

**THE PRODUCTION,
CIRCULATION,
CONSUMPTION
AND OWNERSHIP
OF SCIENTIFIC
KNOWLEDGE:
HISTORICAL
PERSPECTIVES**

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The production, circulation, consumption and ownership of scientific knowledge: historical perspectives

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Abstract

Who owns the content of scientific research papers, and who has the right to circulate them? These questions are at the heart of current debates about improving access to the results of research. This working paper will use the history of academic publishing to explore the origins of our modern concerns. The *Philosophical Transactions* was founded in 1665 and is now the longest-running scientific journal in the world. This lecture will follow the *Transactions* from its early days as a private venture of its editor to becoming the property of the Royal Society. It will explore the basis of the Society's claim to ownership (which had very little to do with copyright) and reveals the ways in which the Society encouraged the circulation, reprinting and reuse of material in the *Transactions* during the eighteenth and nineteenth centuries. It will end by considering how things changed in the twentieth century, as commercial interests became increasingly influential in academic publishing and as new technologies brought new opportunities for circulating knowledge.

Introduction

Let's begin by thinking about the current day. If you are thinking about issues surrounding the production, circulation and ownership of scientific knowledge nowadays, then it's quite likely that names such as Springer, Elsevier and Wiley are going to come to mind. You might be thinking about the role of publishing companies, particularly major commercial publishing companies in the production and circulation and ownership of scientific knowledge. Lariviere et al² have

¹Professor of Modern History, University of St Andrews. This lecture draws upon research carried out by my AHRC-funded team (grant no AH/K001841). I thank Noah Moxham, Julie McDougall-Waters and Camilla Mork Rostvik. In other contexts, they are my co-authors.

²Lariviere et al (2015), 'The Oligopoly of Academic Publishers in the Digital Era' doi:10.1371/journal.pone.0127502.

illustrated the proportion of scientific research articles globally that are produced by just four or five major publishers in Figure 1. When you realise that there are only four or five publishers who are really, really important in the production and circulation of scientific knowledge this can raise questions about who those players are, whether we should trust them, and whether we should be worried about their involvement.

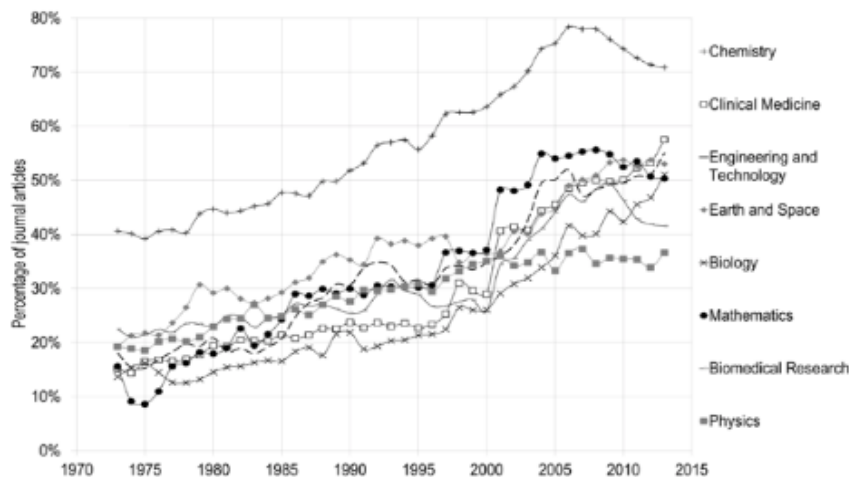


Figure 1 – Percentage of papers published by the five major publishers, by discipline in the Natural and Medical Sciences, 1973-2013 (Lariviere et al (2015))

This is not to say these are the only publishers - there are many other publishers of scientific journals who only publish one or two, or ten scientific journals. Some of those are mission driven, some of them are not-for-profit, and some of them are commercial. But the fact that there are four or five that have so much power is something that we're now starting to question.

Why? Because the whole business model that has been around for the last 50 - 60 years involves selling access. Publishers are providing a means for the circulation of knowledge by selling it to readers or to institutions and that, in itself, is going to exclude certain people from access. Maybe your university can't afford to keep up its subscription; maybe you're in a part of the world where you were never able to have a subscription in the first place. If we're in a world where, for example, there are medical professionals and researchers trying to work out how to adapt to a new virus, it matters if some researchers and medical practitioners cannot get access to the latest research in the field. It's a concern if, perhaps, some of these big players are not going to be circulating knowledge in a way that facilitates access.

Then of course there's the concern about the cost of that access, and whether it is fair and appropriate, particularly when you consider that most of the research has been produced by

researchers working in universities that are funded by governments, taxpayers and charitable organisations. The cost of access will be used not to bring money to the researchers or their institutions, but to generate money for the shareholders of some of these organisations.

It's understandable how people might start to worry about the influence of commercial interests on what one might see as a scholarly research activity.

As one commentator put it:

The commercial houses had another aim in life and their high charges, justified on commercial grounds, might become a danger... Scientific societies must continue to predominate in scientific journal publication, for the moment commercial gain [begins] to dominate this field the welfare of the scientific community would suffer.³

This comment reveals worries about the motivations of commercial houses, and suggests that their high charges may be a risk to the welfare of the scientific community.

Whilst the sentiment may seem quite modern and contemporary, it is in fact from a 1957 speech delivered in London by the executive secretary of the Royal Society, David Christie Martin. It was expressed at a moment when the landscape of academic publishing seemed to be changing; at that point in time, the arrival of commercial interests seemed a danger, a risk - a change. It was something new and it's that newness we must consider. What had the world been like before commercial interests were so actively involved in the circulation, production and ownership of scientific knowledge?

To continue with the de-familiarisation, consider this opinion from 1895, when the eminent physicist Lord Rayleigh, the discoverer of the chemical element of argon, and at this time the secretary to the Royal Society in London, explained in a memorandum to her Majesty's Government that:

A scientific journal... is not a profitable undertaking, even though the contributors are, in contrast to the contributors to a literary journal, paid nothing for their contributions... [Because ...] the expenses are so great, the public so small, and the incidental remuneration by advertisements so uncertain and insignificant... [Hence,] the scientific journals in this country... are carried on with great difficulty..., and at a loss...⁴

For Rayleigh and the world he was working in, there was no expectation that you could possibly make money out of selling articles to research journals. Money could be made from magazines and newspapers; but research journals were different. They were simply not going to be commercially viable, and Rayleigh thought that was just the way the world was, in the 1890s. It's

³ David Christie Martin, 1957, Chief Executive, Royal Society, from a speech in 1957.

⁴ Detailed in Fyfe (2015) 'Journals, learned societies and money: *Philosophical Transactions*, ca. 1750-1900' *Notes & Records*, <https://doi.org/10.1098/rsnr.2015.0032>.

that world that I aim to make familiar to you in this paper- a world in which there was a different way of circulating scientific knowledge.

Until around about the 1950s the enterprise of circulating scientific knowledge was dominated by scholarly associations of various sorts: learned societies, national academies, specialist societies and various things that you might call 'scholarly communities'. They had various different formal structures going back to the late seventeenth century, which was when these kinds of organisational structures started emerging. Some of the first ones were in London and Paris, with the Royal Society in London and the Académie Royale des Sciences in Paris, with some equivalent communities in the German lands. These are now the national academies of sciences in their respective countries.

In the nineteenth century, there were increasingly more scholarly communities in other countries ranging from Sweden to Argentina. And further, there were more specialised communities such as the Geological Society, the Microscopical Society, the Zoological Society - even eventually the Royal Historical Society. Each was producing transactions, or proceedings or memoirs - in short, producing research publications. This came to be seen as an activity that these kinds of entities did. If you were a scholar trying to gain a reputation and make your name, this was where you wanted to get published.

It's not that there were no commercial publishers: printing firms were certainly involved in the circulation of knowledge in this period. However, if you were a private firm, the best way to make money was to do the printing for these scholarly communities and get paid to do so. There were only a small number of firms involved in journal publishing in the nineteenth century. This included, for example, Taylor and Francis, although at the time they only owned a few journals. Similarly, Macmillan entered the field later in the century, with just one journal, *Nature*. But overall there were only a *handful* of journals in commercial hands, and generally speaking they were not very profitable. In the nineteenth century, they were quite often seen as loss leaders for other aspects of publishing, like book publishing. The idea was that if you could get people to come and publish their articles with you, then you might get their book from them later on - this would be much more likely to be profitable.

Therefore, in terms of research publications, scholarly publications, it was the learned societies and similar organisations that were vitally important in the production and circulation of knowledge.

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I've spent the last six years of my career working on the history of the Royal Society in London. It's the publisher of the world's longest running scientific, and indeed academic, journal, the *Philosophical Transactions*, founded in 1665. Indeed, it's still published, but in a somewhat different form, to this day. I have been working on this project with a team of collaborators, beyond what any historian would normally do in terms of timescale. There are lots of different types of archival material in the Royal Society, as they tend to keep their archives in pretty good condition, going back hundreds of years. I am not aware of any other periodical that has an archival history of that length. In fact, it's arguable whether there are any other periodicals *with* a history of that length, let alone an archive to illustrate it.

In particular, I have been working on matters like the editorial practices, a topic that speaks to the history of peer review and research evaluation. It is largely outwith the scope of this paper, though it does have some bearing on the production and circulation, and sometimes selling, of knowledge. Whilst historians tend to look at issues like the foundation of journals, I'm actually more interested in how you keep a journal running. What are the practices necessary to keep this continuing? Much of this comes down to business practices, which is this paper's focus.

This paper will take you on a 350-year tour of Royal Society history. This provides us with a window into the changes in scientific journal publishing during that time. In the early period the Royal Society, I would argue, is fairly representative of scholarly publishing, but by the time you get into the twentieth century, it's less typical and less dominant. This may be an issue when using it as a case study, but it nonetheless offers us an unrivalled opportunity to look at change over time.

In terms of structure, this paper has three chronological sections, structured around changes the ownership and business model of the *Transactions*. In Part I, we begin in 1665, when the *Transactions* were founded, moving to 1752 when the Royal Society took over formal ownership of the Society. In this early period the Royal Society was a bit unusual in terms of learned societies and academies because it didn't own the journal that was firmly associated with it (depending what we define as 'owning'). By contrast, a lot of the later academies created a journal as part of the process of setting themselves up. Perhaps it is because the Royal Society was first, that it *didn't* do that. There is an interesting and complex story about who owned what, and who was responsible for what in this early period.

In Part II we look at the period 1752 through 1954: this is the main focus of the paper. This is when there was Royal Society ownership, and this ownership of the journal was being used to circulate

it in different ways from what we would expect. In essence, they were not doing this to make money, but they were supporting the circulation of knowledge through the *Transactions*.

Lastly, in Part III, we look to the 1950s and beyond, where the business model flipped, and publishers started trying to make money out of their journals. This takes us to where we are right now.

Part I – The Independent Editors (1665 – 1752)

We begin with what I call the era of the independent editor. This is the period when Henry Oldenburg, a German émigré in London and secretary of the newly founded Royal Society, had an idea. He thought that maybe there could be a printed news sheet that contained news and goings on in the world of natural philosophy (a study now known as science) and scholarship. He could gather material from people all over Europe and publish it in English, which would be useful to readers in London and thereabouts to know what's going on.

This idea created the periodical *Philosophical Transactions*. This was at a point in time when the periodical was actually a relatively new literary format, and certainly in terms of natural philosophy, books were a much more common way of publicising your work. Alternatively, scholars would simply speak about their work or write letters about it. Other periodicals of this time tended to be literary or political, so having a natural philosophical periodical was novel. Oldenburg was very much hoping that he could make money from this but, as will be discussed further below, this did not go so well.

It is worth emphasising that Oldenburg's periodical was different from what you would typically think of a scholarly journal. Oldenburg referred to himself sometimes as the 'author' of it, as evidenced in the presentation copy that he gave to the Royal Society. This was not a world where a scholar could write a paper and send it into the editor and hope to get published. This was a world where an editor (or author) sat around in London and looked at all the books recently published, or the pamphlets recently published, and wrote reviews of them, or accounts of them. He excerpted parts of them, translated other parts of them, and he could also draw upon his voluminous correspondence, being very well connected across Europe and speaking multiple languages. He selectively drew upon his literary resources – some private, some published – to produce copy for the periodical. So rather than being the editor of *Transactions*, he was the creator of it.

We don't know as much as I wish we did about the business arrangements in Henry Oldenburg's period, because until the Royal Society took over formal ownership of it, the archival record is

somewhat spotty. We do know quite a lot from his correspondence, but he didn't mention things like money, for instance, as often I wished he would have done! We do know that he thought initially that he would make money out of this endeavour. A secure income would have been very useful to Oldenburg, being an émigré in a foreign city, and dependent very much on the patronage of the wealthy. He managed to convince some booksellers (i.e. publishers) to enter a profit-sharing agreement with him. As a result, he actually got paid for the copy that he produced each month (the text that was going to go into it), and received some kind of share in the sales income afterwards. As evidenced in his later letters, this income never lived up to expectations, and was disappointing as a commercial enterprise as far as he was concerned.

However, we do think he made a small amount of money out of it. This is worth noting because, as far as my team and I can tell, he was the last person to make any money out of this venture until the 1950s.

However, it's also significant that when Oldenburg died in 1677, there were serious questions as to who was going to take over *Transactions*. At the time, his children were under the age of ten, and his wife died shortly after him, so there was no family who might be interested. If this had been a notably successful literary property you might imagine the booksellers would be trying to find another editor to maintain it, but they were not involved at all, which probably says something about its circulation and success.

Transactions could easily have died with Oldenburg, as happened with a lot of early periodicals: when their editor died so did the periodical. Yet, over the period to 1750, there was a continuous series of people acting as editor⁵. The question is, who and why?

The editors were all closely involved in the Royal Society of London, most of them being secretaries to the Royal Society, as Oldenburg had been. It's also significant that they were all independently wealthy. Everyone who was involved in the Royal Society at that point in time was a male aristocrat, nobleman, gentry or professional, and had (at least) a fair amount of wealth. This mattered if they were going to take on editing the *Transactions*, because they must have the ability to finance the printer's bills (and the engraver's bills, if they wanted illustrations).

⁵ Including: Nehemiah Grew, 1677 (hon. Secretary to the Royal Society); Robert Hooke, 1679 (hon. Secretary to the Royal Society) [running an alternative periodical titled *Philosophical Collections*]; Francis Aston and Robert Plot, 1682 (hon. Secretaries to the Royal Society); Francis Aston and William Musgrave, 1684 (hon. Secretaries to the Royal Society); Edmond Halley, 1686 (clerk to the Royal Society); Richard Waller with assistance of others, 1692/3 (hon. Secretary to the Royal Society); Hans Sloane, 1696 (hon. Secretary to the Royal Society); Edmond Halley, 1714 (hon. Secretary to Royal Society); James Jurin, 1720 (hon. Secretary to the Royal Society); William Rutt, 1727 (hon. Secretary to the Royal Society), and; Cromwell Mortimer (hon. Secretary to the Royal Society)

Take for example Hans Sloane, who left his collections to what we now know as the British Museum, and who made his money as a physician in the Caribbean – he was fabulously wealthy in the early eighteenth century. He said that he put £1,500 of his own money into running the *Transactions*. At that point in time, that’s a considerable amount of money, so he must have done this because he believed that *Transactions* was a good, worthwhile thing – it was certainly not because he was making money out of it.

So, who owned the *Transactions* in this period?

The Royal Society? It was certainly the Royal Society that ensured there was still an editor of *Transactions*, when the booksellers didn’t seem to care and when Oldenburg didn’t have any (adult) heirs. The *Transactions* very quickly became firmly associated with the Royal Society, even though the Royal Society consistently denied that it was in any way responsible for the *Transactions* through to the 1750s. For instance, in 1700 *The Transactioneer* even acknowledged that *Transactions* was “begun by Mr. Oldenburg, who all along declar’d the R. Society were not concern’d in those *Transactions*”⁶; nonetheless “the World everywhere looks on [it] as a kind of Journal of the Royal Society”⁷.

This became a difficult problem for the Royal Society in the early eighteenth century because they were seen as being responsible for it, and they were assumed to be running the journal. Yet according to the Royal Society, this was not the case; it was a private venture of the individuals who happened to be its secretary and happened to be the editor, and these were two distinct matters. But many people didn’t see it that way; the comments above are in fact extracted from a severe critique of the Royal Society, which it associated with *Transactions*.

There are other examples where that assumption of Royal Society ownership or responsibility is made. For instance, in 1703, John Lowthrop, who was in fact a Fellow of the Society, and who one could assume would know about their arrangements, planned on creating an abridgment, compilation and re-organisation of all the back issues of *Transactions*. Essentially, he would take 21 volumes and turn them into three better-organised volumes. He even had the backing of some booksellers. He wrote to the Royal Society asking for permission to create this abridgement.

Why did he ask permission? On what basis did he feel the need to ask permission when there was no legal basis at this point in time (being 1703 and before the Copyright Act)? The Royal Society had been the agency that licensed the *Transactions* for publication but that had ceased to be

⁶ King (1700) ‘The Transactioneer, with Some of His Philosophical Fancies: in Two Dialogues’, sig. A3r–A3v.
⁷ *ibid.*

necessary with the lapse of the Licensing Act in 1695. And licensing doesn't usually imply ownership of the *Transactions*. But Lowthorp asked for permission nonetheless.

He didn't ask permission of the editor, he didn't ask permission of any of the authors, but did ask permission of the Society. What's more, the Society gave permission, as if they had permission to grant. Although they denied being involved with the *Transactions*, nonetheless they granted permission for him to reuse it. It turned out to be a phenomenal publishing success and he made quite a lot of money out of it – but the Royal Society didn't make anything out of it.

This raises clear questions of responsibility, or moral ownership, if not legal ownership or copyright. There were licensing arrangements, but they had since lapsed. So, what were they basing this ownership on? Why did everybody think the Royal Society was involved? Of course, the editors did all happen to be secretaries of the Society which may have suggested a connection. It was also published by the Society's booksellers, which may have been coincidence. There was also the fact that a lot of the content in *Transactions* was no longer derived from printed sources and correspondence, but was now content that had been presented at meetings of the Royal Society. The fact that much of the content was very closely linked to what was going on at the meetings of the Society was a further reason why it was perceived as being the Society's journal. The *Transactions* was perceived by outsiders as being within the control of the Society, but the Society kept insisting that it was a private venture of the editors and deflected any critique on to them.

By the 1750s, this position became difficult for the Royal Society to sustain. This was why the Society did finally decide to take over *Transactions*.

However, there is one example where the Society's control of *Transactions* was contested. This arose when the Society's former publisher died, and his son decided to sell his father's literary properties at auction in 1757. The auction catalogue, an excerpt of which is detailed in Figure 2, included *Philosophical Transactions* from numbers 1 to 422 – in essence from 1665 all the way up to 1736. His father had not published the *Transactions* for all that period of time, only from 1714–36. Yet the son thought he could sell the rights, including the rights to re-print.

C O P I E S.		
N. B. Half a Guinea Earnest to be paid for each L O T.		
Those marked * are out of Print or Re-printing.		
<p>Philosophical Transf. at large, N^o 1 to 422 inclusive, with 259 Copper Plates, the Whole Ditto, N^o 423 to 442 inclusive, with 15 Copper Plates,</p>	<p>1 Altieri's Dictionary, 2 Vol. 4to. one 12th 2 ————— Ditto, one 12th 3 ————— Ditto, one 12th 4 ————— Ditto, one 12th 5 ————— Ditto, one 12th 6 ————— Ditto, one 12th 7 Albin's History of Birds, one 6th</p>	<p>30 Boyer's Telem. 2 Vol. 12mo. and 18^o one 31 Beveridge's Works, 2 Vol. Folio, one 32 Ditto, one 33 Beveridge's Thoughts, 8vo. and 12mo. one 34 Ditto, one 35 Boyer's Dictionary 4to. one 36 Ditto, one 37 Ditto, one 38 Ditto, 8vo. one 39 Ditto, one</p>

Figure 2 – Excerpt from auction book 'A Catalogue of Books in Quires, and Copies, being part of the stock of the late Mr William Innys' (February 17, 1757)

The Royal Society was furious about this and called in the son to have a serious discussion. The son believed that the previous editors had transferred their rights to his father, and that was the basis on which he thought he could sell them. The Royal Society insisted that the editors had no such rights to transfer to anybody, and that the rights resided with the secretary to the Society (which is not at all what they had been insisting for the last 50 years...). The Society's argument was successful, and the son withdrew them from the auction. As a result, everyone assumed that the Society owned the entire run of transactions from 1665 onwards, even though they had denied this repeatedly.

We understand this as a demonstration that the Society was seen as having the moral right to do this, though the existence of any legal basis for this is unlikely. But it shows that, by the 1750s, the Society definitely had established its rights to the current and future *Transactions*. This also helps explain why they had the social clout to insist on having the rights to the earlier issues as well, though this was never tested in court.

Part II – The Scholarly Mission (1752 – 1954)

Two further significant things happened in the early 1750s. Firstly, the Royal Society had once more been critiqued for being too much of a gentleman's club, too concerned with trivial natural history and not doing anything worthwhile, judged on the basis of what was in the *Transactions*. Essentially, the Society was being critiqued on the basis of a publication it didn't actually have control over.

Secondly, the Society's secretary died, leaving a vacancy for a new editor. It also so happened that the Society's president had a stroke leaving him paralysed and unable to attend meetings.

The simultaneous absence of both the president and secretary was very convenient for reformers trying to enact some change within the Society and subsequently they decided to take control of the *Transactions*.

In January 1752, they declared that from henceforth:

... [the *Transactions*] shall be printed at the Sole Charge of the Society, and under the direction and inspection of the Council... and also that the *Philosophical Transactions* so printed shall be for the Sole use and benefit of the Society, and the Fellows thereof.⁸

What does this mean? One thing it meant was that the Society set up an editorial committee in order to have collective editorial responsibility for what was published. This was about protecting reputation, which was also related to the creation of the peer review process. The other thing it meant was of course financial responsibility – “being printed at the sole charge of the Society”. The Society was now responsible for paying the bills for the paper merchant, the printer and the copper plate engraver for the illustrations. The Society’s bookseller was still involved in managing this and in selling some copies to the trade. They received a commission, but only a commission - not a share of any profits (were there any in the first instance...).

The reformers were well aware of the costs this would involve, so in the 1750s they increased the membership fee to try and cover the extra costs, and considered how to manage the printed copies now owned by the Society in strategic ways to help their mission.

In terms of financial benefits, now that the Society owned *Transactions*, we have access to better records with details of costs and income for most of the periods, illustrated in Figure 3. The take home message from these records is that production costs (in red) outstripped any income from sales (in blue) across this period and continued to do until the 1950s. The Society was clearly not doing this for the benefit of any income: it was in fact supporting the journal. Why was it doing this?

⁸ Statutes of the Royal Society, Chapter XIII, section V.

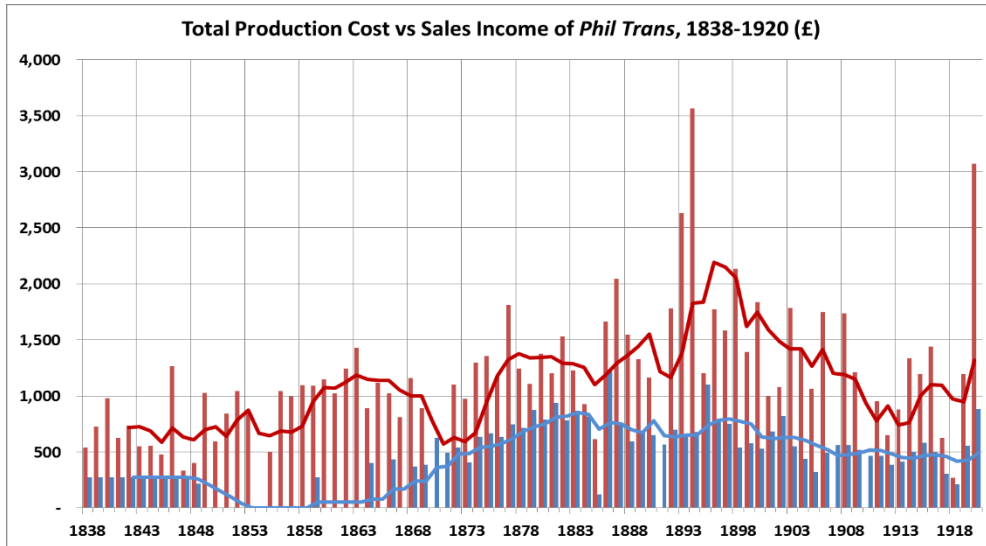


Figure 3 – Total production cost vs sales income of Philosophical Transactions, 1838-1920 (£). (A. Fyfe (2015)).

Another key point here is that sales were not the main way in which the *Transactions* and the material in the *Transactions* were circulated in the eighteenth, nineteenth and early twentieth centuries. In the estimates I have compiled from the archives, in Figure 4, we see that there were some sales, but they were actually falling across the period between 1765 and 1908. There was a very large amount of other circulation, because the *Transactions* was circulating through channels other than commercial book trade. And also of course, and as will be discussed below, the content of the *Transactions* was circulated in ways other than in the *Transactions* itself. There were abridgements for instance, and a range of other ways in which content could be re-printed and re-used.

	1765	1838	1908
Membership perks	512	733	510
Gifts and presents	8	61	260
(estimate) full price sales	209	140	80
Estimated circulation	729	934	850
Print run	850?	1000	800?

Figure 4 – Sales Estimates for Philosophical Transactions, 1765 - 1908

We look now at this non-commercial circulation. The first way that *Transactions* circulated non-commercially was to “the immediate benefit to the Society and its fellows”: the fellows of the Society could claim a free copy if they wanted one, provided they travelled to London in person

to collect it and signed to confirm. This incidentally took away the natural market for selling the *Transactions*; the most likely people who would have bought it would be the Fellows of the Royal Society, but they all had access to free copies.

Secondly, now that the Society owned the entire print run, they started to realise they could also use some of these copies to give as gifts. For instance, they may have decided to reward certain individuals who sent the Society interesting astronomical observations from China, or missionaries who sent their observations to the Society. They also gave copies to the people they wanted to impress, such as the King, the British Museum, the Universities of Oxford and Cambridge, the Royal College of Physicians and the Stockholm Academy. As illustrated in Figure 5, there was not a huge number of gifts from the Society in the 1760s, but there were some, and this number grew. The number of copies given to other national academies, learned societies, observatories, government bureaus of standards, and to universities grew through the late eighteenth and nineteenth century. By 1908 there were lots more free copies: they were being sent to about 460 institutions globally, including all the universities and university colleges in the UK, as illustrated in Figure 6. This is another reason why they were not selling copies in the way that you might expect nowadays. University libraries got them for free because that was what the Royal Society was concerned with – it was, after all, a charitable enterprise with a mission to encourage natural philosophy. One of the ways this was achieved was by making sure that

the accounts of philosophical research were in libraries such as in New South Wales, the USA and South America.

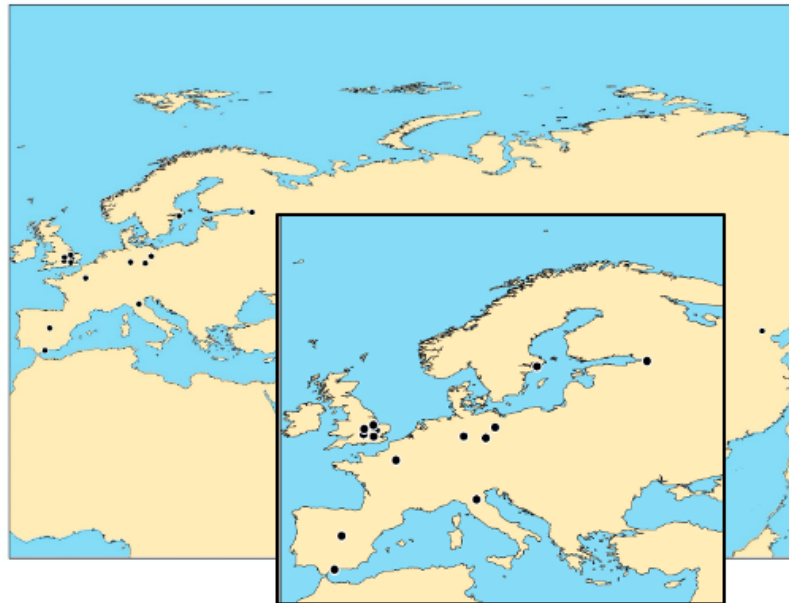


Figure 5 – Geographic representation of recipients of gifted copies of Philosophical Transactions, 1765

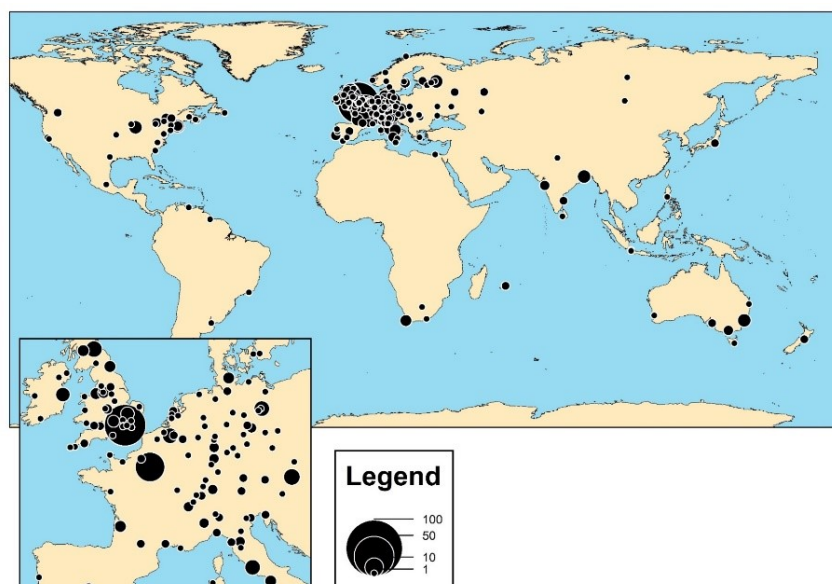


Figure 6 – Geographic representation of recipients of gifted copies of Philosophical Transactions, 1908 (Fyfe (2020))

This huge amount of non-commercial circulation raises a question about whether this model could be considered 'open access'. *Transactions* was free at the point of end use because the

Society paid for the shipping and the production of these copies that were available in libraries. Of course, there are issues about access to those libraries themselves, which were not open to everyone. But for the age of print on paper, it was pretty good in terms of free access to this research.

As we move into the nineteenth century, I had anticipated that by this point in time there would be lots more discussion of copyright, particularly after the 1842 Act when periodicals could be registered for protection. The Royal Society doesn't, as far as we can tell, ever register its literary property in the *Transactions*. We assume this is because it had been working for 100 or so years perfectly happily without needing copyright protection and with enough social clout in the world of science, and in the London book trade, that it seemed to manage on some kind of customary notions of its property.

Since 1776, there has been a line in the Society's statutes to the effect that they assert ownership over the 'copies' of all manuscripts presented to it. 'Copies' in the eighteenth-century sense meant not just the physical piece of paper, but also the right to do what you wanted with it afterwards, whether that meant printing it, or not printing it, or indeed chopping out sentences from it, or revising it in some way. So authors submitting to the Royal Society after 1776 in theory were aware that the Royal Society then owned, in some sense, those copies. Again, we see wider recognition of that ownership in the 1802 quote from an editor of a commercial scientific journal who wanted to re-print some material from the Royal Society and wrote to the president for their approval:

I am well aware that the property of the Copies here discussed is invested in the Corporation; and that consequently it lies wholly in their pleasure whether British Journalists shall publish the same & when...⁹

He was very conscious that the property of the copies was invested in the Royal Society, and that consequently it was up to the Royal Society whether he was allowed to re-print. He was writing to ask for permission.

Similarly, in 1803 when Charles Hutton had an idea for an updated set of abridgements like the ones from a century earlier, again he sought permission: could he have permission from the Royal Society to re-print the material that he assumed the Society owned?

The fact that the Society granted this permission in 1803 is intriguing, because by 1803 it would have been very obvious that the previous abridgment in the eighteenth century (by John Lowthorp) had been a great commercial success. We know that it made its original editor a

⁹ William Nicholson to Joseph Banks, 1802.

couple of thousand pounds, and in fact we also know that Charles Hutton made about £6,000 out of this re-print.

The Royal Society granted Hutton permission even though they knew he was planning to make money out of it, and they did not ask for a royalty or for a share of the profits. Come the 1960s and 1970s, the Society did start expecting royalties from equivalent projects. But not at this point in time... Whilst their claim on the property was recognised by other people, they were more concerned with securing attribution, rather than money.

We also see this in the way that the Society responded to requests for re-printing. As we go into the nineteenth century, there were increasingly more scientific journals, scientific periodicals, and more periodicals in general. Some of those journals wanted to report what happened at recent meetings of the Royal Society, or to report the latest discoveries as reported in the Society's journals. Is this infringement of any rights the Society had or not? Given the ambiguity of the copyright status, we can't say for certain. However, we know that the Royal Society didn't mind. There is absolutely no record through the nineteenth century of the Royal Society trying to stop any of this reportage, excerpting or re-printing, *unless* it was happening before the Royal Society journals had actually been published.

Their focus was on the attribution for the publication. For instance, the Society became annoyed when someone re-printed some of the illustrations and removed the line that said it was created by the Royal Society.

In conclusion, the Society at this time prioritised being the place of first publication and getting credit, but were not concerned about preventing circulation or making money from these activities.

In fact, there are a lot of examples in the late nineteenth century of the Royal Society even helping people to re-print. In particular, illustrations in this period were very expensive to produce, through a process of engraving onto copper plates or painting onto lithographic stones. The Royal Society was paying for these illustrations for the *Transactions'* papers, but then they had these huge numbers of stones and sheets of copper sitting around in a warehouse not being used... When someone came along and requested to borrow one of these plates or stones, the Society was happy to grant permission. In a way, the Royal Society was not really granting permission, but actually enabling re-printing due to the expensive and time-consuming methods of reproduction – the Royal Society made it possible to just borrow the images.

They were very much motivated by prestige and scholarly credit rather than attempting to use copyright to make money. It is only in 1950 when we first find the Royal Society apparently paying

any real attention to copyright, where they were the leading organisers behind the creation of the fair copying declaration.

This is a time when photocopiers were just appearing in libraries, making it possible to create, possibly multiple, copies of scientific journal articles. Some people worried that as a result of this libraries wouldn't buy journals anymore – that they would simply get a hold of a photocopy from somewhere else. This could have been potentially dreadful for sales.

As such, many learned societies and some university presses signed up to the Fair Copying Declaration, saying that as long as it was a photocopier in an educational establishment for use of study or research then copying of their journals was permitted. After all, the photocopier is a labour-saving device acting as an alternative to copying a book by hand.

At this time, the Royal Society was not looking for copyright licensing fees. Instead, it was again about trying to enable research, trying to encourage circulation rather than use the strict letter of copyright to constrain that, as some people were fearing it would. Later, this allowance was incorporated into the 1956 Copyright Act as an educational exception.

By the time this happened in the 1950s, there was a change away from the very generous model of supporting circulation through sending out printed copies and enabling re-printing and re-use.

Part III – The Commercial Model (1955 – Present Day)

The 1950s were a difficult time for lots of learned society publishers in Britain and America. The post-war economy, especially in Europe, was very poor, with prices rising everywhere. It was a difficult time for all the printing industry, and for learned society journals, who seemed to be struggling even more than they already had been:

By 1955 it was obviously desirable to examine... the general problem of production and distribution of those periodical publications which were essential for the encouragement and communication of original research, which nobody wished to go out of existence, but which without some kind of help were on the way to extinction.¹⁰

The Royal Society and the Nuffield Foundation led a project to try and help learned societies adjust to the new post-war world. (An interesting point about this is that the amount of money the Nuffield Foundation put into this is significantly more than the amount of money that the Wellcome Trust, UKRI and the Association of Learned and Professional Scholarly Publishers have put into their current project to help learned societies adjust to open access.)

¹⁰ Morley (1963) 'Self-Help for Learned Journals', Nuffield Foundation.

The Nuffield project hired a publishing consultant to work with and advise individual societies, trying to work out what they could do to self-help. The aim was to try and get learned society publishing to be self-supporting because it had been a drain on resources for so long, and now learned societies were finding it very difficult to cope with that drain in the post-war world. Recall especially that scientific enterprises had been expanding at this point; there was increasingly more research being done; and more papers were being published. So, even if they had supported their publications back in 1850, by 1950 this was quite difficult.

The project's main recommendations were for things like production efficiencies and getting to know how printers actually work, making sure that your workflow fits with their workflows, and also, very importantly, sales and marketing. Most of the recommendations concerned developing promotional material such as brochures, leaflets or carefully curated mailing lists which were appropriate to their discipline, and particularly including wealthy North American institutions.

There was a real interest here in looking for new *sales* for the journals, rather than just circulation. There was also a realisation that you could look beyond the British Isles, with lots of interest in the North American market and some interest in the Japanese market. This worked quite effectively.

One of the reasons the Royal Society was pushing this mission of self-help was because they had already done it. In 1953, their publisher, Cambridge University Press, wanted to renegotiate terms which weren't beneficial for the Society. When considering their options, the Society decided to take control of their own sales and marketing for the first time ever. The Society had previously been involved with philanthropic circulation, but not sales and marketing. As a result, the extensive free circulation discussed earlier in this paper stopped completely in 1954.

As a result, two main things occurred. Firstly, all the people who used to get free copies were now potential subscribers. Secondly, new international markets were being targeted in order to find genuinely new subscribers. There was also a reduction in the money spent to produce and ship those free copies. As such, the Society began to save a lot of money on distribution and received additional money from new sales. As is evidenced in Figure 7, the effect was quite immediate¹¹. By the 1960s, the publications surplus for was positive for the first time in its history, and it continued to be so from that point. The new strategy proved very successful for the Royal Society in terms of its finances.

¹¹ A. Fyfe et al, work in progress.

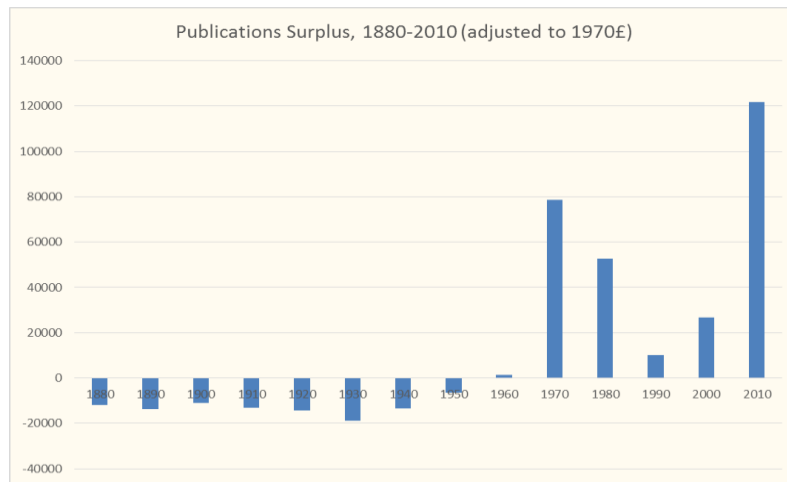


Figure 7 – Publications Surplus, 1880 – 2010 (adjusted to 1970 £)

Initially, this movement was not about making surplus, and not about income generation. It was about *breaking even* - about survival. However, in a few decades' time it became about something else; and this is where the commercial houses come in.

The early Cold War period was a good time for trying to sell journals. Governments on both sides of the Atlantic were heavily investing in research, including investing in laboratories and researchers, but also library budgets. So, librarians in particular could buy these journals. More journals were being set up, especially by people like Robert Maxwell at Pergamon Press, though they were not alone. This led to concerns about quality issues: if commercial players, who didn't have a scholarly community, were involved in producing journals, should we be worried about what was going to happen long-term to scientific journals? Would it mean that these would be low quality journals, with no one to referee their papers? These journals had no help from members of societies or associations: how could they possibly get any kind of decent editorial standards? These were the concerns in the early 1960s.

This was the time when new players became involved in academic publishing, but who were not yet dominant. They were certainly not in any way like the modern-day Elsevier or Taylor and Francis, but they were becoming prominent enough, particularly in certain fields that didn't have learned societies in them. In certain new fields, these publishers become important quite quickly.

These changes led David Martin, Executive Secretary to the Royal Society, to worry about the possible danger from commercial interests:

Maintaining the highest attainable standards in publishing scientific papers is the greatest service scientific societies could render to the community... Ideally, the best

body to start and to run a journal is a scientific society, but if this is impossible, a journal should only be put in the hands of a commercial publisher [subject to] safeguards.¹²

These safeguards were incorporated into the Royal Society 'Code for new scientific journals' in 1963, which insisted that scholars shouldn't hand their journal to a commercial publisher, or if they did, that they should take legal advice and make sure that the copyright remained with the author. It was a code that seems to have had far less impact than the voluntary code in fair copying did. But it shows that the Royal Society was clearly aware of these concerns, even if it seems that they didn't have the power to enforce such a Code.

The Royal Society itself kept its publishing in-house. During these difficult economic times, plenty of other societies in the 1970s and 80s went into co-publishing arrangements, or in some cases sold their journals to publishing partners. The Royal Society continued to publish its own journals throughout this period.

However, in the late twentieth century, the Society's officers started to wonder if they could make publishing actually generate income. So, we see a switch towards actually trying to generate income rather than just be self-supporting. This is also when the Royal Society changed its mind as to what copyright might mean.

In 1990, the Society developed a 'copyright transfer form', meaning that, rather than having jointly held copyright between the author and the Society, the Society now took control of copyright from authors. This document made it quite clear that they were doing this because of the 1988 Copyright Act, and their interest in secondary rights in things like electronic databases, reprinting, reproduction and electronic document delivery. The possibility of income from those secondary rights was something the Royal Society had become very interested in pursuing and they believed that they would need to own the copyright in order to do this. This is a very different approach from where we were in 1950, let alone in 1850.

This approach was somewhat successful. The financial effect was that come 2014, the Royal Society's operating surplus on its publications was up well over 40 per cent, per Figure 9. In 2014 it was 52 per cent - that's even more than certain big commercial companies. In terms of production and circulation, they have learnt a lot from the commercial publishers, which has led to different discussions at places like the Royal Society. Should they still be taking that level of surplus from their publications, or should they not? They had to be dragged into open access in 2005. But more recently, the Publishing team has been much more active in setting up a number

¹² David Christie Martin, 1957, Chief Executive, Royal Society, from a speech in 1957.

of new open access journals and having fairly low Article Processing Charges (APCs), in trying to argue that they are a mission-driven organisation who should not be making that level of surplus.

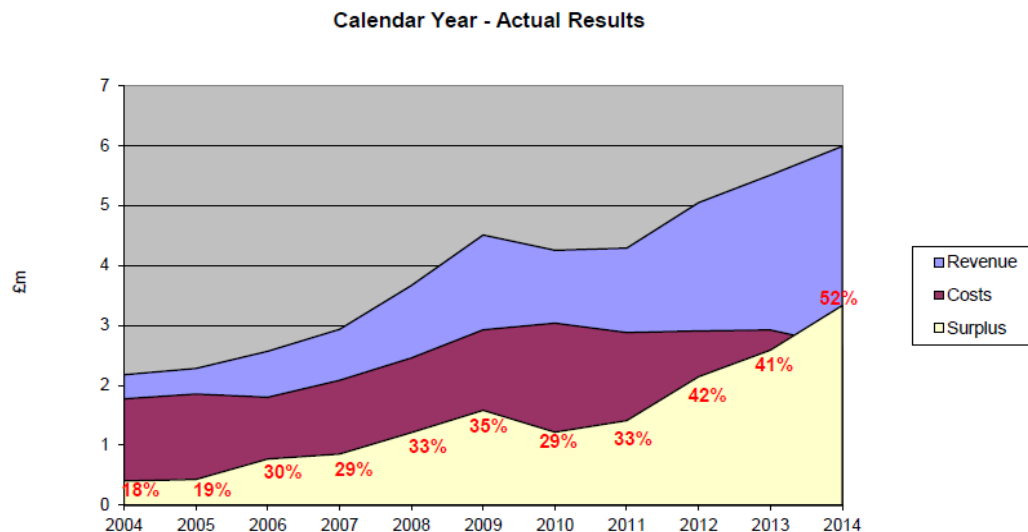


Figure 8 – Financial summary of revenue, costs and surplus of the Royal Society, 2004 – 2014

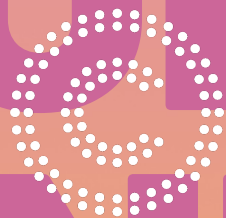
But it's a difficult and complicated discussion for a learned society to have: trustees have become very used to the income from publishing. This is why learned societies are not necessarily any more willing to shift into open access than some of the commercial publishers, even though their history might suggest that they should be open to this.

Conclusion

The moral from this research is that the model we're trying to change at the moment, as we try to move away from commercial publishing to a more open access model, is that the commercial model hasn't actually been around for all that long. There are a whole two centuries of history where scientific research was circulated through the philanthropic schemes of learned societies, through a generous policy of re-printing and re-use, and by funding free copies to libraries in places from Australia to Argentina.

The commercial model that we know and don't love today, is something that developed from a very particular political economic climate in the early cold war years, as well as a different technological context. In the world we live in now, where we have different technologies and a very different political economic context, why would we still be working with a model that was developed in a completely different context?

THE PRODUCTION
CIRCULATION
CONSUMPTION
OWNERSHIP
INTELLIGENCE



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