Copyright Issues for MKM

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Abstract. We present an overview of the current situation and recent and expected future developments in areas of copyright law and economics relevant to Mathematical Knowledge Management.

1 Introduction

The advent of digital information distribution has created both new opportunities and new challenges in all information-rich fields. The new field of MKM is itself based on this advent. As in all other fields some of the challenges for MKM are social and legal as well as technical. As Lessig [1] put forward, social norms, law, economics and technology are strongly interdependent spheres. Although the primary aims of the MKM community are technical in nature the ramifications of technology for these other areas, and the constraints of these other areas on what technology is useful, must be addressed by this community. Here, based on the reports (Deliverables 1.1 and 1.2) from Project MKMNet, we present some social and legal aspects of copyright which are central to the way in which MKM technology may develop. There is an enormous debate currently underway in society on how to move forward in a digital information age with laws and social norms based upon analogue understandings of technological possibilities. This debate is address below in section 1.1, although readers interested only in the current situation and the practical implications for MKM may wish to skip over it.

1.1 Information Wants to be Free, People Want to be Paid

The phrase "Information Wants to be Free" has become something of a rallying cry for those who object to the restrictive practices of the so-called "copyright industries" and their representative trade bodies such as the IFIP (the international trade body representing music recording publishers). The phrase has some unfortunate aspects to it but the essence is that in the digital era it is almost impossible to control the copying and (re)distribution of information even as much as was possible in the earlier analogue era. Various variations of the phrase have been used to oppose this on philosophical, practical or economic grounds such as "if information wants to be free then who's going to pay for it?". The version we will consider in this article is that while information, by its nature, can be easily copied and redistributed, the people who produce the information and who provide value-added services making it more accessible in some

way, need to pay the bills and so "want to be paid". In the midst of the industrial revolution the so-called "copyright bargain" was therefore struck which granted authors a limited monopoly on the exploitation of their creation so as to ensure that further acts of creation would be encouraged. Other voices at the time argued on both sides of this compromise, one group regarding intellectual creation as an inalienable part of the personality of the creator or creators and therefore worthy of perpetual protection, the other regarding each act of creation as building on prior creations ("If I have seen further it is by standing upon the shoulders of giants." Sir Isaac Newton; "there is no new thing under the sun" Ecclesiastes 1:9 King James version) and therefore allowing no basis for monopolistic protection.

The growth of the internet in terms of number of users, speed of access and types or amount of content has upset the copyright bargain's basic premise which is that the act of making a copy can be simply subjected to restrictions in order to make information (relatively) freely available while ensuring that creators are paid. The particular academic ramification of this problem comes with the structures that have built up around academic publishing of material. These structures may well have been reasonable as they were incrementally produced but a number of changes have placed as great a strain on them as has been seen in the music recording publishing business. Various solutions are being proposed to the problems of the current system, which we shall present in section 6.

1.2   Guide to the Paper

Mathematics is an international field of study and the internet makes borderless access to information more feasible, although natural language and semantic differences between country or regional groupings provide technical challenges to MKM. Both the legal basis of copyright ownership of creative work (which includes mathematics) and the social norms/working practices in both academic and non-academic settings in various places provide challenges for international MKM efforts. In section 2 we present a limited survey of the original ownership question for (principally) mathematical papers (other areas of mathematical knowledge, such as teaching material and computer programs are sometimes dealt with where differences are known). Once it is clear who owns the original copyright we must consider what happens to copyright when the work is published. This is usually achieved through peer-reviewed journals for mathematical papers and so in section 3 we present information about the current practice of various publishers and owners (as is made clear in section 2 the original author is not necessarily the initial owner) when arranging for publication. In addition to the mathematical information itself MKM is also highly concerned with metadata such as databases of citations, publication information, and extracts (such as abstracts) concerned with mathematical publishing. In section 4 therefore we consider ownership rights and economic aspects for metadata, including an overview of ownership rights for databases. Having covered the ownership question we then turn our attention to the general situation of digital rights management (DRM) seen by some as the technological solution to a technological problem in section 5. We then cover the issue of current and future journal publication in terms of economics, legal issues, author rights and technology in section 6, including a brief analysis of access to older material.

2   Original Ownership of Copyright

The question of who has the copyright in an original piece of unpublished mathematics is interesting. For the vast majority of authors (Ph.D. students, hobbyists and retired academics apart), it could be argued that producing publishable mathematics is part of their job, and therefore, in the phrase used in English law, it is a "work made for hire", and so the employer might claim to own it. The situation in practice is more complicated, and the following examples were obtained.

U.S. federal government: claims the rights to all material produced by employees during their normal work and does not allow for the transfer of ownership to third parties. This has specific ramifications for publication in journals (see section 3).

British Universities tend to have clauses in their employment contracts that says that they do not claim this sort of copyright, though increasingly (e.g. in 1998 at Bath) they are adding clauses that say that, nonetheless, they have a licence to use it. This is required by the increasing regulation of British Universities, which may require such material to be submitted for the purposes of the Research Assessment Exercise (see `www.hefce.ac.uk`) or other exercises.

Technological developments in teaching software has produced a new concept, that of the Virtual Managed Learning Environment (VMLE). The modularisation of Higher Education in the UK, and the pressure on Universities to develop new sources of funding (both direct pressure from government and HEFCE and indirect pressure due to underfunding) have led to Universities viewing the contents (not the structural software which is generally off-the-shelf externally-owned or internally developed) of such VMLEs as University Intellectual Property which might be exploited for monetary gain or traded with other providers to offset production costs in other topics. However, existing academic contracts are mostly either unclear on such matters or leave copyright ownership with the academic(s) who produce such the content. Most Universities are reviewing their regulations (as mentioned above) and this is often one of the contentious issues between Universities and staff representatives (often the AUT and/or NATFHE).

However, most UK academics explicitly retain all rights in their scholarly work including the right to transfer it if required/desirable. The nebulous nature of the working day for British Academics make this an unclear area of law. Since academics generally have not signed waivers under the European Working Time Directive[1] and many frequently work more than a forty eight hour week on a regular basis, any claim by the University to a specific piece of intellectual property the production of which was not absolutely mandated by their contract and specifically requested by their manager would be very difficult to enforce.

German Universities seem, from discussion at MKM '03, not to make such things explicit, but the assumption made by academics was that they had the copyright. A similar situation seems to pertain in Italy and France. The copyright law of these countries is quite divergent from that of the UK/US, in particular in the concept of "moral rights" which extend much further than required in international copyright treaties (and indeed are the source for Moral Rights existing in those treaties at all).

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[1] Council Directive 93/104/EC, 23 November 1993.

Full transfer of copyright is not possible under these laws, only the assignment of exclusive rights to publish/exploit the work, and the concept of "work-for-hire" is missing or very weak in these jurisdictions. In the past, where publication, copying and sale of copyright material were solely physical activities located in an identifiable legal jurisdiction this was not problematic. Modern communications and electronic print media make this a highly contentious area of IP law generally.

CWI as a Netherlands–funded research institute, does claim the copyright.

NAG as a private British company does claim the copyright, and makes case–by–case decisions on whether to transfer it.

If the copyright is owned by the author or institution, then it is possible for the author or institution to publish the material on internal or external web sites[2], or submit to pre-print archives such that the Cornell (formerly Los Alamos) archive (`www.arXiv.org`). However, as the work moves towards publication, publishers may well require that the work be pulled from external web sites. There are persistent rumours, though we have been unable to substantiate it, that some Physics journals have refused papers since they are also available on the Cornell archive, which does not allow deletion.

3 Copyright in Published Material

The practice in the past has been for publishers, academic or commercial, to request (often demand) that the copyright in a piece of mathematics to be published[3] be transferred to them. The excuse often given is that it makes it easier for them to defend the author's rights. No-one in the network, or others we have consulted, could think of an example of this happening with articles or conference proceedings, and the split of royalties on translations of books (which the publisher generally does negotiate) is often very unfavourable to the original author: typically 50:50 between author and publisher.

However, there are numerous exceptions to this principle. One important case is that U.S. (federal) Government employees are forbidden to transfer copyright, and publishers that often deal with these authors tend to have a standard clause in the copyright transfer form. At MKM '03, it was said that several European countries do not allow copyright transfer in the same sense at British and American law does. There is also the interesting question as to which law does apply if, say, a French Professor publishes in a journal produced by the American subsidiary of a Dutch company (an actual example). It was noted that many copyright transfer forms[4] are not very specific on the subject.

Publishers are not always very consistent on this subject either. As one example, the London Mathematical Society asks for copyright transfer for its paper journals (even though all these have an electronic parallel edition), but not for its all–electronic *Journal of Computation and Mathematics*. Furthermore, the spate of take–overs in the publishing industry has complicated matters. We give two examples.

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[2] A recent classic experience was the August 2002 publication on an Indian web site of the "PRIMES is in P" paper, which went round the community within weeks, and received more rapid positive comment than a journal editor could ever hope to collect in the way of referees' comments.

[3] Book, article, conference proceedings etc.

[4] Which are generally quite brief, normally one side of A4 to avoid intimidating the authors.

– The take–over of Academic Press by Elsevier meant that, at least in 2002, there were two different sets of procedures, depending on the original history of the journal.
– The transfer of *Compositio Mathematica* from Kluwer to the London Mathematical Society, means that, in this particular case, authors are asker to transfer their copyright to the Compositio Mathematica Foundation.

Over the past few years, the International Mathematical Union has been producing guidance, suggesting that publishers (at least of articles) should not be asking for copyright transfer, and authors should not be ceding the copyright. As a result, some publishers (e.g. the American and London Mathematical Societies), now *recommend* (rather than *demand*) such a transfer. At MKM '03, several people reported that, even for publishers that did not offer such an option, it had often been possible to negotiate it.

3.1 Why Authors Might Want to Keep Copyright

Other than philosophical reasons[5] there are several practical reasons.

1. One may want to publish it on an internal web sites, e.g. for one's research students, and maybe classes.
2. One may want to publish it on an external website. There is then an issue of which version of a paper an author can self-publish:
   The author's original version (e.g. with `article.cls`);
   The publisher's version, which may well incorporate formatting that is copyright for the publisher. It is quite common for a publisher's "internal" class file to be more sophisticated than the one issued to authors.
   In either case, there is data mining that can be done with the LaTeX source, but not with, say, PDF or Postscript. But the publication of the LaTeX would imply the publication of the class file, which might prevent the previous option. Some authors feel that publishing the LaTeX might make plagiarism easier, but an advanced MKM system should make plagiarism much easier to detect.
   It was noted that LMS Journal of Computation and Mathematics publishes the PDF, but keeps the LaTeX, and has the right to re-generate a new format if PDF ceases to be the only useful publishing format. One should also note that Springer Lecture Notes in Computer Science allows articles in conference proceedings to appear on an external web site.
3. One may wish to re-use more of the paper, e.g. in a text book, than the Berne convention "fair dealing 10%" would permit. Even if the publisher ultimately allows this, it still places an administrative burden on the author, and publishers have been known to demand royalties if the author neglected to get permission.
   Indeed, in publishing a text book, most publishers will require indemnity by the author for any unacknowledged use of copyrighted material held by another. Reproducing highly similar material from one's own prior work without realising it

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[5] Which can be quite strong. It is often said that academics are the most stupid people in the world: they create something at great expense; give it away free to publishers; help, generally free of charge, with the refereeing and editing process; and then they and their libraries pay vast sums to buy the journals back.

is not impossible, particularly when trying to explain common concepts in one's research.

3.2 Publicly Accessible Information on Copyright Policies

Even though, as mentioned above, publishers are sometimes willing to accept or negotiate rights other than a full transfer, most authors are not aware of this. The pressure to publish placed by institutions on, particularly junior, academics may force them to accept conditions to which they object but to which they do not realise they may not be required to submit.

Even where required copyright assignment is no longer the official policy of a publishing organisation (such as the LMS), it may well be some time before their public information about publishing policies is updated. This is particularly true where commercial publishers (such as Cambridge University Press) are the physical publisher of a journal under the auspices of a learned society (as is the case for the Bulletin and Journal of the London Mathematical Society and the Journal of the Institute of Mathematics of Jussieu, all three of which are published by Cambridge University Press).

A brief investigation into the publicly published policies on copyright for journal articles produced the following results:

AMS: The American Mathematical Society The AMS specifically states that they only *require* "Consent to Publish" (i.e. a non-exclusive right to print and otherwise distribute the material). However "an author is encouraged also to transfer copyright of the work to the AMS. In doing so, the author retains the right to use the work for his or her own purposes but simplifies for others the permissions process by enabling the AMS to administer it."[6] The wording of the AMS statement shows a lack of attention to the detail of copyright law. Assigning copyright to the AMS is not needed for them to administer rights negotiations and permissions to reprint, a simple assignment of those rights to the AMS would do that. What assignment of copyright does do is allow the AMS to pursue anyone violating those rights, and prevents[7] the author from negotiating payment for use of their work. There is no mention in the agreement of any sharing of payment that the AMS might negotiate/receive for such permissions.

Oxford University Press As well as publishing a number of mathematic journals of its own, the Oxford University Press publishes on behalf of two external sources in Mathematics; The Institute of Mathematics and its Applications (IMA) and the Interest Group in Pure and Applied Logics (IGPL).

The IMA Journals and the OUP's own journals require a transfer of copyright to the OUP (not the IMA): "It is a condition of publication in the Journal that authors assign copyright to Oxford University Press. This ensures that requests from third parties to reproduce articles are handled efficiently and consistently and will also allow the article to be as widely disseminated as possible. In assigning copyright, authors may use their own material in publications provided that the Journal is

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[6] AMS "Consent to Publish and Copyright Agreement Forms".

[7] as specified in the full text of the agreement rather than the above which was taken from the explanatory notes about the agreement

acknowledged as the original place of publication, and Oxford University Press is notified in writing and in advance."

The Journal of the IGLP situation is somewhat different. The stated purpose of this journal is to provide a fast and efficient journal publication route for a subject where timely reporting of a diverse and growing field is needed. As such , the IGPL is published online and full text articles are available for free download. There is no explicit notification on the "author submission" pages on copyright issues, but the statement regarding "Publication Policy" which includes: "We do not mind if a paper which *has already been published* in the Journal is submitted to another journal. It is the author's responsibility to inform the new publisher that the paper has already appeared in the Journal and that it will be further electronically accessible." (Emphasis in original.)

seems to indicate that only the required permission to publish and maintain (presumably perpetually) the original paper are required. The information for authors on the Journal of Logic and Computation website gives no information either. The third journal of the IGPL, Journal of Language and Computation is reported to have recently switched to Kluwer Academic Publishers but does not yet appear on their list of journals, so no information is available online.

Kluwer Kluwer Academic Press require transfer of copyright. Their reasoning for this is explained in their September 2003 copyright policy document, available on request from their legal department. This would appear to be supposedly a non-negotiable standard both for societies using Kluwer as their publishing partner and for individual authors. That is the impression given by representatives of Kluwer's legal department, although individual authors or co-publishers may have found this not to be so strict. As mentioned above publishers are sometimes reluctant to acknowledge variations in practice to avoid a flood of non-standard requests. "Important elements of the publisher's role in the scientific communication process are peer-reviewing, registration and quality assurance In order to guarantee that the requirements of these three elements are fully met, control of the dissemination of the final article is necessary. Permitting an article to be published elsewhere on public servers without a clear connection to the peer-reviewed final article can potentially confuse readers who use the article for their own research and will not be in the interest of science By asking for the transfer of copyright from the author to the publisher, Kluwer tries to protect the mutual interests of both the author/researcher and the publisher."

Elsevier Elsevier have almost identical requirements for a transfer of copyright to Kluwer's. Their justification is quite interesting: "Elsevier wants to ensure that it has the exclusive distribution right, for all media. Such a right can be obtained through an exclusive license from authors, but there is virtually no difference between transfer and exclusive license. Given that there is virtually no difference, it seems to us that transfer does give an advantage in the elimination of any ambiguity or uncertainty about Elsevier's ability to distribute or sub-license."

In particular, the right to distribute is a separate aspect of copyright to the right to produce derivative works. Now, while it is highly unusual (though not completely unknown) for works of mathematics to be re-interpreted and adapted in another medium (which is a different process than simply transferring a printed article into a

textual article online) the transfer of copyright would technically require permission from Elsevier whereas explicit rights to publish the article in all media for Elsevier would not include such rights. While it is unlikely that Elsevier in its current form would exert such rights, it is not entirely outside the bounds of possibility that such a case could arise in the future and so the current situation expects that Elsevier (and similar publishers) would always maintain their current stance on the issue. Elsevier does make a gesture in the direction of derivative works where authors retain: "The right to publish a different or extended version of the paper so long as it is sufficiently new to be considered a new work."

What the difference is between a "derivative work" and a "new work" is an interesting question, but too large for this report and so left as an exercise for the courts (see literary examples such as "The Wind Done Gone" and "Peter Pan: After the Rain" cases in the US and Canada).

Whether academic publishers honestly believe that transfer of copyright is beneficial to the academic endeavour, and whether or not they are right in this, is not the point of this report. It is clear that many if not most academic publishers have received a transfer of copyright for the material they have published in journals and sometimes in books, and that they continue to solicit such a transfer, either as a pre-requisite before publication or as a strongly supported suggestion for authors. The fact that a few major publishing houses hold such copyright could be of great benefit to making mathematics freely [8] available online in that only a small number of agreements with publishers would have to be reached to include a large portion of existing mathematics in an endeavour. It might also present a great obstacle should those companies regard these copyrights as part of their assets which they will seek to protect and from which they will seek to make further profit.

4 Copyright in Metadata

4.1 *A Priori* metadata

This falls into several categories.

– Unstructured metadata added by the author, such as title, author and, generally, abstract.
– Unstructured metadata added by the publisher, such as journal, volume, page numbers, web addresses for on-line versions (which will generally be subscription-based with today's technology).
– More rarely, the above two classes could be combined, generally by the publisher, into more structured metadata, generally using the "Dublin Core" metadata standard. This would form an important part of any Mathematical Knowledge Management system, since the unstructured metadata in the first two classes varies widely between publishers, and in the absence of a uniform approach, one would need to build a case-by-case analysis into any metadata search engine, which would be tedious and error-prone.

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[8] "Free as in speech" and/or "free as in beer" to quote Richard Stallman and the Free Software Foundation.

If the author has not retained copyright in the paper, then it is fairly clear that the copyright in the metadata belongs with the publisher, though it is clearly in the publisher's commercial interest to make the metadata widely available to search engines. This is especially important if the publisher makes the on-line version of the journal (or other item) available in a binary form such as Postscript and PDF, without added external metadata where search engines, even if they had access, would not be able to harvest useful information. Where authors retain copyright it seems obvious that they grant publishers the right to use metadata along with the material.

4.2 *A Posteriori* **metadata**

The classic examples of this in the mathematical community are the *Mathematical Reviews*, *Zentralblatt für Mathematik*, or possibly *Computing Reviews*, reviews of the paper. The review is generally written by an individual, who may or may not be entitled to transfer the copyright to the reviewing organisation (see the debate in the previous section). Clearly, the review would be of no use unless the reviewing organisation had at least a licence to use the review. For the copyright in the database created by the reviewing organisation, see the next section.

4.3 **Copyright in Databases**

Few things are less certain in intellectual property rights law that the question of whether there is such a thing as "copyright in a database", as opposed to the items in a database. There is currently no international consensus, and cases are still fighting their way through the U.S. legal system and legislature. The EU does have a sui generis database right, separate from the copyright in the individual records, based on the work done in compiling and indexing such a database. "A "database" is defined by reg. 6 of the Regulations as a collection of independent works, data or other materials which are arranged in a systematic or methodical way, and are individually accessible by electronic or other means. Database right can subsist in a database regardless of whether copyright also subsists. Unlike the law of confidence, there is no requirement that the database or its contents should have any commercial or other value. [9]"

There have been few cases attempting to enforce this right so far and so the actual implementation remains something of a grey area.

4.4 **Bibliographic databases**

Some of these are the reviewing databases, as described in the previous subsection. The on-line versions of these databases are very largely a mathematician's first source of information. Another one of great use is the "Web Of Science", produced by ISI. This can be used to find all papers that cite a given paper, thus enabling one to chase progress since a particular article. It would be a disaster for mathematics, undoing many of the advantages that information technology has brought to mathematics, if the absence of any protection for databases led these services, or the on-line version of these services,

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[9] Quoted from the Kingsgate Chambers guide to IP Law: http://www.nipclaw.com/datab/

to disappear. On the other hand if the use of such services is priced out of reach of too many researchers due to over strong protection then this too would be disastrous.

The other category of bibliographic databases are those maintained, generally by individuals and their friends, of publications in a given area. One example is the "Harmonic Maps Bibliography" which can be found at `www.maths.bath.ac.uk`. Again, these bibliographic databases, generally accessible over the Internet, are a great asset to mathematicians trying to cope with the explosion in the mathematical literature, often said to be doubling every ten years [2].

4.5 Factual Databases

Many mathematical software packages are equipped with large databases of mathematical facts, which the software can search and/or use. An example of these is the database of all finite groups of order ≤ 31 contained in the Group Theory software GAP. Again, these databases are often compiled by a team on the basis of several wider contributions. Things are complicated in this case by the fact that GAP is released under an "open source" licence.

5 Digital Rights Management

Digital Rights Management technology was seen, in 2001, by many, especially in the music and video industries, who claimed to be suffering greatly from Internet "piracy" to be the panacea for their woes. [10] It was felt at the time of writing the MKM proposal that mathematics could just latch on to what were clearly going to be industry-standard solutions. However, a more balanced view has now emerged, and a recent report [3] has the following in its Executive Summary.

> A principal consequence of deploying DRM technologies is to reduce the variety of tools available for accessing and modifying information goods. Thus, technological solutions threaten to worsen the imbalance between producer and user interests further.

While there were a plethora of statements about DRM on the W3C website in 2000–1, the very few later statements were significantly more pessimistic. In 2002, we read the following [4].

> Today, choosing a Digital Rights Management System (DRM) often locks you into a limited usage space for the content protected by the DRM due to limitations of the client software that plays back the content. To give customers what they want and allow broader usage, publishers and e-tailers have to offer the content in multiple formats, protected by multiple DRM systems. With the lack of a standard business rule definition language, these publishers or e-tailers have to specify the business rules separately for each DRM system they support.

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[10] Often simply described as 'Napster'.

As far as one can tell, this was never followed up technically, though W3C did issue the following comment[11].

> New technologies are needed to address a variety of issues around copyright and the Web. Electronic copies of a digital (intangible) item have no age: one can't distinguish between the original and the copy. The cost of copying has disappeared, which changes the whole landscape for the content industry. DRM and metadata can provide the necessary framework for a new balance and peace in the content arena.
>
> Consequently, this submission is a valuable attempt to provide input for a future DRM-Activity.
>
> There are many Activities around DRM in different Standards bodies and Consortia around the world. MPEG is integrating DRM into MPEG-4, MPEG-7 and MPEG-21, CEN/ISSS has a Steering Group around DRM. OASIS just opened a Technical Committee on DRM to create a rights-language and Content-guard provided XrML as a contribution. None of the above mentioned initiatives federate all the stakeholders and interested parties around one table. The library community, new initiatives like the Creative Commons, like Project Gutenberg or consumer-protection associations offer welcome user perspectives too often missing from the technical design discussions of rights management systems. During the DRM-Workshop stakeholders asked W3C to help coordinate this broad variety of initiatives. This was partly done with the Workshop and the www-drm mailing-list.
>
> DRM technologies are broadly covered by patents. This might affect the widespread use of such technology outside the very commercial sectors of the Web.

The last sentence probably implies that it is W3C's view that DRM would not be applicable for the bulk of mathematics.

Similarly, there are some proposals in MPEG-21 [5], which state that they have some connection with Digital Rights Management, but again follow-up seems to be limited, and probably not applicable to our community. The Rights Expression Language standard in MPEG-21 was approved by ISO in 2004 [6].

A further problem with the DRM technologies advocated by the music and video industries in that they tend to block all copying, whereas our community is used to "fair dealing", and indeed this is currently enshrined in most (paper-oriented [12]) copyright law. This discrepancy is brought out in the following quotation. [13]

> More specifically, the content development industry, which consists of the recording industry and the movie studios, has repeatedly emphasised the need for immediate DRM solutions that stop all unauthorised copying and distribution. Meanwhile, the information technology industry is emphasising that DRM solutions should support the concept of "fair use," which allows consumers to

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[11] `http://www.w3.org/Submission/2002/05/Comment.html`

[12] See `http://www.eff.org/IP/DRM/20030916_brownback_statement.pdf` for illustrations of how current interpretations in the U.S. of the DMCA are restricting this.

[13] `http://www.content-wire.com/drm/drm.cfm?ccs=104&cs=2639`

make copies of some types of copyrighted content for their own personal use. In the US, these disagreements have led to an increase in both DRM-related lawsuits and new legislative initiatives.

5.1 IS P3P Any Better?

A more recent initiative, the P3P project, describes itself as follows [14].

> The Platform for Privacy Preferences Project (P3P), developed by the World Wide Web Consortium, is emerging as an industry standard providing a simple, automated way for users to gain more control over the use of personal information on Web sites they visit. At its most basic level, P3P is a standardised set of multiple-choice questions, covering all the major aspects of a Web site's privacy policies.

It was originally hoped that this would also deal with issues such as copyright information as well as strictly privacy information. However, after the P3P 2.0 Workshop, the following statement appeared in the minutes [15].

> In general there was no consensus on the exact way how DRM techniques and privacy policy enforcement techniques in an enterprise should or could relate and this seems to be an interesting open question.

5.2 The State of Digital Rights Management

Steinmueller in [3] is pessimistic in his analysis of the future of intellectual property protection (IPP).

> The most likely scenario for future developments will be a set of continuing skirmishes between those having the greatest interests in enforcing IPP rules and those with the greatest interests in defeating IPP. Some of the vast numbers of producers and users that are in the middle of this battlefield are likely to be caught in the crossfire. They will step into various traps designed to capture those viewed as "pirates" by IPP proponents or fall victim to the opportunistic behaviour of a growing population of "claimants" who have varying degrees of legitimacy. The possibility that users will en masse be converted to a regime involving strong self-regulation of IPP transgressing behaviours is not considered seriously here. While such a regime might be conceivable in some limited domain such as the exchange of pirated copies of current hit recordings, it simply does not reflect the realities of information use that have been considered here.

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[14] `http://www.w3.org/P3P/#what`
[15] `http://www.w3.org/2003/p3p-ws/minutes.html`

5.3 The Current use of DRM for Academic Papers

A number of the major publishers have begun making some or all of their publications available online. Few of these have made significant efforts to put material older than about 1990 online and many of them are only including new material. We will discuss the business models of these archives below, but will cover the issue of digital rights management for such material here.

Most academic papers in mathematical sciences are typeset principally by the author using either a wordprocessor or the LATEX (or TEX) systems. Where electronic versions are offered by the publisher these are frequently in portable document format (PDF) and sometimes in postscript, both of which are easily generated from all these input formats. Postscript does not offer much in the way of rights management, except that it can be difficult to select and copy portions of the text into an editing program, depending on the display tool used. One of the motivations for Adobe to produce the PDF specification was to allow the inclusion of some digital rights management controls in viewing and production software. It is therefore possible to place some restrictions on usage of a PDF file. In particular files may require separate passwords for opening or editing a PDF file and files may be marked as non-printable. Such restrictions are enforced by encrypting the content of the file and allowing only certain viewers to access the contents in certain ways (such as not allowing clipboard selection of the viewing screen as text and not allowing printer output. As with most DRM facilities these only discourage casual and non-technical users from violating the conditions of the files since there are always ways around such restrictions: if the material can be displayed on screen then it can always be printed via a screen shot at worst.

6 New Models

Academic publishing has been showing a great deal of strain in recent years. The old model of small publishing houses dedicated to publishing academic journals and monographs and making small profits on turnover has been superseded by two factors: publishing houses have been merged or taken over by large multimedia publishing organisations or, where they are attached to a University the parent organisation is more interested in the financial returns rather than in providing a non-loss-making service to academia at large. Scholarly societies who used to generate a significant proportion of their income from publishing activities are finding that the squeeze on University library budgets (caused from both ends as real-terms budgets are reduced and as prices from commercial publishers increase well beyond inflation) is causing a knock-on effect on their subscription income. When the number of institutions subscribing reduces, the cost per subscription must rise if "surplus" income for non-profit organisations is to be maintained. As these subscription rates increase many academics have looked at this model and decided that it is not the right way forward for the long term. Since many of the prestigious titles in which to publish are owned by the publishing houses new ventures are being brought forward with different models in the hope that they will eventually gain sufficient prestige (via their editorial boards, scholarly society affiliations and authors published) to supplant the expensive old-style journals. The two main models for this are the Open-Access journals and the subsidised journals. In the open

access model the costs of editing and distribution (primarily maintaining web sites and printing bond copies on demand) are paid by authors. In order to avoid authors without significant funding from being barred from publishing most such journals operate an honour-based system where submitters are trusted to pay unless they really do not have funding available. In the subsidised model scholarly societies absorb most of the costs of providing fere electronic access (such as the London Mathematical Society does for its Journal of Mathematics and Computation) by subsidy from other activities including reasonably priced sale of hardbound copies to libraries. Existing publishers are also changing their practices somewhat, including offering tied-deals for access to the full archive of a journal while a current subscription exists and even bundling access to a wide-ranging set of archives in a single deal or together with a minimum-cost set of print journals subscribed to. Given the ownership of much of the existing material in papers and monographs (transferred to publishers by trusting academics over the years) it is clear that older material will always have a profit-inclusive charge attached to it. Whether profit- or surplus-generating publication of academic work can be maintained in a connected world where Google replaces the librarian for most people is still to be seen. What is certain is that knowledge management in any field cannot ignore the economics and legal aspects of ownership of creative work.

7   Conclusions

It is clear that appropriate use (and where necessary amendment) of both copyright law and custom and practice in publishing will be a major ideological battleground for the twenty first century. This as much if not more true for mathematical knowledge as it is for music, films, games and general textual material. Already online sources of information such as the arXive and free or "pay to publish" (rather than the prior "pay to purchase") journals are making inroads against traditional academic publishing models. Free software and open source software models are becoming economically viable beyond academic and pure research institutions, and are beginning to challenge proprietary software producers for market share.

Because of its very rich level of content (one page of mathematics can contain more hours of work, more insight and more useful results than a single page on almost other topic) and the broad applicability of mathematical information, a share and share alike attitude to mathematical knowledge has always been more prevalent than a pay-per-use approach. it is much more clear to both pure and applied mathematicians that their "seeing further" has been enabled by "standing on the shoulders of giants" (to quote Isaac Newton). As with other areas commercial publishers have gained a manner of monopoly on some of the output of mathematicians. However, unlike the music publishing world, the majority of the users are also the producers and the quality controllers of mathematical information. Thus the logic of using new technology to its utmost to aid in the creation and dissemination of knowledge as freely as possible seems unassailable and the biggest problems facing users today is how to ensure continued support for each other's work and not how to continue to support rich pickings for the middlemen.

In academia, it is well known that one must "publish or perish" and at the beginning of an academic career the question of whether to sign over copyright to a well-

respected journal published by a commercial publisher in order to allow publication is not a quandary easily solved. Indeed the copyright to this very article has been signed over to Springer-Verlag to enable publication in the LNCS series. It is therefore the responsibility of more senior, usually tenured, academic staff to promote open access journals and open source or free software so that they become the standard routes to academic dissemination. They can do this by joining editorial boards of such journals (and resigning from those operated as profit-engines for commercial publishers) by publishing their own work in such places, and by dedicating as much respect in tenure and promotion decisions to such journals as to more established commercial titles. Pressure from University administrators to "exploit" mathematical "intellectual property" should not be allowed to undermine the fact that the prime purpose of academic endeavour is the production of new knowledge, and that this is better achieved both in general and in specific by exploiting new communications technologies to their fullest potential instead of closing off knowledge in a "pay-to-play" world. In the end the vast majority of academic institutions will end up paying more than they earn and most of the "earnings" will be spent on legal bills and administration, diluting still further the application of resources to the academic goal.

Mathematicians working in commercial sectors generally understand that they provide a service for the rest of their organisation, which are the profit-making parts. Even those working in the production of proprietary mathematical software often find it more beneficial to publish some of their work freely rather than keep it concealed. The emerging benefits of free and open source software development methods can provide suitable models. Those publishing material in academic publications should realise that they are already giving their work away for free and that ensuring as wide an audience as possible will bring far more benefits than giving it away to expensive-to-access routes.

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