Elsevier’s *Journal of Algorithms*, sent a letter to every member of the editorial board explaining his long-standing objections to the company’s pricing policies. [73] In response to Knuth’s letter, the entire editorial board of *Journal of Algorithms* resigned in support. Elsevier, however, plans to continue publishing the

journal. Meanwhile, Knuth and his editorial board are planning the launch of their own journal, which is to be titled *ACM Transactions on Algorithms*, and will be published by the Association of Computing Machinery.

As an integral part of the TeX project Knuth also created a new font design system called Metafont, and a specialised font family called Computer Modern. [74] He was magnanimous enough to place the entirety of these groundbreaking programs in the public domain. Metafont is a program for making bitmap fonts that can be used by TeX, its viewers, printer drivers, and related programs. It interprets a drawing language with a syntax derived in part from Algol, which was the first major language to stress the modularity, and related concepts, of structured programming. [76] Metafont supports the creation of entire families of fonts from a set of dimensional parameters and outline descriptions.

One of the defining characteristics of Metafont is that all the parameters of glyph images are defined with unerring accuracy by well-proven geometrical equations. The output of Metafont is at a fixed-resolution in a raster-based format. However, the Metapost output is vector-based PostScript graphics, which means that it is possible to define a given point as the intersection of a segment of line and a Bézier curve. Metafont can render any kind of graphical output the user wishes, not just glyphs, but Metapost, with its PostScript output, is preferred for the creation of complex illustrations. Metapost is both a programming language and the only available interpreter of the Metapost programming language to date.

The closest comparison to Metafont is Adobe System's MultiMaster fonts, which parameterise fonts by interpolations from parameters of three or four basic fonts using Adobe Type Manager 4.0 or Adobe's older Font Creator utility. The use of Metafont is comprehensively described in the third volume of Knuth's five-volume *magnum opus*, *Computers and Typesetting*. [75] [78] The program is documented in the fourth volume of Knuth's *Meisterwerk*. [76]

Computer Modern fonts are standard with every TeX distribution. Those unfamiliar with the system sometimes equate TeX with Computer Modern, but TeX can use any font for which adequate character metrics are available. Lucida and

MathTime are fonts that are quite popular with researchers in mathematical sciences. [77] Knuth's Computer Modern font family is based on Monotype Modern 8A. It is easy to understand the appeal of the name 'Monotype' to Knuth. After all, he is a mathematician with an obsessive interest in typesetting.

The Monotype system of typesetting, which is now obsolete, consists of two units: a keyboard and a casting machine. Monotype composition rests on a mathematical underpinning called the 'Unit System'. Under this system every character has a 'unit value', which it shares with the other characters in its row of the matrix case. The basic 'unit' in the system is 1/18 of a standard printer's 'point'. The basic 'unit' is standardised as 0.0007685 inches; 12 points is standardised as 0.1660 inches, or a linear unit of 1/6 of an inch. The *pica em*, or 12 points, is used as an absolute unit of measure in line length, whereas the *em* is a typographer's unit of measurement that is proportional to the width of a capital letter 'M'. It varies from font to font, and also varies with the point size of the font. The capital letter 'M' is chosen because it commonly represents the widest glyph in the font. It is from this basic 'unit' of the 'point' that all character widths for every point size in the Monotype system are determined. [74]

The Lucida font family, which is produced by the firm of Bigelow & Holmes, duplicates the Computer Modern mathematical repertoire. Charles A. Bigelow, who is a colleague of Knuth at Stanford, has a history of collaboration with him. Lucida has been the major text font used in *Scientific American* for the last several years. MathTime, which was originally developed for the American Mathematical Society (AMS), includes a large set of mathematical characters. It was the development of MathTime that enabled the AMS to move its journal production from a proprietary commercial typesetting system, in which many journals were set with the Times font family, to a TeX-based system, without significantly changing journal article appearance. This change also enabled authors to prepare the TeX input for their own papers. The Computer Modern font family is illustrated and fully documented in Volume E of Knuth's *Computers and Typesetting*. [77] However, Computer Modern is untypical in a number of significant respects, and is in some ways unique in the history of typographical design.

- The font collection is based on the concept of a 'meta' font, wherein a range of sizes and styles are created from a common set of character outlines by modification of dimensional parameters.
- The font programs are documented and published in book form, and may be freely adapted and modified for other purposes, provided that the font names are changed.
- Tuned instances of the fonts may be created for specific output devices by modification of a relatively small number of parameters.
- There is a large repertoire of additional characters needed for the typesetting of mathematics, and the AMS has further extended the original set. [78]

The name *metafont* has been trademarked by the Addison-Wesley Publishing Company to ensure the intellectual integrity of the system. However, users may modify the program for their own purposes, provided that the modified program is renamed.

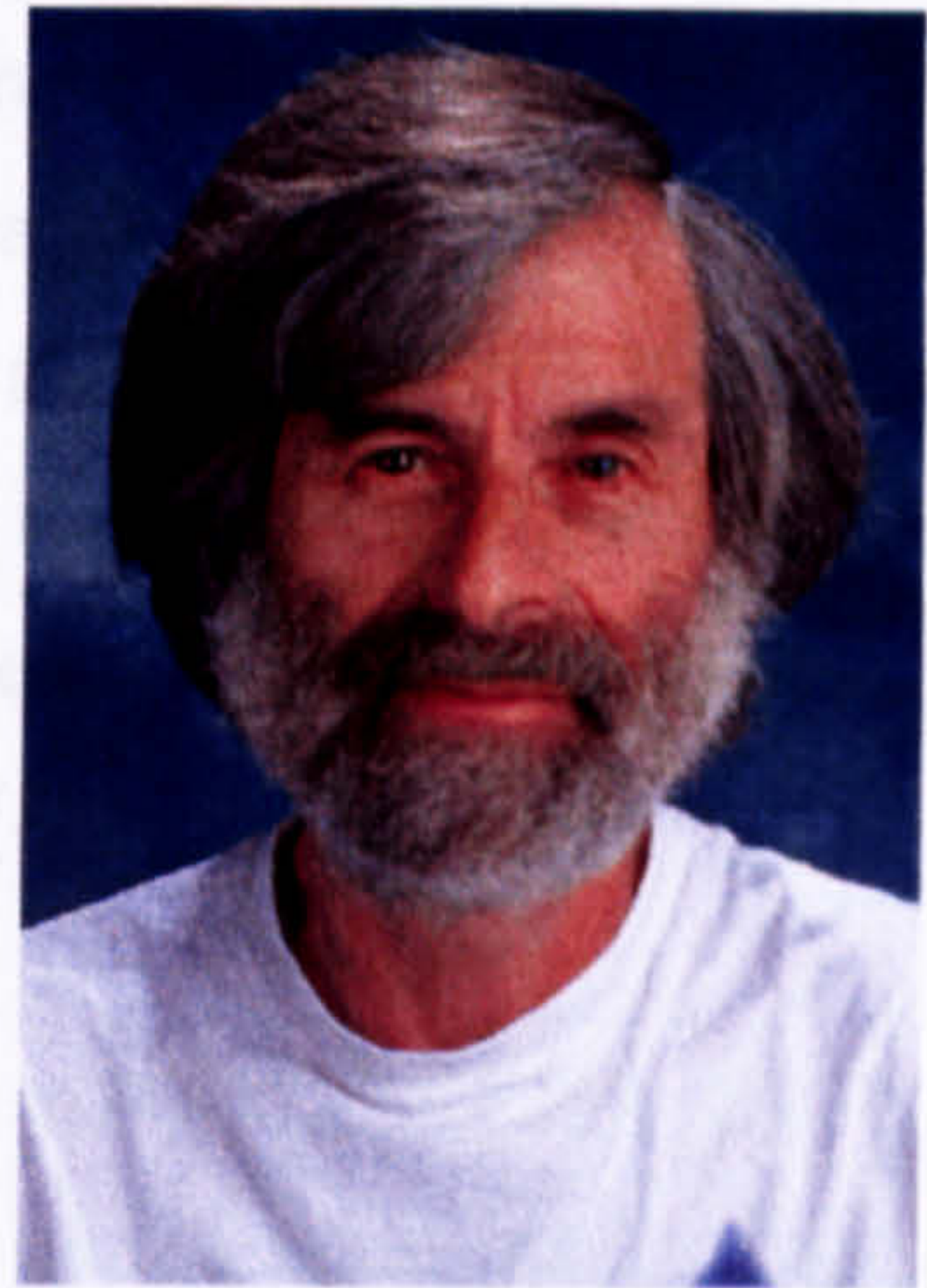
Knuth designed TeX expressly to facilitate mathematical composition, but it can also be utilised for nonmathematical material. Plain TeX, and such variants as LaTeX, AMS-TeX, and AMS-LaTeX, are ubiquitous in certain disciplines. Indeed, the use of it in mathematics, engineering, physics, and astronomy has become almost *de rigueur*. In addition, some publishers employ TeX as their mathematical composition engine of preferred choice.

TeX is therefore almost matchless insofar as it can be brought into play as both an original authoring tool and as a professional authoring tool. TeX can differentiate between superscript and subscript, and can recognise the difference between a numerator and a denominator. It can recognise a summation or an integral, and can identify operands and variables. TeX can compose equations based on the mathematical meaning of their components. The TeX system is in wide use, and likely to remain so for the foreseeable future, but MathML, which is a derivative of XML, may eventually supersede it.

LaTeX is almost a *de facto* standard for the communication and publication of scientific documents. It is used to simplify TeX composition with macros targeted to

specific publishing environments. In order to use LaTeX it is necessary to have both TeX and LaTeX installed on the system. LaTeX, a typesetting language for print production, does produce high quality work, but it is necessary to have a firm understanding of its specific syntax, for customisation of any predefined macros requires some programming expertise. Nevertheless, LaTeX can indeed produce sophisticated print documents of an almost unlimited variety. LaTeX offers great flexibility in text layout, but there is a steep learning curve ahead for any mathematician wishing to use it. [23]

In addition, it should be noted that LaTeX is a print-production tool, and does not support online interactive documents. Leslie Lamport (right), a programmer who now works for Microsoft Research, developed LaTeX in 1985. [29] REVTeX is a joint product of the American Physical Society, the Optical Society of America, and the American Institute of Physics. Those who would wish to publish their work in those societies' journals are required to use it. LaTeX must already be running before REVTeX can be used. [27]



The AMS prefers its own open source software, AMS-TeX or AMS-LaTeX, to be used when submitting to AMS publications. [28] The LaTeX command typesets a file of text using the TeX program and the LaTeX macro package for TeX, which is to say that it processes an input file containing the text of a document with interspersed commands that describe how the text should be formatted. [79]

HyperTeX, which was inspired by the success of the World Wide Web, is a protocol for implementing links in device-independent (dvi) files. [90] HyperTeX files require a dvi driver in order to be viewed. The dvi is the output file format of TeX. HyperTeX not only enables an author to embed within a document links to other parts of that selfsame document, but can also embed links to other documents. Information concerning these links is stored in a dvi file. The external links can be to any document on the Internet, in a manner compatible with the naming scheme used in the World Wide Web. The main advantage of HyperTex is that it obviates the need for a conversion step, which means that any paper that has been composed using TeX

can have hyperlinks appended. [68] [69] [70] This adds another level of utility to mathematical e-journals.

It has become much easier to publish mathematics on the web. Characters and fonts that in the past could be obtained only after some degree of difficulty are now easy to procure. Indeed, with a font creation and editing program such as Macromedia Fontographer, it is now a comparatively simple task to create characters to order. [4] In addition, existing characters can be customised to suit specific requirements.

A Web page that has a lot of text and images interspersed can be difficult to align. Small mathematical equations can disrupt the uniform leading of a paragraph, but there are ways of overcoming this problem. For example, the equation below is actually an image. The equation has been laid out with a mathematical typesetting program, converted to a transparent-background GIF file, and embedded in this Web page with an image tag. The limitations of this approach to rendering equations are obvious. However, users who view this equation on the web will see it with the font, type, size, and spacing exactly as the author has specified. [80] [81] [82]

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

The above image is coded as follows. [82]

```
<center>  
  
</center>
```

It is possible that some users may view the page without images. As a consequence, it is necessary to use the alt tag to describe what is in the GIF file. Understandably, PDF files remain a popular choice whenever exact typographic control is obligatory, or when a facsimile of printed pages must be rendered with unerring accuracy, but GIF images remain the optimal choice if and when compatibility with the greatest number of browsers is paramount.

Typesetting and symbolic computational systems have previously compelled users to employ an array of commands, and a complex syntax, to represent input. Commonly, such systems have over 2,000 separate operators that must be learned in order to create such input. For example, in order to integrate the following expression in most computational systems it must be entered in a linear fashion. [84] (The following equation is a blurred GIF image, which is reproduced from a web page produced by a commercial publisher. This serves to illustrate how variable the quality of reproduction can be in the field of mathematical literature.)

$$\int \frac{x^2}{\sqrt{x^2-9}} dx$$

`int(x^2/sqrt(x^2-9),dx).`

To typeset this expression with LaTeX it must be written thus. [84]

`\int\frac{x\{2\}}{\sqrt{x\{2}-9}}dx$.`

A simple typo would cause an error message. However, there are now a number of programs that eliminate the need to master complex syntax by using natural notation for input, and also to display results. The program understands what the user is writing, and evaluates the expressions. The downside is that these are proprietary programs, and as a consequence they are relatively expensive. The use of Design Science MathType™ has become more common, for it facilitates the setting of mathematics papers in a desktop environment by enabling mathematical notation to be created in a word processing program. MathType™ can also create files in one format, and then save them in a different one, such as anyone of the several variants of TeX. It can also translate a Word file into a MathML one with ease. [5] MathType™ is the professional version of the Equation Editor in Microsoft Editor and similar software. [18]

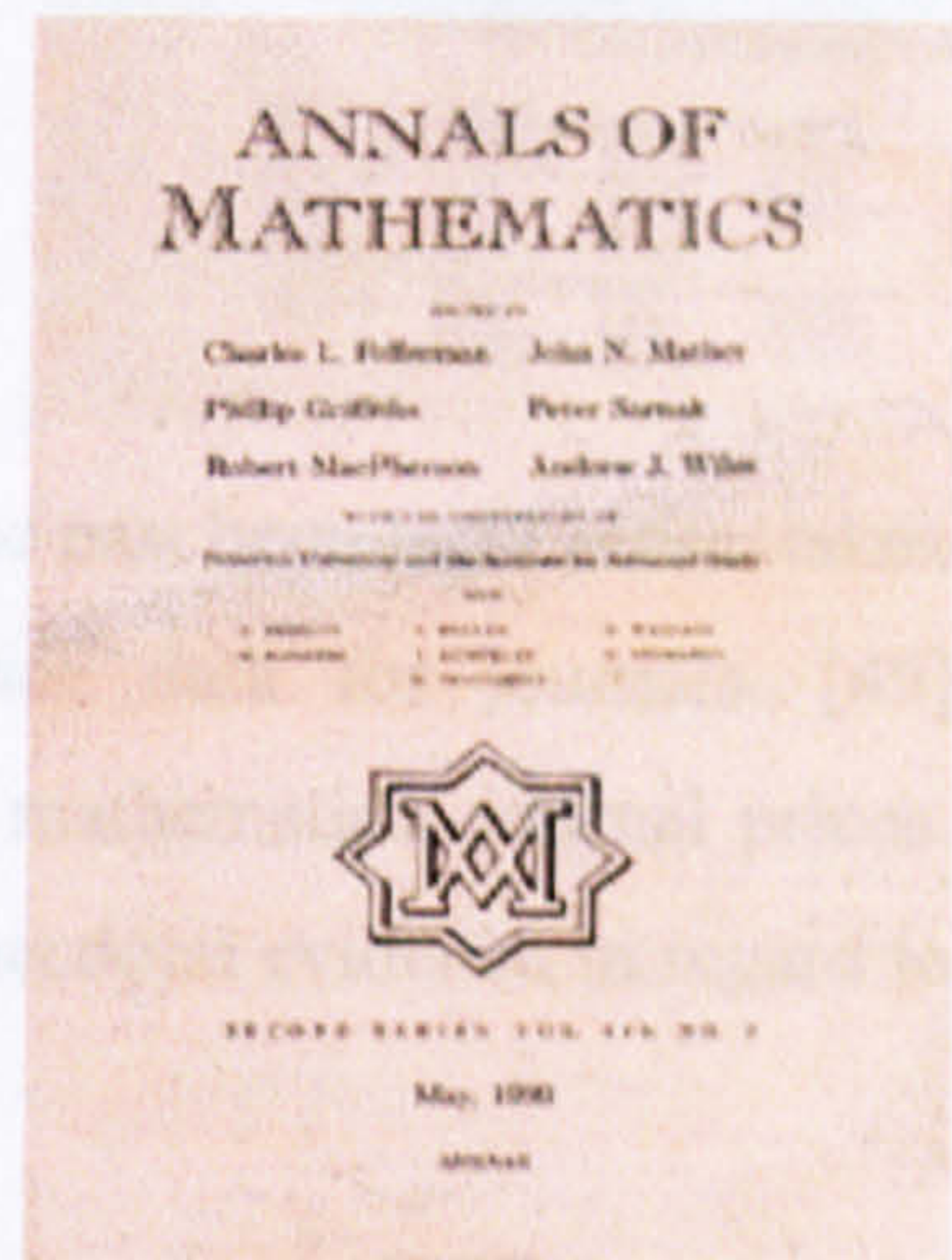
Nevertheless, the representation of mathematical notation online has remained problematic. Browsers have been unable to represent the characters used in the more esoteric branches of mathematics. As noted earlier, the most common solution was to

employ graphics as an alternative to fonts, but this was not a satisfactory alternative, for the graphics could not be made to scale, or even line up properly, once the adjacent text had been resized in the browser. [11] However, mathematical support of a consistently high quality is now available in Netscape, Mozilla, and Internet Explorer browsers. In August 2002, Netscape 7 was released, and it offered comprehensive mathematical support on the Unix and Windows platforms. [6] Mathematical support on the Mac platform came on stream around the same time in Mozilla 1.1, which is the open source version of Netscape 7. [7] The following month a free extension from Design Science called MathPlayer was released for use with Internet Explorer, and this appended mathematical support to what is now the Web's most widely used browser. [8]

9.3 Publishing models

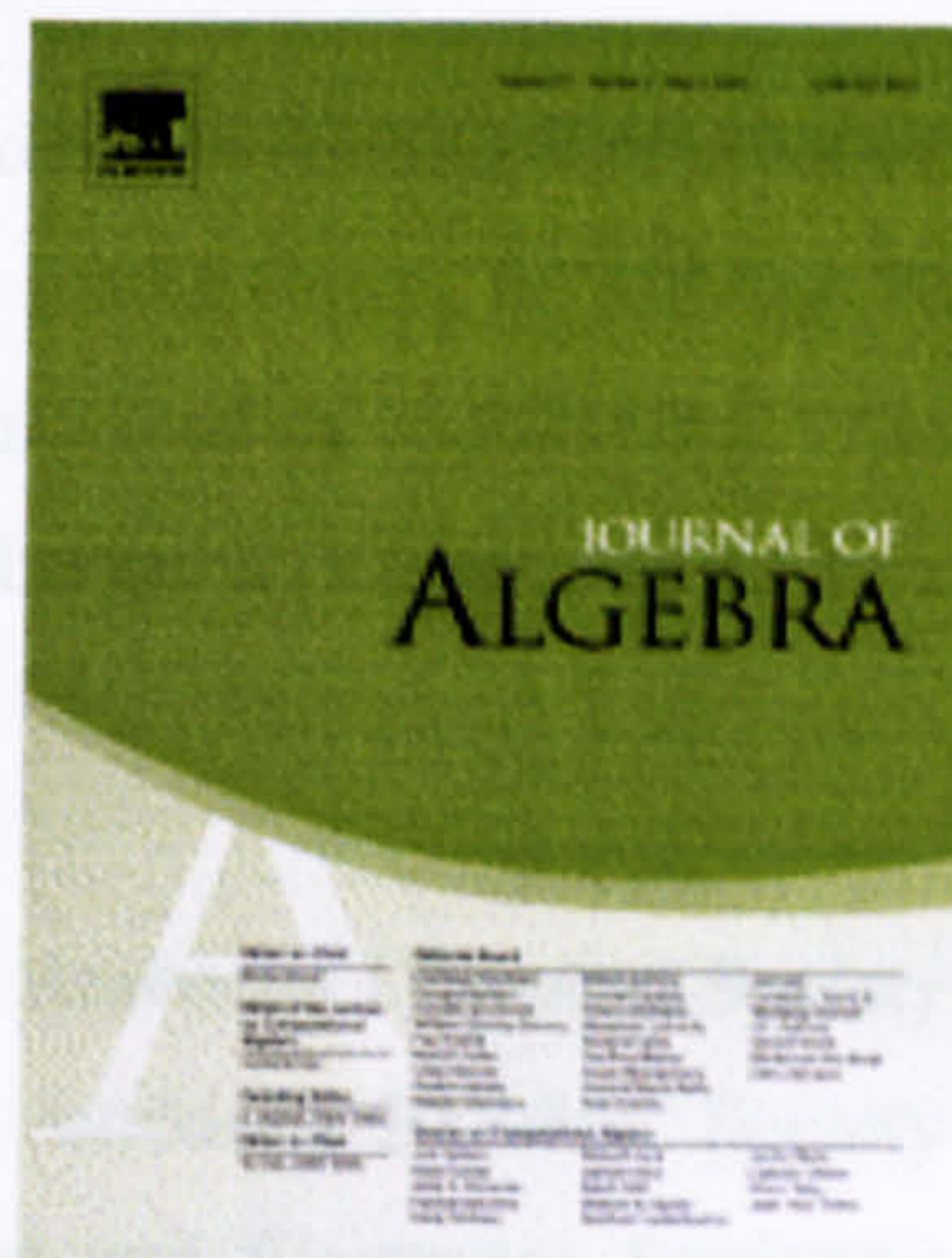
Needless to say, better browser support for mathematical notation impacts upon the publishing of each and every academic discipline that has a mathematical component. At present, a great deal of scientific publishing on the Web is done using PDF, but it is now entirely feasible to publish scientific content in an HTML+MathML format. There are a number of different ways in which mathematics journals are owned, and this issue of ownership reflects sharply on pricing policies and issues related to copyright.

- Journals that are owned by, and published in, university departments of mathematics. For example, *Annals of Mathematics*, which is owned jointly by Princeton University's Institute for Advanced Study and the University's Mathematics Department. This journal is one of the most prestigious in its field, and is now open access.
- Journals that are owned by learned societies. For example, *Journal of Online Mathematics and its Application*, which is published by the Mathematical Association of America.



- Journals that are owned by university presses. For example, the very reputable *Quarterly Journal of Mathematics*, which is published by Oxford University Press, or *Theory and Practice of Logic Programming*, which is published by Cambridge University Press.
- Journals that are owned by commercial publishers. For example, the highly cited *Journal of Algebra*, which is published by Elsevier.

It could be enlightening to compare three highly cited mathematical journals. *Annals of Mathematics*, which is published at 15 cents a page, *Journal of the American Mathematical Society*, which is also published at 15 cents a page, and *Inventiones Mathematicae*, which is published by Springer, and costs 110 cents a page. [53] It should be noted, however, that Springer is by no means the publisher with the worst reputation in regard to overpricing. The seven most highly cited mathematical journals are published by societies and are affordably priced. On the other hand, the eighth most highly cited mathematical journal is Elsevier's *Journal of Algebra*, which is highly priced.



As a rule of thumb, journals published by mathematics departments are either open access or significantly cheaper than most of their rivals, including the modestly priced society journals. [46] There has in the past been legal action taken against those who wish to publish comparative price data for journals. [45] Nevertheless, in 2002 the AMS published a survey of mathematical journal prices. Basically, the findings of the survey supported all the anecdotal evidence in regard to the pricing of mathematical journals. [44]

The editor of *Compositio Mathematica* solved the problem of overpricing by moving from Kluwer to a society publisher, which instantly lowered the cover price by one-third. [54] The foundation that publishes the journal, the International *Wiskundig Tijdschrift Compositio Mathematica*, also has legal rights to the name. As

a consequence, the foundation was able to retain the title of their journal while looking around for another publisher.

The London Mathematical Society (LMS) now publishes the journal, in addition to its four society journals. [57] This is a route that may be taken by some other editors in the not-to-distant future. There are about 50 mathematical societies in Europe, and many among them have an interest in publishing their own journals, instead of relying on commercial publishing houses to do the work for them. [58] The easy availability of font creation software could accelerate this process.

9.4 STIX fonts

The goal of the Scientific and Technical Information Exchange (STIX) font creation project is to develop a comprehensive set of fonts for mathematics, in addition to other special characters used in scientific, technical, and medical publishing. It is planned to make the fonts available to users free of charge. STIX is essentially a group effort of scientists and publishers.

The American Mathematical Society (AMS), the American Chemical Society (ACS), the American Institute of Physics (AIP), the American Physical Society (APS), Elsevier Science, and the Institute of Electrical and Electronic Engineers (IEEE) combined their resources to fund and manage the STIX project. They now have the task of designing and delivering nearly 6,220 characters and glyphs in a comprehensive table, though 2,132 of those antedate the STIX project. A glyph image is any character that is not in the ASCII character set. The symbols to be included in the STIX font set have unique, universally standardised computer codes. [47]

It is widely known that STM publishing employs a large number of symbols. However, there is as yet no single source that can offer all characters and glyphs. Instead, authors are compelled by necessity to utilise characters and glyphs from a variety of sources, and this can complicate online publishing. There are specialised mathematical fonts such as St Mary's Road Symbol, and Waldi's Symbols, in

addition to the proprietary fonts that come with scientific software such as Mathematica and Scientific Workplace. It is hoped that STIX supersedes them, and becomes an industry standard.

In addition, the printed page can sometimes take on an appearance of disarray due to the use of disparate fonts. Whenever authors unwittingly use characters and glyphs that are unable to be rendered online it results in the 'missing symbol' square box. To date, many publishers use PDF files in an attempt to overcome this problem.

There is also a vital requirement to render mathematical formulae, particularly mathematical expressions that involve complex fractions. Publishers commonly call such mathematical notation 'display equations'. One solution to such rendering difficulties is the use of MathML, but this may take some time to become widely accepted.

The goal of STIX will have been realised once fully hinted PostScript Type 1 and OpenType font sets have been created. (Hinting a font is a method of defining exactly which pixels should be turned on in order to ensure the optimal bitmap shape at small sizes and low resolutions.) All characters/glyphs are being incorporated into a Unicode, or a representation comparable to it, and browsers will include program logic to utilise completely the STIX font set in the electronic representation of scholarly documentation. A character is the smallest component of written language that has semantic value; it refers to the abstract meaning or abstract shape. A glyph image is a specific shape obtained from a glyph representation displayed on a presentation surface. Glyphs are selected by a rendering engine during composition and layout processing. [85]

This incorporation of the full STIX symbol collection into Unicode, in conjunction with the availability of MathML, will eventually permit the development of a new archival format for mathematics, wherein users can search not just for text, but also for symbols and expressions, and channel them straight into symbolic manipulation tools. [48] Unicode is the universal character encoding scheme for written characters and text. It defines a consistent way of encoding multilingual text that enables the exchange of text data internationally and creates the foundation for

global software. [85] Unicode is an extension of the American Standard Code for Information Interchange (ASCII), and the original ASCII characters are included in it.

The STIX fonts will resemble the now ubiquitous Windows Times New Roman or Adobe Times font. These fonts sets were originally derived from the original Monotype set designed by Victor Lardent, under Stanley Morrison's direction, for *The Times* of London in 1932. This is now a standard font, indeed often the default font, used by printer and word processing software. Initially, it was planned to release the STIX fonts in Autumn 2003, but the project is at present running behind schedule.

9.5 The MathML platform

MathML was released in 1998, just a couple of months after XML was completed, and in the intervening period several software packages have added support for it. The technology that underpins browser support for mathematical notation is MathML, which is a mathematical markup language, and also a World Wide Web Consortium (W3C) Recommendation. [9] It is used to encode mathematics in an XML format, and accommodates both presentational and syntactical features that describe mathematical notation and capture both its structure and content. MathML makes possible the serving, receiving, and processing of mathematics on the Web in a manner similar to the way that HTML functions with text.

Unfortunately, HTML itself lacks any facility to express mathematical notation. MathML, however, is designed for use in conjunction with another document-level markup language, such as XML. [66] The key feature of XML is that it is designed to be functional in hitherto neglected areas such as mathematics. [10] MathML is similar in several ways to earlier programs for encoding mathematical expressions, but what sets MathML apart is the volume of data encoded. Hitherto, encoding in the main stored data pertaining to the appearance of an equation. MathML, in comparison, stores data about the logical structure, and the meaning, of equations in addition to their appearance. [23] MathML also has consequences for the

retrodigitisation projects, for it offers a greater degree of flexibility in regard to forward format migration. [72]

MathML consists of two complementary sub-languages. Presentation MathML and Content MathML. On the one hand, presentation MathML, as the name would imply, is primarily concerned with the formatting of mathematical notation rather than its mathematical meaning. ContentMathML, on the other hand, is primarily concerned with the mathematical meaning, or semantic content, rather than formatting. However, it is possible to implement conversions from one sub-language to another, albeit with some loss of precision and information. Presentation MathML was designed to solve an online rendering problem, but Content MathML is really what gives MathML the edge over other languages that can be used to describe mathematics, for it is a robust exchange format that preserves mathematical meaning. The association of mathematical notation with mathematical meaning needs to be customisable within an editor due to the very nature of mathematical research papers, which are more often than not open-ended. [83]

The stratagem of storing data about structure in addition to appearance is in keeping with the W3C outlook, and this is by design, for MathML was intended for use in Web pages from its conception. The creators of Math ML have striven to create a set of publishing tools, and provided support for interactivity, computation, and speech synthesis, as well as traditional publication in a print format. The WebEQ Browser Control applets provide cross-platform support for displaying, entering, graphing, and evaluating MathML in web pages. [22] Hence, the salient feature of the MathML system can be encapsulated in four points.

- There is more information in regard to structure and meaning, and it allows easier conversion to other formats.
- The greater volume of information provided enables better searching and indexing.
- The ability to encode expressions in a structured and media-independent way permits more interoperability between varieties of software.

- There is an ability to encode meaning, and this allows expressions to be evaluated in addition to being displayed. [23]

The W3C has also created Scalable Vector Graphics (SVG), which is XML based, and permits graphics to be manipulated in a similar manner to any other XML content. [30] Adobe Illustrator is capable of implementing SVG, and Corel has produced Smart Graphics Studio, which is a program that can build SVG applications. [19] [20] A publishing house is palpably advantaged by migrating to MathML, for using it to express equations in an XML publishing environment enables documents to be displayed wholly in XML, rather than in a hybrid document comprised of XML with links to graphics of equations. [65]



The employment of MathML does much to facilitate the management of change during the publishing cycle, for there is no need to store and order, delete and append, large numbers of equation graphics. There is also the added value of searching equations, which cannot be done with graphics.

Equations can be copied and pasted straight into a mathematical processing system such as Wolfram Research's *Mathematica*, and also into its mathematical typesetting system, *Publicon*. [21] Steven Wolfram (right), the ingenious creator of *Mathematica*, thinks it important to disseminate new mathematical knowledge once it has been either created or discovered, depending on one's viewpoint, though both concepts are related. (However, the nature of that relationship is moot.) [25]

A lot of the value of *Mathematica* comes from the fact that it is a single integrated system, and *Publicon* is an integral part of that system. [24] *Publicon* is a structured document authoring system that is based on the Mathematica notebook. It is an integrated program for authoring documents in XML and other structured data formats. It offers a simplified graphical interface for creating documents that integrate text, typeset equations, graphics, hyperlinks, endnotes, and references. [21] *Publicon* automatically exports all equations as MathML, though it can also save documents in HTML, XML, or TeX. The conversion support also supports publisher-specific

formats such as REVTeX, [27] AMS-TeX, [28] and LaTeX. [29] All documents created in *Publicon* are based on an underlying American Standard Code for Information Interchange (ASCII) format, and are therefore portable and platform-independent. [26]

The strength of *Publicon* is its simplicity. *Publicon* offers a WYSIWYG graphical interface for creating structurally formatted documents with technical content. A user of *Publicon* is not required to have any previous experience in typesetting mathematics, nor is there any need to master a programming language. Wolfram Research has produced a user-friendly typesetting system for mathematical publications, and that is perhaps a first.

It is likely that MathML will become increasingly important in concert with the increased use of XML, though as of yet MathML has not quite gravitated down to the authors of mathematical and scientific papers, and the reason for this is clear. There is a dearth of user-friendly TeX-to-MathML conversion software, and this is unquestionably slowing the rate of transferral to MathML by academic authors. Overall, MathML really has to be seen as part and parcel of a much larger XML environment. [23]

In order to address the relatively high costs of Web publication, a good many publishers are moving toward XML-based workflows, in which it is possible to compose the same document as PDF for print and as HTML for Web publication. Publishers can use MathML to encode equations, and XML documents can be self-contained. Therefore, there is simply no longer any need to generate and store very large numbers of equations as GIF files and then link them to documents. Moreover, since MathML is an XML application, industry standard tools such as Extensible Stylesheet Language (XSL) can be used to process documents in a uniform manner. Understandably, the financial benefit to be derived from this unification of workflows makes it attractive to publishers.

Mathematical notation is a defining characteristic of the greater part of STM publishing. MathML is a viable delivery medium for mathematical articles on the Web, and it is simply a matter of time until publishers embrace it wholesale.

However, for the time being at least, most publishers are proving reluctant to embrace change. For example, all the e-journals examined in the following pages use some dialect of TeX. MathML is a dynamic format, but there are many mathematicians in the tertiary education sector who feel that a static format is entirely adequate.

In 1994, *New York Journal of Mathematics*, published by the Department of Mathematics in the State University of New York, became the first electronic general mathematics journal on the Web. [52] Its instructions for submissions of articles have not changed since the first issue went online. Papers may be submitted for publication in any dialect of TeX, but the final version must be in LaTeX. The coming shift to MathML should prove beneficial to all players in the field, but the amount of inertia in the system means that TeX will continue to play a leading role for the foreseeable future.

9.6 Documenta Mathematica

In July 1995, the *Deutsche Mathematiker Vereinigung* (DMV), the German Mathematical Society, began to solicit papers with a view to publication in the first issue of *Documenta Mathematica*, and the first articles were indeed published the following year. It has since been published on a regular basis. *Documenta Mathematica* is a general, peer-reviewed mathematics journal, and therefore is open to all mathematical fields. It is likely to obtain a higher number of submissions if it does not specialise. The journal does not ask authors to sign over their copyrights prior to publication, but there is a stipulation that they cite original publication *Documenta Mathematica*. Once a year, a printed volume is published that contains all the articles to be found in the preceding year.

The journal is now run independently of the DMV, but the society still has the responsibility of appointing managing editors. *Documenta Mathematica* was founded on the initiative of Ina Kersten, who is a Professor of Mathematics in the *Georg-August-Universität* in Göttingen. She was at that time also president of the DMV. Peter Schneider, who works at the *Westfälische Wilhelms-Universität* in Münster, and

who is one of the journal's three managing editors, concurs with Kersten's views in regard to the publication of mathematics.

'She was, and still is, very much convinced that mathematicians should take publishing into their own hands, at least to some extent.' [2]

The other two managing editors are Alfred. K. Louis of the Institute of Applied Mathematics at the *Universität des Saarlandes*, and Ulf Rehmann, a mathematician who works at the *Universität Bielefeld*. Rehmann is the technical managing editor, and the markup for the journal is done in his own department. The journal is also hosted by the Digital Libraries Initiative, which is based at the University of Illinois on its Urbana-Champaign campus. Rehmann was motivated to involve himself in scholarly publishing by his being made suddenly aware of the pricing policies of commercial publishers.

I...learned, to my great surprise, that many journals had an average annual price increase of 15 per cent or more during the last five or six years. This inflation of 15 per cent or more per year was during a time when, in the Western world, the average rate of price inflation was usually below two per cent or so, and this is true for both the price increase per volume as well as for the price increase per page. [34]

The international mathematical community became generally aware of *Documenta Mathematica* subsequent to the publication of a special issue of the proceedings of the International Congress of Mathematicians (ICM) that was held in Berlin in August 1998. The first two volumes of the proceedings, which contained verbatim transcripts of the coming lectures, were presented to participants in the Congress as they registered. This was indeed a sea change, for to date it had taken several months for ICM proceedings to appear in print. [2]

The DMV awarded *Documenta Mathematica* a grant of 25,000 Euros with which to cover all production costs associated with the publication of the 1998 ICM Proceedings. *Documenta Mathematica* managed to publish the electronic edition of the Proceedings for the sum of 1,250 Euros, which amazed those individuals who had

originally awarded the grant. Of course, *Documenta Mathematica* returned the surplus funds to the DMV, in addition to 6,500 Euros earned in sales. This sum totalled 30,250 Euros, which was 5,250 Euros more than DMV had awarded in the first place. The table below presents the relevant figures.

Production Costs of ICM Proceedings	
Funding provided by German Mathematical Society	25,000 Euros
Production Costs	1,250 Euros
Profit derived from sales	6,500 Euros
Total sum returned to German Mathematical Society	30,250 Euros

Figure 9.1: *Production costs of ICM proceedings*

The DMV has since used this money to create the Carl Friedrich Gauss Prize, which includes a medal and an award of 10,000 Euros. It will be awarded by the International Mathematical Union, but administered by the DMV. The Carl Friedrich Gauss Prize will be presented at four-year intervals during the International Congress of Mathematicians. It is planned to award it alongside the Fields Medal, which is equivalent in the field of mathematics to a Nobel Prize. Gauss (right) was the obvious name of choice for a prize awarded by German mathematicians.



The capacity of *Documenta Mathematica* to publish no less than two-thirds of the Proceedings before the Congress had actually begun, and the remaining third immediately after, was regarded by many in the profession as an administrative and technological triumph. This outcome was achieved for the most part through the Herculean efforts of Rehmann himself, who had only a fortnight to generate 2,228 pages containing the 160 papers that were due to be presented at the Congress.

However, Rehmann did have the assistance of two able amanuenses when working on the non-scientific part of the volume, which comprised 140 pages. He says that the transformation was carried out with relative ease due to the use of style files that he developed during his work on *Documenta Mathematica*. These style files

are rather small and general, and can interact with four different versions of TeX, which were Plain TeX, AMS-TeX, LaTeX 2.09. and LaTeX 2e. They have to be appended to the articles in order to give them the uniform layout required by the journal.

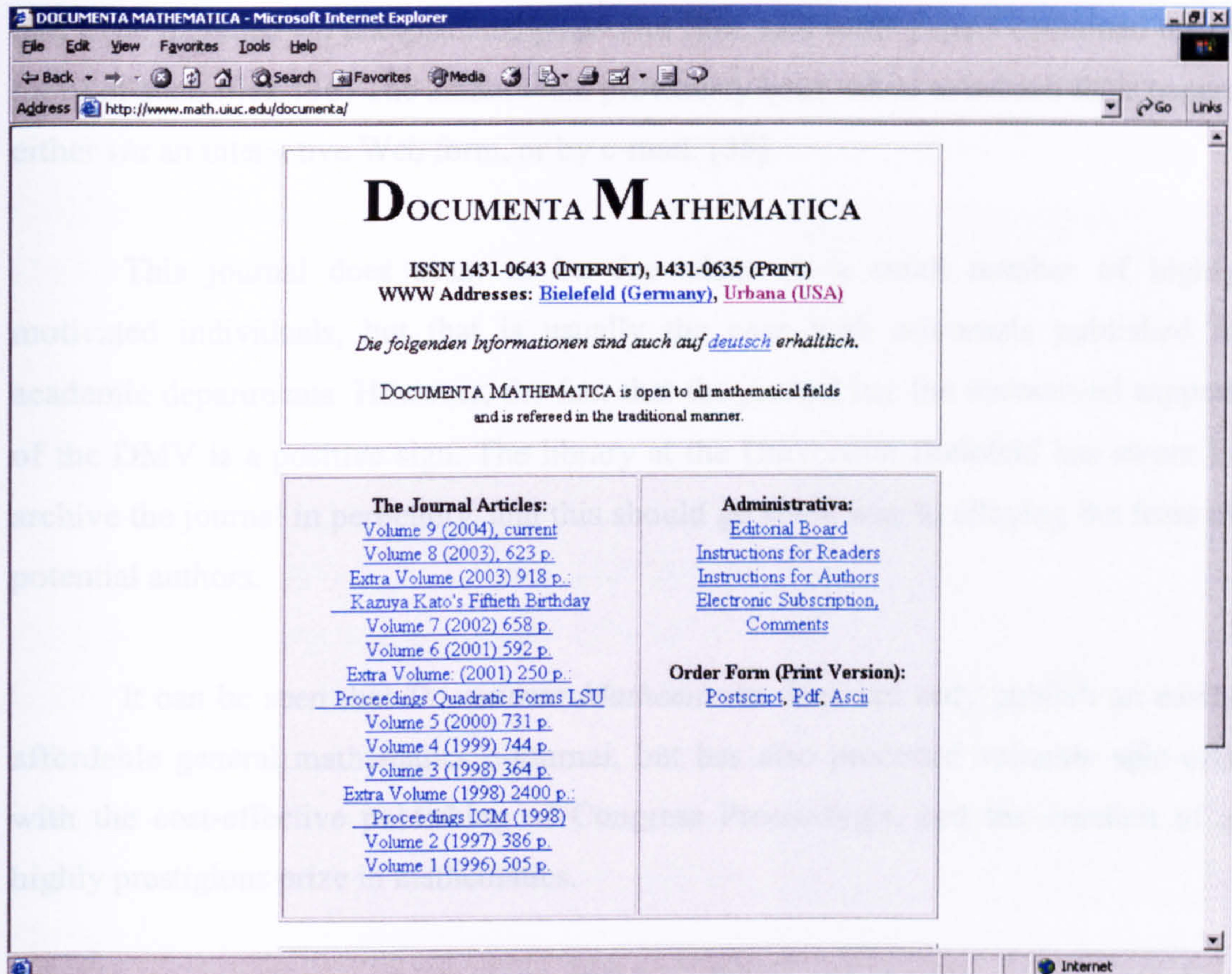


Illustration 9.7: *Documenta Mathematika* home page

As a consequence, Rehmann found it not too difficult to automatise the publication of the papers in a uniform format. [36] The journal permits submittal in any one of these four dialects out of a wish to maintain the goodwill and cooperation of authors, for they seldom express any willingness to adopt new ways of presenting their papers. [37] Now, for the purpose of printing, Rehmann created a single postscript file for each volume of the proceedings, each one of which displayed data in a format that was readily printable. In addition, each volume had two separate postscript files for the front and back covers. A printing house in Rosenheim, a small town in Lower Bavaria, then downloaded the files from the Web, printed and bound them using the print-on-demand model, and despatched them back to Bielefeld. [37]

The format files were created using the *Documenta Mathematica* template, which at that time had already been operational for almost three years. Indeed, around 50 *per cent* of the files had already been preformatted using one of the *Documenta Mathematica* style files. However, a Perl program was used to reformat those that had been submitted in a Tex dialect. A number of papers contained graphics, and these had to be included *via* encapsulated postscript files, and some papers contained ten or more of such files. [36] The authors had previously been asked to submit their papers either *via* an interactive Web form, or by e-mail. [35]

This journal does seem to be dependent on a small number of highly motivated individuals, but that is usually the case with e-journals published in academic departments. However, the fact that the journal has the unreserved support of the DMV is a positive sign. The library at the Universität Bielefeld has sworn to archive the journal in perpetuity, and this should go some way to allaying the fears of potential authors.

It can be seen that *Documenta Mathematica* does not only publish an easily affordable general mathematics e-journal, but has also produced valuable spin-offs with the cost-effective publishing of Congress Proceedings, and the creation of a highly prestigious prize in mathematics.

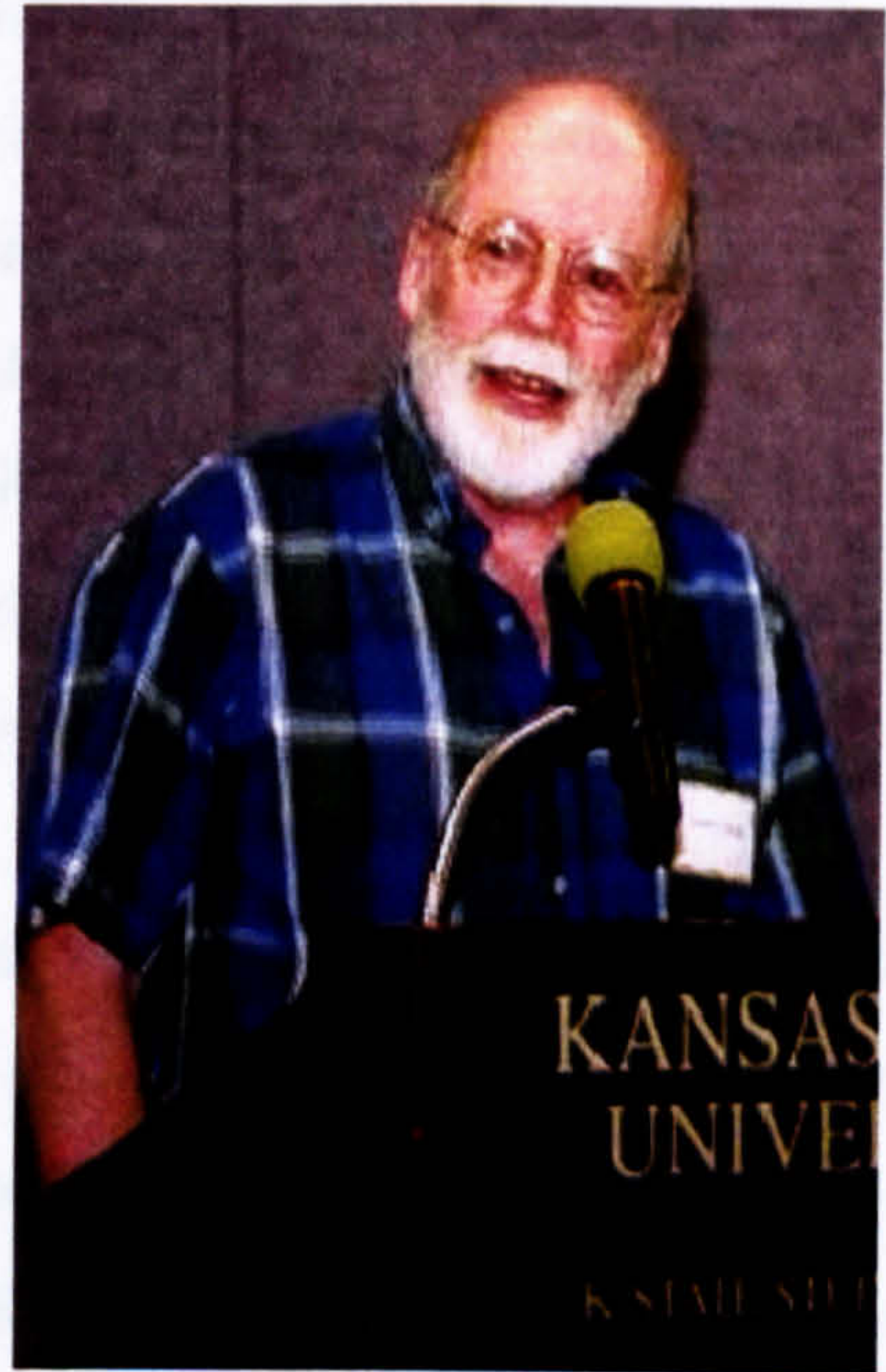
9.7 Geometry and Topology Publications

Geometry and Topology Publications (G&TP), which is based in the Mathematics Institute at the University of Warwick in Coventry, publishes monographs and two open access e-journals, *Algebraic & Geometric Topology (AGT)*, and *Geometry and Topology (GT)*. This enterprise was launched in 1997, and from the outset it was intended to rival in quality the most prestigious journals in the field.

The journals are primarily concerned with publishing original research papers, but expository papers are also considered for inclusion. [38] The e-journals are published in PostScript and PDF. International Press produces the printed editions,

and also administers the system of subscription and dissemination. [49] *GT* is an affordable alternative journal to Elsevier's *Topology*, which costs 1,491 US dollars for an institutional subscription. *AGT* is in direct competition with *Topology and its Applications*, which is an Elsevier journal with an institutional subscription cost of 3,130 US dollars *per annum*. [39]

Documenta Mathematica pioneered the publishing model that is being used by G&TP, but it was Robion Kirby (right), a mathematician working at University of California, Berkeley, who was central to getting G&TP off the ground. [2] However, it was Colin Rourke, Brian Sanderson, and John Jones who actually did the spade work. *AGT* and *GT* have been designated as SPARC Alternative Journals.



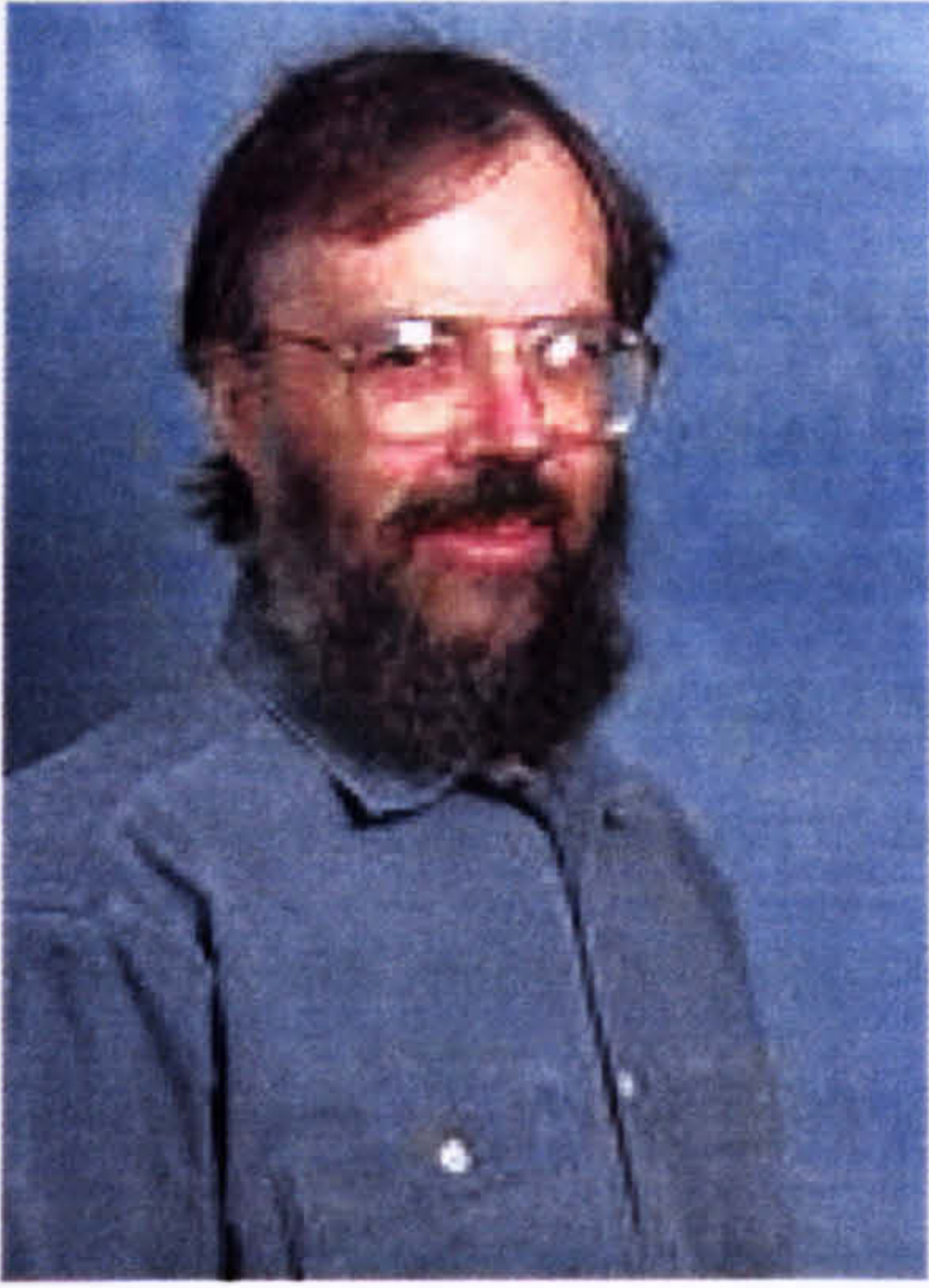
Joan S. Birman, a mathematician at Columbia University, and a member of what is a highly distinguished *AGT* editorial board that includes three Fields Medallists, resigned from the editorial board of *Topology and its Applications* in order to play a part in the founding of *AGT*. [3]

Haynes R. Miller, a mathematics professor at the Massachusetts Institute of Technology, also resigned as a member of the editorial board immediately prior to accepting a similar position with *AGT*. It would perhaps be illuminating to quote from the letter of resignation he sent to Elsevier.

'...one reason for the difficulty in attracting papers in algebraic topology is the resistance... of mathematicians to publish in an Elsevier journal. Elsevier's rapacious pricing policies have not been ameliorated by...this editorial board, and in fact have become significantly more damaging with the advent of Science Direct.' [43]

TeX has converted mathematicians into compositors; e-journals have converted mathematicians into publishers. However, there is a limit as to how many hats mathematicians are willing to wear. It seems that mathematicians look upon the

e-journal as a cost-efficient means of disseminating research papers, and little more than that. Brian Sanderson (left), Emeritus Reader at Warwick, and a member of the AGT editorial board, is not impressed by interactive media or hypertext, and finds it



inconceivable that that a change of policy could ever occur. The PDF files provide an online facsimile of the print journal, and they believe that is all that many mathematicians require. [42]

'We do not read other mathematicians' articles on screen. We browse them on screen. If we seriously want to study them, then we print them out, and carry them around, and read them in the bath, or in the garden, or wherever. We treat electronically sourced

articles and conventional journal articles exactly the same in this respect. We make our own paper copy for serious study.' [42]

Sanderson makes the valid point that downloaded PDF files, because they are likely to have been printed out from a laser printer, are of a markedly better quality than an article photocopied from a print journal. Yet, not all mathematicians are so conservatively minded. *New York Journal of Mathematics (NYJM)* has published a number of papers that abjure the traditional linear presentation mode of mathematical papers, and embrace a hypertextual mode, which encourages users to make their own conceptual connections. [2] Indeed, it has been argued that hypertext is a pertinent illustration of mathematical reasoning processes, mirroring as it does the interconnectivity of concepts, the necessity of continual revision, and the diversity of perspectives. [89]

However, one form that this can take is a highly linked, layered document that provides additional information about terms or ideas used therein; the author can write at a level of detail appropriate for a knowledgeable audience, but also write at a more basic level to provide support for those who are less familiar with the subject. It is a presentational approach that has aroused some controversy. *NYJM* also uses hypermedia, including animations and interactive demonstrations, to develop expository techniques that are unable to be replicated in a printed journal. It is

possible to use a linear document style, while augmenting it with colour images, movie clips, interactive graphics, and even VRML, though many in the profession view the use of VRML in mathematical research as a novel innovation with limited practical applications.

Nevertheless, it has proved very useful in some areas of mathematics. [41] *NYJM* is fully integrated with the library system, and has been from the start. Librarians have been active in every phase of the journal's development, and not just in the archival process, but also in all matters related to publishing. [14] [15] Mathematicians are very much aware that the support of serials librarians for institutional e-journal projects is extremely desirable, if not indeed essential, and that such assistance is important even to open access publications. [3]

G&TP, however, is more concerned with the mathematical quality of the journals' contents than being at the cutting edge of Web technology. G&TP is also deeply concerned about the financial issues related to scholarly journal publishing. Sanderson takes the view that *AGT* is primarily a reputable and fully refereed journal; the fact that it is an e-journal is secondary. [42] *GT* received one paper for publication that included a short animation, but the editors did not deem it suitable for inclusion. Sanderson, and indeed the other members of the G&TP publishing team, are sensible of the fact that the prefix 'e' appended to the noun 'journal' signals to many both continuity and change.

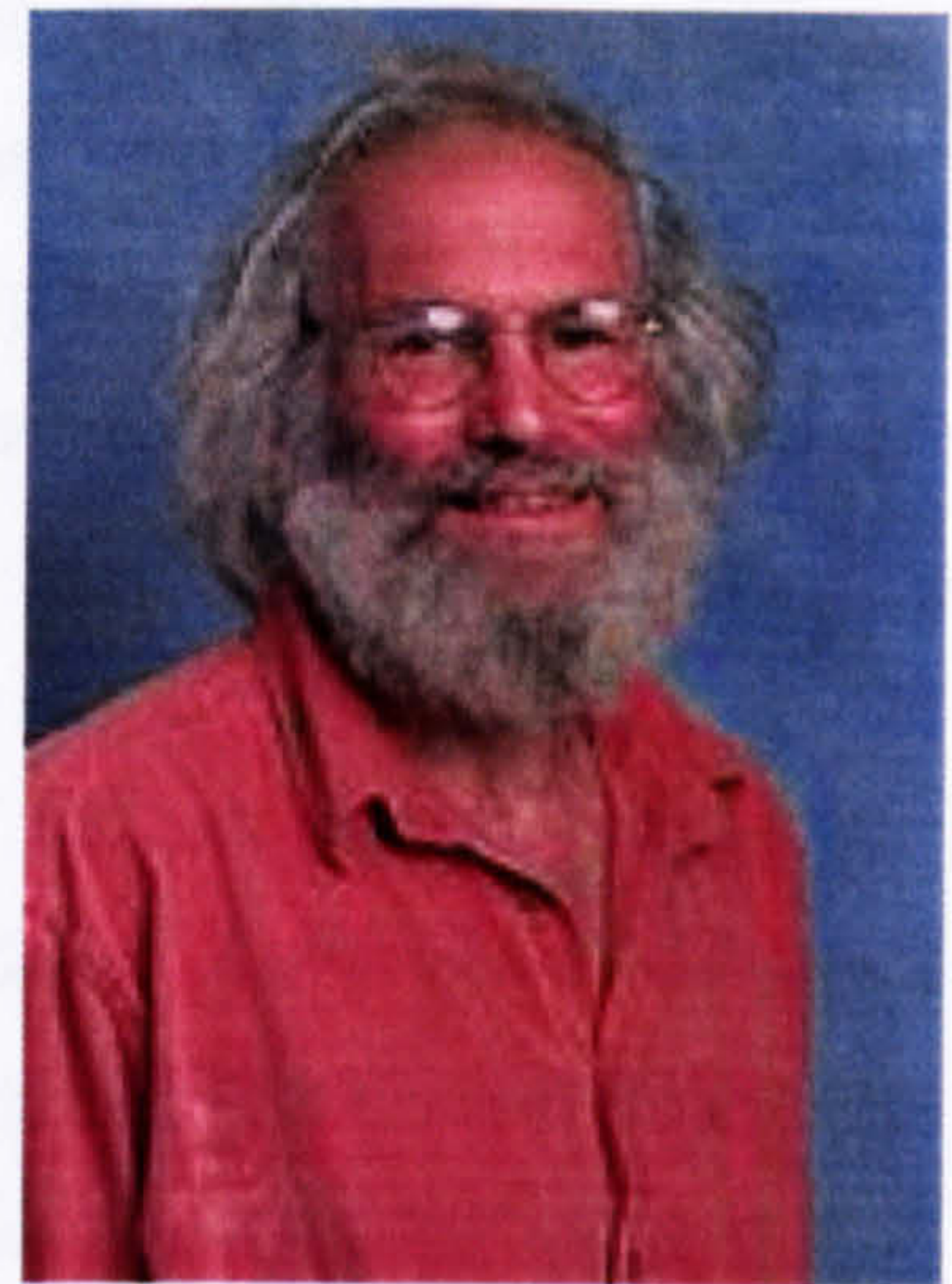
'We are really just a dyed-in-the-wool, old-fashioned maths journal. What we do is publish nice, finished papers. They do the maths, and then they publish it. Somebody proves proposition 'p', and then they publish it. The only difference is that we are distributing it electronically before we print it. We publish it electronically as soon as it's available. We have always regarded the electronic version as just a vehicle for distributing what is essentially a paper copy.' [88]

G&TP has a publishing policy that imparts a stamp of intellectual authentication to research papers even before submittal. Each paper has to be proposed by someone, and be seconded by two others. before it can be submitted to

referees for appraisal. The names and positions of those who propose and second are published at the foot of the first page of each published paper. However, the anonymity of referees remains guarded. It was thought by members of the editorial board that this policy would afford papers more credibility. *Annals of Mathematics* has a similar policy of proposal, but the names of those who propose and second papers for publication are not made known. [87] The editorial board support Sanderson's views on journal publishing. For the most part, they look upon the electronic aspect of the journal as simply a means to an end.

'We chose postscript as the primary medium for publication, for two reasons. Firstly, PostScript can handle graphics properly and articles in geometry or topology are likely to contain a good deal of graphic material. Secondly, by dealing with PostScript files we can handle material sourced from a variety of TeX packages, or even other word processors.' [42]

Professor Colin Rourke (right) explains the financial outlay on running the journal is not great, and that the academic infrastructure absorbs much of the publishing costs.



'There were no secretarial or setting-up costs. Computer costs for running a journal the size of GT are negligible, given the fact that universities are already networked and provide good computing facilities for their staffs. I estimate that the size of the Warwick Maths computing system is about four orders of magnitude greater than that needed to run GT. But then this is the whole point: journals are firmly based in the academic world, and all piggy back to a great extent on that world.' [3]

The running costs of the journals are relatively small, for a lot of the work has been automated. Authors submit their papers by way of an online submission form, which arrives in the editorial office as an e-mail attachment. It is then processed by means of a PERL script, which is a program that assigns files to the appropriate places

in the system, and subsequently generates e-mail messages to the author and to a suitable editor. [50] This program also updates the G&TP main log. In total, these tasks can be completed in around ten minutes. [3]

Once a paper has been accepted for publication the presentation of the TeX file is carried out. This can be carried out very quickly if the paper has been well formatted by the author, but sometimes the author's implementation of TeX is poor and the reformatting of a paper can be time-consuming. The editorial staff could certainly make life much easier for themselves by accepting a greater variation in appearance between different papers.

On the other hand, some of the e-print servers accept anything that is compatible with TeX. If G&TP were to adopt such a policy it would considerably reduce the workload. Publication is automated by means of another PERL program. The same program also announces publication of an article to each member of the editorial board. [50] It usually takes two hours to edit a paper, and about one hour to prepare ten pages of an article for publication. G&TP uses student labour for some of the more routine work.

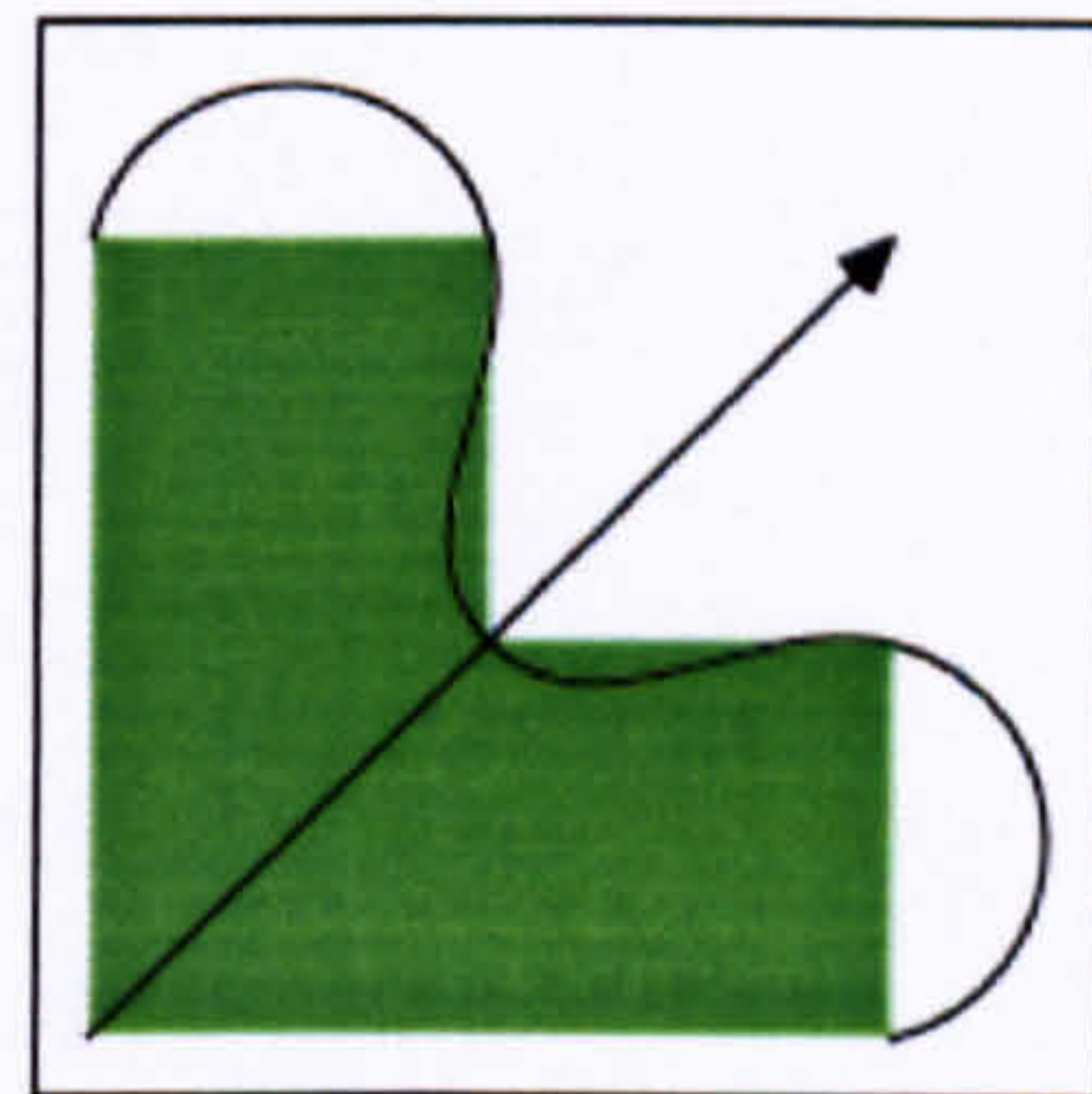
The ways of embedding graphics into a TeX file are many and varied. However, the standard macro package of epsf.tex is available to embed encapsulated PostScript (eps) files into TeX by means of special commands that are interpreted by a program for conversion of DVI files to postscript files (dvips). The eps file is a sophisticated format for capturing precise image and text information. This is a reliable method for accurately communicating artwork due to the mathematical basis for building the format. It is usually embedded within a larger document created by a page layout or illustration program. [10]

Several members of the *GT* editorial board have provided Macro packages that can change PostScript labels into labels that are correctly formatted for TeX, which means that an author can produce a graphic using an eps file of any drawing package for inclusion in a TeX document. The illustrations are simply drawn without labels, and then the TeX labels are added afterwards. The eps files are usually created by a dedicated graphics program such as CorelDRAW, Adobe Illustrator on an Apple

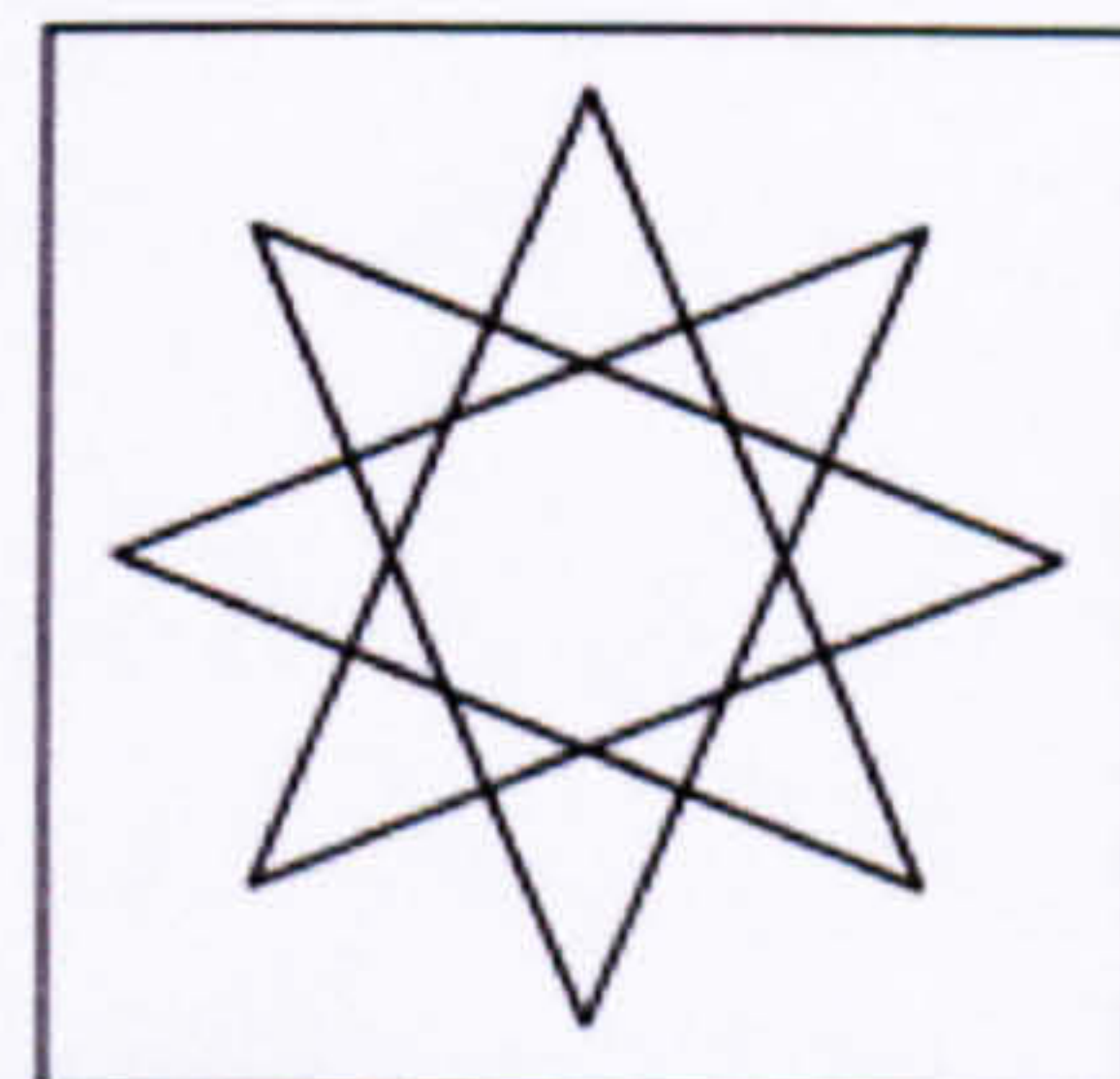
Macintosh, or xfig on the X Window System. Alternatively, it is possible to scan a hand-drawn diagram, or an illustration, and output the result from the scanning program as an eps file. There is below an example of a single file, processed by the Metapost interpreter *via* the mpost command on Linux. It has produced three eps files, which are shown on the right. [86]

```
transform pagecoords;
pagecoords:=identity scaled 10mm shifted (100mm,150mm);
```

```
beginfig(1)
fill ((0,0)--(2,0)--(2,1)--(1,1)--(1,2)--(0,2)--cycle)
transformed pagecoords withcolor green;
draw ((2,0)..(2,1)..(1,1)..(1,2)..(0,2))
transformed pagecoords;
drawarrow ((0,0)--(2,2)) transformed pagecoords;
endfig;
```

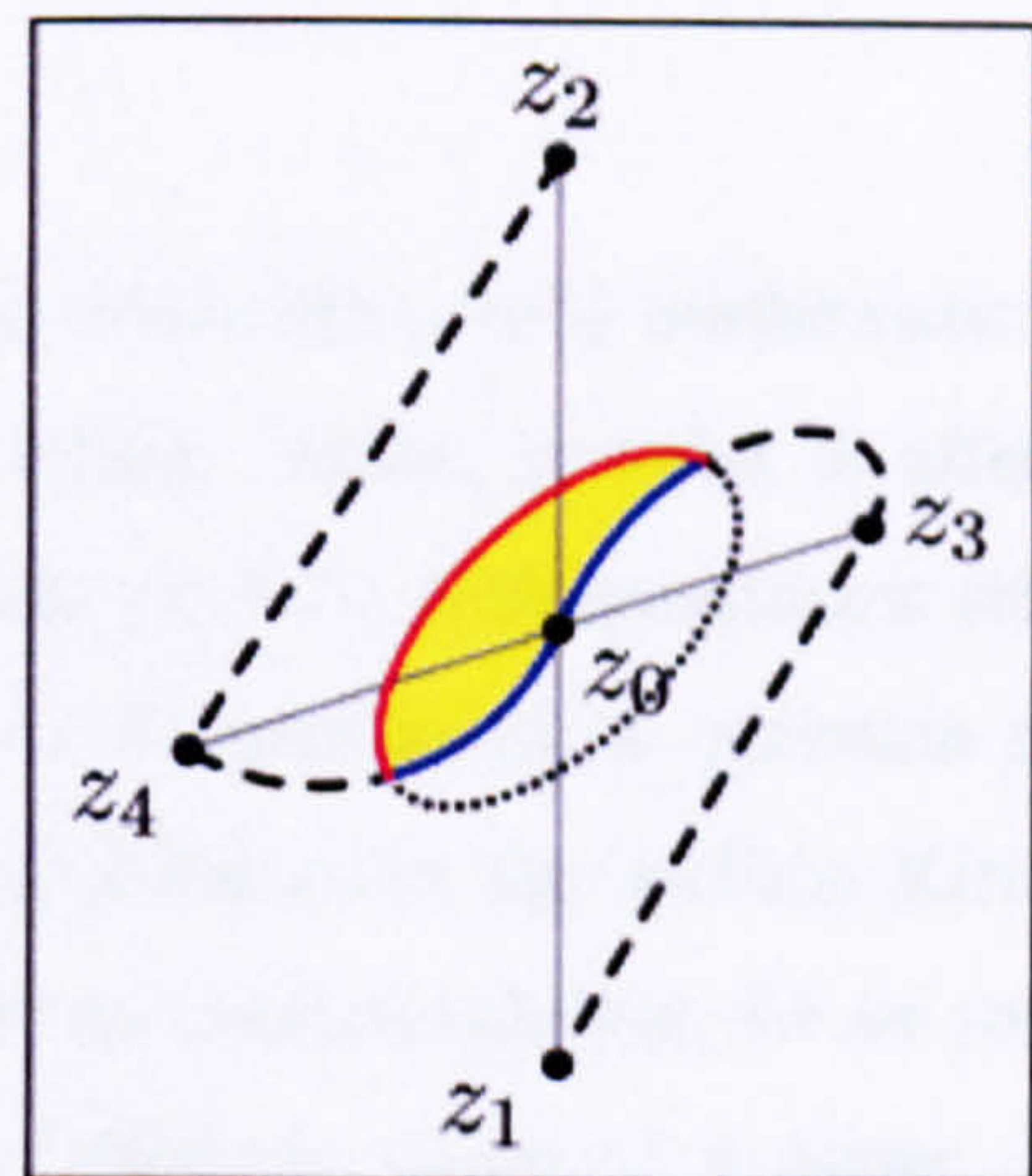


```
beginfig(2)
draw (for i=0 upto 7: dir(135i)-- endfor cycle)
transformed pagecoords;
endfig;
```



```
pagecoords:=identity scaled 15mm shifted
(100mm,150mm);
```

```
beginfig(3);
% declare paths to be used
path p[],p[]t;
% set up points by defining relationships
z1=(0,0); z2=z1+2up;
z3=z1+whatever*dir(60)=z2+whatever*dir(-50);
z4=z3+(-1.5,-.5);
z5=z1+dir(135);
z0=whatever[z1,z2]=whatever[z3,z4];
% set up paths
p0=fullcircle yscaled .5 rotated 45 shifted z0 ;
p1=z2--z4..z0..z3---z1;
p2=p1 cutbefore p0 cutafter p0;
```




```

p3=p0 cutbefore p1 cutafter p1;
p4=p2--p3--cycle;
% define transformed versions of paths and points
for i=0 upto 4: p[i]t=p[i] transformed pagecoords; endfor
for i=0 upto 5: z[i]t=z[i] transformed pagecoords; endfor
% do some drawing
fill p4t withcolor (1,1,0.2);
draw z1t--z2t withcolor .5white;
draw z3t--z4t withcolor .5white;
pickup pencircle;
draw p0t dashed withdots scaled .3;
draw p1t dashed evenly;
draw p2t withcolor blue;
draw p3t withcolor red;
label.lrt(btex $z_0$ etex, z0t);
label.llft(btex $z_1$ etex, z1t);
label.top(btex $z_2$ etex, z2t);
label.rt(btex $z_3$ etex, z3t);
label.llft(btex $z_4$ etex, z4t);
for i=0 upto 4:
    drawdot z[i]t withpen pencircle scaled 2;
endfor
endfig;
bye

```

Figure 9.1: *Three encapsulated PostScript files.*

Typically, it takes around two years from the submission of a mathematical paper till its appearance in a journal as a published article. Hence, in order to effect the timely dissemination of their work, and to establish priority, mathematicians rely on preprints. The preprint system enables members of the profession to maintain an awareness of the research being done, and negates the publication lag. Robion Kirby believes that the journal system will remain important to mathematicians, for its role in organising peer review, which vouchsafes the intellectual value of a paper, in addition to the valuable archival function served by the journal, makes it irreplaceable. [53] The main costs associated with G&TP are related to the production

of printed copies. In order to be cost efficient it is necessary to print around 200 copies. However, G&TP can break even after selling just eighty copies, after that point is reached the profits help to keep G&TP in business. Of course, G&TP is a not-for-profit publisher, but bills still have to be paid. Rourke regards the annually produced monographs as a useful source of additional income.

'The cost of printing in small quantities has declined markedly. The University printshop does this work. The production costs are three pence per page. It's not fantastic quality, but it's good enough. We sell it at ten pence a page, which is a very low price, and we make a good profit.' [87]

The paper journals, printed on acid-free paper suitable for binding and archiving, are published on an annual basis. All research libraries that purchase print subscriptions to both journals are granted electronic access *gratis*. All papers are published as they are accepted, which means a shorter publishing lag than most journals. This is fairly typical of academe-based e-journal publishers, who feel the need to add value whenever possible in order to substantiate their claim of providing a better standard of service to the academic community than their commercial rivals.

Those involved with G&TP share the almost messianic outlook, albeit devoid of any hint of stridency, that motivates so many of the small, academe-based publishing operations. The desire to precipitate change is strong, but they realise that there is a great deal of inertia in the scholarly communication system to be overcome. G&TP, and similar academe-based mathematical publishers, which are for the most part based in the United States, see themselves as part of a movement to bring about a more equitable system of dissemination. Sanderson succinctly lays out the mathematical publishers' various *raison d'être*.

'We hope that this will be a catalyst, and influence a lot of other journals to come over to our particular model. We think of a journal as an author-centred publication. The authors own the copyright. The authors for the most part do the typesetting. We just facilitate the process of publication. We think that the academic community is the natural place for all research publications to reside.' [88]

9.8 Project Euclid

The staffs of Cornell University Library and Duke University Press have combined their talents to found Project Euclid, which is an initiative to advance scholarly publishing in pure and applied mathematics, but also in statistics and computer science. This project is named after Euclid of Alexandria (right), who is the most prominent mathematician of classical times. He is best known for his treatise on mathematics, *The Elements*. Project Euclid publishes 27 journals, with a further eight forthcoming.



A university library and a university press working in tandem have produced a publishing system, and a viable business model with which to support it, that is sensitive to the needs of both their communities.

In addition, the project has collaborated with a cross-section of the scholarly publishing community, such as learned societies, academic departments, small commercial publishers, and university presses, assisting them to publish their journals on the Web.

Project Euclid began in 2000, and has been developed with funding from the Andrew W. Mellon Foundation. Euclid is also a SPARC Scientific Communities partner, which means that it is a project that supports the development of not-for-profit information aggregations or portals. Rick Johnson, SPARC Enterprise Director, believes that Euclid can make a difference.

'Libraries will benefit from the viability of community-based, economically priced, high-impact independent journals. Project Euclid not only provides a way for journals to make the transition to the Web. It also offers a means for them to reach a vastly expanded readership with a high-quality offering.' [55]

Of course, these sentiments are echoed by those who are directly involved in working with Euclid. Sarah Thomas, University Librarian at Cornell, which is one of the ten largest academic research libraries in the United States, looks upon Euclid as a service to the mathematical community. [56]

'Math is a field with a vibrant independent publishing tradition. Some 60 per cent of the core journals in the discipline are still published by small publishers, such as university math departments, at reasonable prices, but these could be an endangered species with the growing importance of the Web, and of the market dominance of huge commercial aggregations of journals. We expect Project Euclid will help level the playing field and offer independent journals a way forward.' [55]

Steve Cohn, director of the Duke University Press, believes that Euclid can serve as an example, and indeed as a model, for similar projects. He believes that both publishers and authors will find the exposure gained *via* a large aggregated site to be beneficial in a number of ways. Duke publishes thirty academic journals, which is an uncommonly large number for a university press. [59]

Scholars and their intellectual communities around the world and in every discipline need forward-looking communications models that exploit the potential of the Web. By providing journals in mathematics and statistics with a standardised, but highly flexible, publishing tool kit we believe we can help keep their costs low, implement efficient editorial processes, and enhance searching and linking capabilities. We are also intent on proving that university presses, libraries, and disciplinary communities can work together to innovate in the service of scholarship. [55]

The archival aspect is a very important part of the project. Initially, files will be retained in the formats in which they were submitted, but Euclid is monitoring developments in conversion methods between TeX and the more robust MathML, which is a much more robust system from the archival aspect. [62] The software is Open Archives Initiative compliant, and uses the Dienst protocol, though that will soon be replaced by the Open Archives Initiative Protocol for Metadata Harvesting

(OAI-PMH). [60] A harvester is a client application that issues OAI-PMH requests. It is operated by a service provider as a means of collecting metadata from repositories. Dienst was originally a project of the Cornell Digital Library Research Group. (The project took its name from the German word for 'service'.)

In April 2004 the National Science Foundation awarded Cornell University Library a grant of 450,000 US dollars to create a system for the long-term preservation and dissemination of mathematical and statistical e-journals. [61] The library staff members will cooperate with colleagues at the Göttingen State and University Library in Germany, which is home to the *Göttingener Digitalisierungszentrum*. Göttingen's participation in this project is financially supported by the *Deutsche Forschungsgemeinschaft*, which is Germany's primary funding agency for research in the sciences and humanities.

The two institutions plan the development of an online archive of mathematical and statistical e-journals that will be available to research libraries worldwide. In addition, it is hoped that this project will serve as a model for similar efforts in other disciplines by the combined efforts of the academic library and scholarly publishing communities that serve them.

Dr Zsuzsa Koltay, the Cornell University Library's coordinator of electronic publishing, believes that mathematics and statistics can benefit from a balance of commercial enterprises, scholarly societies, and independent publishers. Euclid provides a choice of three flexible options for those wishing to publish online. However, only time will tell which of these models are viable. At present, Euclid offers access to 33 e-journals.

- **Euclid Prime.** This is a steadily growing collection of peer-reviewed journals in mathematics and statistics that offers publishers an affordable option for the online dissemination of their publications. This option helps to heighten a journal's visibility through comprehensive sales, marketing, and operational support. The publisher is not required to pay a fee, and the only costs incurred are those linked to metadata generation.

- **Euclid Select.** This option permits research libraries and other users to subscribe to individual titles that are not included in the Euclid Prime collection. The publishers maintain control of their online subscription systems, and can offer open access to selected parties if they wish, or choose a pay-per-view option. The Euclid Select journals participate in the advanced features offered, which includes reference linking, Open Access Initiative support, Digital Object Identifier registration, and linkage to the discipline-based services such as MathSciNet, and *Zentralblatt für Mathematik and ihre Grenzgebiete*.
- **Euclid Direct.** This offers hosting services to journal publishers that do not require additional sales and marketing support, but still wish to avail themselves of the advanced features available through the Euclid infrastructure

It is as yet too early to tell whether Project Euclid can be a success, but is certainly the road that many in the library profession wish to travel. Cornell is not publishing journals, but is providing an aggregation service, and an archival service, in addition to providing such services as sales and marketing. In short, Cornell University Library is participating in every aspect of the scholarly communication system except the editorial process. Duke publishes two mathematics journals, and provides Euclid with editorial services when needed, but that is a short step to Cornell actually publishing a journal. Cornell University Library has really become a journal publisher in everything but name.

9.9 Conclusion

Mathematical journals published by academics have proved to be successful. They attract sufficient papers to remain in business, and they seem able to cover their costs by one means or another. However, they have not succeeded in making a dent in the profits of commercial publishers. Authors have been made aware of the iniquitous pricing policies of commercial journal publishers, but most continue to submit their papers to the pricey journals that have always published their papers. [51]

The essential nature of mathematical e-journals is unlikely to change for the foreseeable future. [63] The learned societies such as the LMS and AMS, are pleased to support initiatives that lead to lower journal prices, and thereby assist research libraries to maintain, and indeed to improve, their services. Mathematicians seem to be perfectly happy with paper printouts, which they can annotate at their leisure.

However, there may be some move toward more open access publishing, and commercial publishers may feel compelled to look at the Biomed Central model. The big publishing houses may have prestigious journal titles, but they persist in giving poor value for money. It is likely that more academics will begin to publish their own journals in the years ahead. The learned societies such as the LMS and AMS, are pleased to support initiatives that lead to lower journal prices, and thereby assist research libraries to maintain, and indeed to improve, their services. The Committee on Electronic Information and Communication of the International Mathematical Union recently issued a statement aimed at mathematicians and librarians alike.

Journal prices matter to all mathematicians. When deciding where to submit a paper an author may choose to be aware of a journal's standing and impact, but an author should also take account of a journal's price (as well as its general policies, including archiving). In addition, one might consider a journal's price and policies when considering whether to referee or serve on an editorial board. [71]

It has become increasingly common for learned societies to issue such advice to their members. However, mathematicians have been very active in academe-based publishing for a considerable period of time. The cumulative effect of their efforts is now beginning to produce a dividend, and perhaps not before time. The mathematical profession has also shown a desire to embrace cutting-edge Web technologies.

The communication of mathematical research is undergoing profound change as information technology creates evermore ways to disseminate and access the literature. Yet, much more than publishing technology is changing. The culture and practices of those who create, disseminate, and archive the mathematical literature are changing in tandem. Mathematicians wish to shape those selfsame changes to the best

advantage of their own discipline. Mathematics is in a constant state of flux, and its inherently dynamic nature is best served by a mode of publication that is quick to respond to the changing perceptions of its users. The paradigm shift in e-journal publishing may have a profound effect on mathematical research.

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CHAPTER TEN

Conclusions

10.1 Introduction

This thesis has analysed and evaluated a number of academe-based e-journal publishing projects and operations, and the situational and conceptual factors that impinge upon them. To be sure, an increasing number of academic and library staff members are coming to understand the potential that cutting-edge e-publishing technologies have to transform the scholarly publishing system. The advocates of small publishing houses in academic departments and research libraries, and those who have adopted such a role as an avocation, have made significant strides in the creation and promotion of groundbreaking paradigms in scholarly communication.

In this context, a paradigm may be defined as beliefs and attitudes shared by members of an academic community. Conversely, an academic community consists of people who share a paradigm. They not only understand how the scholarly communication system functions, but also understand how it actually should function, and this is a fundamental distinction. It is apparent from the case studies that social factors play a central and direct role in academic publishing, and that this serves to differentiate the publishing strategies of one discipline from another.

The proof of concept has been amply demonstrated. The disparate publishing projects collectively constitute a fundamental research publishing movement congruent with the age of information technology. These developments are part of a coherent tradition of scientific research publishing. Academe is itself doing much to improve scholarly communication, albeit by a process of osmosis.

There are now a great many academe-based groups involved in the publishing and storage of scholarly content. However, although they are constantly increasing in

number, they are as yet too few to exercise a decisive degree of influence. The tipping point lies rather further ahead than many would like to believe. Nevertheless, there is abundant evidence that commercial publishers are looking over their shoulders, and indeed have been for a while now. It is the very lack of uniformity to be found in academe-based e-journal publishing that is its overarching strength. As is explained in the thesis, the commercial publishers have adopted models from academe-based publishing. It can be observed that the desire to experiment, the intellectual vitality, is to be found in academe, and not in the commercial environment.

10.2 General conclusions

The case studies are heterogeneous in structure, scope, and rigour, and this mirrors the disparate nature of the e-journal projects and the academic disciplines that they seek to serve. As a consequence, it is rather difficult to make comparisons between fields, and to draw conclusions. There is a differential use of information technology in the presentation of research findings, and this may have some influence on the penetration of e-journals across disciplines.

Indeed, an examination of the development of academe-based e-journal publishing elucidates the differences, many and varied, not only between disciplines and their cultures, but between subdisciplines and their associate subcultures. However, amid this milling crowd of variables there stand a number of significant constants. The three central supports of the journal-publishing edifice are copyright, peer review, and bundling. However, the academic publishers, and their colleagues, are actively undermining these supports by the following means.

- Academe-based e-journal publishers permit authors to retain their copyrights.
- Peer review is in general better organised by academic publishers, and publication lag times are markedly shorter.
- In the United States, many Ivy League institutions have cancelled their bundling agreements. The bundling system suits large publishing houses, but

is unsuitable for, and greatly resented by, academic librarians. This turn of events presents opportunities to all small publishers.

The socio-economic climate has become more conducive to small publishers. The advocates of academe-based e-journal publishing have made significant strides in designing and promoting new paradigms for information access. There is evidence presented in the thesis that author and user behaviour regarding information technology changes as they become familiar with it, and there are now more authors willing and able to write papers for the new media. The way research findings are compiled is changing apace with the new e-publishing paradigm, though this is definitely more pronounced in some disciplines than others. In addition, perceptions of the scholarly communication process are as surprising as they are diverse.

- Journals in some disciplines, and specialisations within some disciplines, are able to attract advertising. Usually the revenues from this source are small, but some journals can accrue significant amounts of advertising revenue. This is an important source of revenue for some open access journals.
- In some fields, such as physics, the average set of differences between submitted preprints and edited postprints is small. In others, such as economics, it can be substantial. These differences between disciplines are reflected in the length of time taken up in the refereeing process. In general, however, a preprint is a markedly less adequate substitute for the postprint.
- It is usually the case that the author of an article holds the copyright for every part of it. However, in some other disciplines, such as History of Art, researchers may wish to include images that are under copyright to other persons or institutions. Permissions to reproduce images for open access publications have been proving more difficult to obtain than permissions for traditional pay-to-view publications, either online or in print.
- In some disciplines, researchers would feel disadvantaged if access to the appropriate literature did not prove timely, but in other disciplines timeliness is of much less importance.

- Journals that publish social sciences and humanities have much higher rejection rates than those in the natural sciences. This can add complexities, and costs, to the refereeing process.
- In humanities almost all researchers who publish are academic staff members, while in the natural sciences that proportion is much smaller.
- In some disciplines most of the prestigious journals are commercial, but in others the opposite is true.
- The demand for articles in the natural sciences, and sometimes engineering, can diminish significantly quite soon after their initial publication date. However, in the humanities the decline is less pronounced, and may even increase. Therefore, this factor has to be borne in mind when publishers think about permitting open access to archives after a certain period of time. The costs of maintaining toll access for a science journal archive could outweigh the financial revenue generated.
- It is commonly the case in the natural sciences that the costs incurred by research far exceeds the cost of publishing the results. However, in the humanities the opposite is invariably the case.
- In the natural sciences most research projects are funded, but in the humanities very few are so fortunate.
- In some specialisations it is the case that research material of significance may remain unpublished due to its commercial sensitivity.
- In the sciences journal literature is the primary literature, but in the humanities journal literature is almost entirely secondary literature.
- In some disciplines the journal literature is comprised almost entirely of text, though perhaps with a few tables, graphs, or illustrations, but in other disciplines there is a need for a substantial number of images to be displayed. In addition, the use of multimedia has become increasingly common in some disciplines.
- Some disciplines, such as physics or economics, have a long established culture of preprint exchange, but in other disciplines this practice is almost unknown.

Scientific journals have been the fastest growing media sub-sector over the past 15 years. Nevertheless, the Office of Fair Trading has made it plain that the market for STM journals may not be working as well as it should. It is now within the power of academic institutions to publish their own research material, and this would be a more cost-effective method of dissemination. There are many who trumpet the salvific powers of open access, but that comes with as many problems as solutions. The entire academic funding structure must change in order for open access to work effectively. At present, there are too many papers floating in and out of editorial offices in search of a publishing date. The pressure to publish, and the citation system, loads the dice in favour of commercial publishers.

10.3 Summary of conclusions

The academe-based e-journal has established a permanent position in the publishing landscape. Some SPARC journals now have better citation records than the commercial journals that they were designed to replace, but the small academe-based publishers still have some way to travel before they can effect lasting change to the system. It is a David and Goliath contest. Nonetheless, there are reasons why academe-based e-journal publishers should believe that tomorrow belongs to them.

- There is an increasing awareness among academics of how and why the scholarly publishing system is malfunctioning.
- There is an increasing willingness to do something about it.
- The number of academe-based e-journals being published has increased and, while more does not perforce equate with better, it does contribute to a gathering momentum.
- All academe-based e-journal publishers consulted report a steadily increasing number of papers being submitted.
- The open access movement has proved itself to be economically viable.
- Many universities, particularly in North America, have refused to renew bundling agreements.

- Governmental bodies in Western countries are now beginning to investigate the workings of the scholarly publishing system.
- There is anecdotal evidence from every quarter of academe that the tide is slowly turning. There are a lot of people around who believe the academic revolt is beginning to succeed. It is now less common to find a doubting Thomas among academic and library staffs.

The decision of Elsevier, the world's largest publisher of scholarly and scientific journals, to allow open access postprint self-archiving for almost all of its journal titles is a direct response to pressure brought to bear by the academic community. The significance of this step should not be underestimated, and must weigh against the policies of the journal publishing trade as a whole.

10.4 Future Developments

The Owl of Minerva flies only at the fall of dusk. One cannot pass judgement on the day until it is done. Yet, there has been a sufficient degree of empirical validation presented in the case studies to permit of a reasonable degree of conjecture on the future of academe-based e-journal publishing, and on possible lines of research that could expand on the subject matter of this thesis.

The 'crisis in scholarly publishing' is now in its third decade, and the revolt against the commercial publishing houses continues apace. The academic world, being a small and vicious one, has failed to present a united front against commercial journal publishers in the past, but it now seems to have embraced the logic of collective action. However, academe-based e-journal publishing teams have blazed a number of trails, and it is more than likely that many more will follow in their footsteps. There are number of reasons to be cautiously optimistic.

- Academe-based publishing can be done only as part of a community, and is inherently a communal activity.

- It functions solely for the benefit of the academic community, and has been proven to be economically viable.
- It is now widely known that some e-journals published in academe have markedly higher citation ratings than commercially published rivals, which is to say that these publications have garnered 'prestige'.
- The academe-based publishers are by and large service-based in outlook.

Increasingly, there are academics and librarians who feel that publishing research material is simply a legitimate part of their remit, and regard any recourse to commercial publishing houses as needless. However, it is likely that various forms of open access will develop alongside traditional models. The key groups involved in academe-based journal publishing constitute separate cultures, each possessed of their own sets of perceptions and attitudes that sometimes differ quite markedly from each other. Yet, they do have a variety of factors in common, the most significant of which is a selfless desire to effect positive change in the scholarly publishing system.

One avenue of further research would be a study of how business models, particularly the PLoS model, evolve as publishing operations expand. (PLoS is a scientific society, which operates in off-campus premises, but has connections with the University of California.) It is hoped that academe-based e-journal publishers will become more economically efficient as the number of articles, and the number of journals they publish, increases.

It would also be of some profit to study the development, and subsequent demise, of the Federated Initiative of German Academic Publishers and Roquade (FIGARO). This was a complex, and perhaps overly ambitious, publishing project that involved universities and publishers in Germany and the Netherlands. The attempt to integrate a relatively large number of small publishing projects and operations into a single academe-based publishing house collapsed after the European Union withdrew financial support. However, previous to the loss of funding there had been some major difficulties of an administrative nature. Publishing is more an organic than a mechanistic process, and it seems that the entire concept of FIGARO was flawed from the outset. There are a number of university libraries in the

Netherlands publishing journals. Indeed, Delft University Press is a section of the Delft University of Technology Library. It was intended to include a case study of FIGARO in the thesis, but it was omitted due to a lack of space.

The increased use of XML, including MathML, ChemicalML, MusicML and such like, may change the way in which journal articles are published and read. Some editors are set against the use of XML, while others have embraced it without reserve. Understandably, PDF has become a standard for archiving, but XML can be used to encapsulate PDF records along with standardised metadata. A study of how XML and its derivatives have influenced e-journal publishing and archiving could prove of some value.

These are indeed interesting times for publishers, librarians, and researchers alike. The foundations have been laid for a new system of publishing, and the infrastructure atop expands at an ever-increasing rate. The form and character of the publishing industry is morphing into something more fragmented, and arguably more dynamic, than hitherto. There is no obvious reason why academe-based e-journal publishing should not continue to carve out a niche in this new order. The future is not quite what it used to be.

Appendix One

A SURVEY OF SUBMISSIONS TO LEARNED JOURNALS

COMMENTS OF RESPONDENTS ON MATTERS PERTAINING TO ACADEMIC PUBLISHING IN GENERAL

Engineering

- A more measured pace would benefit everyone. I am fed-up reviewing papers that are quite premature. So is everyone, so the standard of refereeing is very low.
- I have never used e-journals.

Information Science

- Whether a journal is peer-reviewed is a deciding factor for me when choosing publications to submit to. This is related to the reputation of the journal, but perhaps would not be quite so important if it weren't a requirement of the RAE.
- One of the major problems I have encountered is the continuity of the e-journal provision by academic libraries. Some of the journals are available for a period of time, while some others are made unavailable by the university library. This I think affects the behaviour of e-journal users.

Another point is that most of the e-journal providers don't provide a good searching mechanism through which users can save time. This turns out to be a major problem, particularly when you want to use an archive of e-journals.

Life Sciences

- The variation in referees. Some can be very complimentary, yet on the same paper others can be very arrogant, and not necessarily right. The variation in attitude by some journals—again some are very appreciative of your contribution, others have a great belief in their own worth—this is a turn-off for future submissions, especially if they are rude and put obstacles in your way.

My most recent example, an American journal, insisted on us sending them a list of referees. When we did, they objected to them based on their location. They had to be over 500 kilometres from us, and we should not have had any interaction with them for over five years. Why didn't they say so in the first place?

Too much emphasis is placed on impact factors. I think it is more important to publish in journals where people in your line of work have a good chance of reading it. Also, impact factors vary with subject area.

- Dealing with editors can be troublesome.

- Standards of science and written English are declining rapidly.

- There is too much pressure to publish, which is entirely due to the RAE.

- I don't read e-journals.

- If I can't access a paper free online, then I don't bother to follow up the lead unless it's in a prestigious journal that the library does not subscribe to. From discussions at a recent editorial board meeting, this is a common practice among researchers in my field.

I very much resent paying page charges (which unfortunately some of the leading journals charge), when I don't even receive free reprints or access to a PDF file.

The most important thing when publishing a paper is how the journal is viewed by peers. There are so many journals and papers out there that the only way of ensuring that your work is read, taken seriously, and cited by leaders in the field is to publish in the most prestigious journals.

- I prefer to browse paper journals in the library. I like the atmosphere in the library, and I sometimes come across interesting papers quite by chance. I would only consult e-journals if I had to.

- I'm glad we have now decided to subscribe to Science Direct. The inability to get papers from journals was a severe handicap to our research. I hope this subscription continues.

- Generally, it is too slow.

- The current competition to publish as much as possible reduces the quality of research.

- Commercial publishers are charging ridiculous prices for journals. Too many journals have been created purely to meet the demand for academics to publish in order to satisfy RAE and similar requirements. Many contemporary papers would not have been published 25 years ago.

- We were forced to publish research findings before the project we were working on had been completed, and this angered every member of the team. The RAE creates too much pressure to publish, and is the cause of a lot of ill feeling.

Mathematical and Physical Sciences

- The proliferation of journals that have weak, or non-existent, refereeing clutters up the system. Market forces continually drive publishers to start up more and more journals. Publications in them carry low prestige, and often duplicate, or only ever so slightly extend, publication in better-quality, established journals.

The pressure to publish, even in such low prestige journals, is still too great, and this keeps the publishers in profit. In our own physical sciences area at Strathclyde, we try to focus only on publishing in good quality, well-refereed journals and, as far as possible, try to avoid giving support to the plethora of 'junk' journals.

- The whole idea of forcing out publications to meet some 'standard of excellence' is a nonsense. A good line of study will not produce a paper for some three years, and yet we are forced to turn out what are almost interim ideas on a regular basis. My department targets two journal papers a year!

The pre-eminence of the journal above other publications (Governments reports, etc.) is also flawed. The main advantage is the subjection of ideas to peer review, but that is variable to say the very least. Much dross is published, and will never be commented upon by anyone as it is written in journalspeak to achieve publication rather than to illuminate. **YOU GOT ME ON A BAD MONDAY!**

- Overall, the RAE has beneficial effects on research quantity and quality. Its faults are obvious, which is an advantage.

Social Sciences

- Teaching load makes writing and publication difficult and stressful.

- Most of the publications in top journals in my area are team authored, because of the nature of the research. It would be good if the University were to find ways of appropriately encouraging and supporting this.

- The slow turnaround time of most journals, which is due to problems in getting reviewers to review papers. I am a journal editor, and my biggest problem is getting people to do reviews, and keep the turnaround time at around three months.

- Too slow, especially in the electronic age. The time between submission and publication seems to be getting longer. I think this is often a reflection of the speed of the refereeing process. This is, however, very frustrating if you want to influence policy makers through your work.

- The end result is appalling. A great deal of time is taken to do research and writing, which is then read by very few people. I would still do research and writing, because I'm personally committed to the development of my field, and I'm ambitious,

too—but because of the RAE only certain types of publications are valued. This distorts and diminishes the value of the whole process. I work in the social sciences field, but as part of a professional education sector.

- Something needs to be done to improve the quality of the research work that is appearing in journals. There is too much being published now that is derivative and unexceptional.
- The emphasis is on quantity rather than quality. Academics should be encouraged to publish less, rather than more, to reduce ‘intellectual pollution’.
- Very happy with it!
- I would like to see more use made of multimedia in electronic journals. Also, I believe that papers should be published immediately after acceptance.
- It would be good to see the universities taking back control of the publication of academic work, either through re-introduction of the university press or through an open access initiative such as Harnad’s.

Appendix Two

Article Retraction by the Scholarly Community

The retraction of an article by its authors or the editor under the advice of members of the scholarly community has long been an occasional feature of the learned world. Standards for dealing with retractions have been developed by a number of library and scholarly bodies, and this best practice is now adopted for article retraction by Elsevier:

- *A retraction note titled 'Retraction: [article title]' signed by the authors and/or the editor is published in the paginated part of a subsequent issue of the journal and listed in the contents list.*
- *In the electronic version a link is made to the original article.*
- *The online article is preceded by a screen containing the retraction note and it is to this screen the link resolves; the reader can then proceed to the article itself.*
- *The HTML version of the document is removed.*

Article Removal

In an extremely limited number of cases, it may unfortunately be necessary to remove an article from the online database. This will only occur where the article is clearly defamatory, or infringes others' legal rights, or where the article is the subject of a court order, or where the article, if acted upon, might pose a serious health risk.

In these circumstances, while the metadata [title and authors] will be retained, the text will be replaced with a screen indicating that the article has been removed for legal reasons.

Article Replacement

In cases where the article, if acted upon, might pose a serious health risk, the authors of the original article may wish to retract the flawed original and replace it with a correct version. In these circumstances the procedures for retraction will be followed with the difference that the database retraction notice will publish a link to the corrected re-published article and a history of the document. [61] [62]