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**Fit for print: developing an institutional model of scientific periodical publishing in England,
1665-c.1714**

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Introduction (1074 words)

As is well known, the Parisian *Journal des Sçavans* and the London *Philosophical Transactions*, compiled by Denis de Sallo and Henry Oldenburg respectively, both began life in 1665.ⁱ These learned periodicals each emerged alongside one of the most important and durable natural-philosophical organisations in early modern Europe – the *Académie Royale des Sciences* and the Royal Society. The *Journal* was published under royal privilege at the initiative of Louis XIV’s chief finance minister, Jean-Baptiste Colbert, and the *Transactions* under the Royal Society’s cherished privilege of licensing books for publication on its own authority.ⁱⁱ Both had strong institutional associations, but despite these neither had the status of an official publication.

In this paper I will investigate the nature of the link between periodicals and early modern institutions of science in England. The importance of the periodical form to the construction and dissemination of scientific and technical knowledge has long been admitted by historians and, as the earliest scientific periodicals, the *Transactions* and the *Journal* between them get a lot of the credit for this.ⁱⁱⁱ Such a straightforward identity between science and the periodical was by no means inscribed in the form from the beginning, however, and masks the degree of early uncertainty and contestation over natural-philosophical publishing and the purpose of the periodical form in particular. The purpose of the present essay is to uncover it, and to show how institutional periodical publishing arose in England from the working-out of those instabilities.

The link between periodicals and institutions was noted/emphasised by David Kronick, who pointed out, in his survey of early scientific and technical periodicals, that titles with an institutional association tended to be longer-lasting.^{iv} By the nineteenth century, ‘memoirs’ or ‘transactions’ had come to be regarded as essential elements of the identity of learned societies, and were becoming the dominant mode for the publication of scientific research (though they were increasingly being joined by commercial rivals). But, despite their early institutional connections, *Philosophical Transactions* was not an institutional periodical until the mid-eighteenth century, nor was the *Journal de Scavans* until the early nineteenth century.

Beyond the broad explanations provided by Kronick, the detailed reasons for those early survivals outside an institutional context have not been fully explored by scholars. Such an exploration is necessary, because, as Adrian Johns has shown, natural-philosophical publishing in the seventeenth century was fraught with difficulty, and the engagement of the manufacturers of natural knowledge with the print trade threatened the integrity and credibility of their claims.^v Johns focused upon the period

of Oldenburg's editorship, however, and he gave only brief overviews of what happened to the periodical after Oldenburg's death in 1677. His analysis emphasises discontinuities and disruptions in the early Transactions, occasioned by plague, fire, English and Continental literary piracy, and challenges to the intellectual and ethical probity of the enterprise from mistrustful contemporaries. The emphasis on discontinuity has transformed our understanding of the impact of book trade conditions and practices on the formation of natural knowledge. But by its very nature it militates against an explanation of why the form of the periodical survived, and I suggest that in order to understand this we need to pay detailed attention to the institutional context of early modern publishing in natural philosophy.

Two important questions underlie Kronick's correlation between early learned periodicals and institutions. First, how did the Philosophical Transactions survive for so long without formal institutional patronage? Second, why did the members of learned societies want to publish periodicals in the first place? The demonstrable importance of periodicals to nineteenth- and twentieth-century learned societies has disguised the fact that seventeenth-century societies were not so straightforwardly committed to periodical publication (or any publication). Why then might early modern learned societies potentially not want to publish periodicals? And why did the Royal Society in particular take so long to decide that it did?

To answer these questions it is necessary to establish the extent to which the Transactions was truly independent of the Society. The point was repeatedly insisted on by the institution and also by successive editors.^{vi} Yet the distinction remained unclear to much of the reading public, and thus the status of the periodical was ambiguous for much of its existence prior to 1752, when the Society assumed formal responsibility for it.^{vii} To account for this ambiguity I examine in detail the period following Oldenburg's death, relating the variety of possible modes of publication explored during this period to the shifting patterns of institutionality in the early Royal Society. Specifically, I account for the transition of the Transactions from a varied news medium aiming to broaden and inform the natural-philosophical community, to a stable record and repository of individual, discrete knowledge-claims, by arguing that the variety of publishing schemes mooted or attempted in the late 1670s and early 1680s reflects growing institutional concern on the part of the Royal Society with whether and how to involve itself in publishing. In particular, this was focussed on the ownership of experimental knowledge production and of research contained in the Society's manuscript registers, which were the original, fundamental record of the Society's activity.

The essay's final section argues that the essential change governing what we might call the institutionalisation of the Transactions was in the function of registration at the Royal Society. Registration recorded and accredited to the knowledge-claims of individuals, and potentially helped to bestow credibility upon them through collective witnessing, particularly if the claims were actually the

results of experiments or observations performed before the Society; but the registers were also the repository of research paid for by the Society and carried out under its eyes. The Society's role in the construction of matters of fact could be similar in both cases, but only in the latter did the institution have a plausible claim of ownership over the matters of fact thereby produced. There was thus potentially a three-part distinction between what the Society heard reported, what it had witnessed, and what it might claim to own. The difficulty of reconciling this rendered the form of the periodical epistemically unstable, and led to contestation about the proper form in which to publish the Society's proprietary research. Matters were simplified during the eighteenth century, when the Society effectively abandoned its hope of carrying out and publishing research under its own auspices: registration then became mainly a matter of recording what was communicated to the Society. The Transactions remained an important venue for disseminating news of the natural-philosophical world, but with the Society lacking alternative means of proclaiming its own productivity, it also became the chief means by which the Society secured its scientific reputation, as the institutional emphasis shifted from producing programmatic research to hearing and selecting among the fully-documented research communications of individuals. There could no longer be a question of Society ownership of the knowledge-claims thus communicated, and the functions of the Transactions and the register effectively merged. The Society no longer aspired to be the progenitor of knowledge but its midwife; but this made room for a more significant institutional role for the periodical.

Society involvement in the seventeenth-century Transactions (2252 words)

At the turn of the eighteenth century, the Society faced a choice with regard to the Transactions. The then-editor, Hans Sloane, and the publication itself had been savaged in *The Transactioneer* (1700), an anonymous pamphlet whose authorship caused a good deal of heated speculation in the Society.^{viii} One of the men upon whom suspicion had fallen, John Harris, wrote to the Society's Vice-President, Sir John Hoskyns, in February to deny the accusation.^{ix} Harris pointed out that Sloane's claims that his editorial control was absolute and that he was entitled to print whatever he chose in the journal, were ultimately useless. It was impossible to convince men of Sloane's sole editorial responsibility, he wrote, 'while Papers Read before ye. Society are published there, while Letters to members of it are there inserted, & while Experiments made before them are there Printed'.^x He argued that the Society needed either to assume formal responsibility for the Transactions, or publicly disown it.

The Society debated what to do, but took no action. And so the ambiguity persisted. The Swiss traveller Zacharias Conrad von Uffenbach, visiting London in 1710, assumed that the relative worthlessness of recent volumes of the Transactions was an effect of the Society's lassitude (further reflected in the horrifying state of disrepair he found in the Society's repository).^{xi} In the 1720s, and indeed much earlier, it is evident from the Society's journal books that the institution did frequently order the editor to publish particular papers.^{xii} Authors communicated their papers to the Society in the express hope that they

would appear in the Transactions, a fact which is sometimes recorded.^{xiii} The Transactions may not have formally belonged to the Society, but everyone (except the editors) behaved as if it did. This was particularly apparent in 1721/2, when two rival proposals to continue John Lowthorp's 1705 abridgement of the Transactions were adjudicated by the Society. Despite being the work of eight different editors, the Transactions was considered as a single piece of literary property stretching back to 1665 - one controlled by the Society.^{xiv}

How then had the Society arrived at this situation? What was its level of involvement with the Transactions? The Council had been involved since 1665 by licensing monthly issues, but this process has left only faint archival traces; it tends not to record any deliberation or discussion but only the bare fact of the imprimatur.^{xv} It may not be a fully accurate reflection of the Society's input into the work of producing the journal, however. Throughout the period of private ownership the Society would occasionally recommend particular papers for publication, using the formula 'ordered for the Transactions', although the force and effect of these recommendations is nowhere specified. Perhaps more significant, though difficult to substantiate, were Oldenburg's regular meetings about Society business (and likely also the Transactions) with the Society's President, William, Viscount Brouncker, in the latter's rooms.^{xvi}

There were more obvious links. The periodical was published by a succession of Officers of the Society. As is well known, the early journal was closely intertwined with Oldenburg's activity as a correspondent.^{xvii} Much of this was linked to his official responsibility as Secretary of the Society, and much of the research communicated to him by scholars outside London and natural philosophers on the Continent and beyond he received precisely because of his official position; sending material to Oldenburg was a well-understood way of communicating with a wider natural-philosophical audience.

Yet Oldenburg's original appointment as Secretary was also an implicit recognition of the network of natural-philosophical contacts he had independently built up over the previous two decades, as well as his unusual gift for languages, and the robustness and integrity of this network depended upon him personally. This is directly discernible in the content of the Transactions during his editorship: almost half the material in the Transactions between 1665 and 1677 was never communicated to the Royal Society.^{xviii} Similarly, the proportion of material in the Transactions from the Continent was at its highest in this period. Both the ratio of material not communicated in Society meetings and the emphasis on Continental news declined after Oldenburg's death. This careful equilibrium allowed Oldenburg to orient his periodical two ways at once; a fellow of the Society could read it and expect to learn about natural philosophical activity outside England and the metropolis, while provincial and foreign readers would receive news of the Society.

This balance of Royal Society and non-Royal Society content in the periodical, combined with the dense networks of correspondence with Oldenburg at their centre, made the Transactions in effect into a

newsletter of natural-philosophical goings-on. That Oldenburg was striving for this effect can be demonstrated by considering briefly the form of the items it contained. Full descriptions of experiments were set alongside stray observations or second-hand scraps of information, often no longer than a single paragraph, as well as summaries of recent books, translated excerpts from recent works in other languages, requests for information on specific topics, and previews of forthcoming books (especially by Robert Boyle). Often an item in the early Transactions had no single author but was instead compiled by Oldenburg from disparate, frequently anonymous sources. Oldenburg, then, enjoyed a high degree of editorial independence – but it suited him commercially to create an impression of association between the institution and the periodical while preventing perfect identity between them. This was not a trivial consideration, since Oldenburg hoped to make his living from the Transactions, and was wholly financially responsible for it.^{xix}

The ambiguity of the periodical's position was partly Oldenburg's deliberate creation, and his death afforded the Society (notionally, at least) an opportunity to clarify it. Yet it did not do so. Instead we continue to find evidence of publications that were technically the sole property of their editors appearing within the ambit of the Society and subject to its influence. The Society continued to recommend particular papers to the editors for publication; it continued to express its desire for the periodical to appear whenever it threatened to lapse; it replaced failing editors; and it even began for the first time to encourage the publication financially, in the form of an institutional subscription of 60 copies of each issue.^{xx} Yet the editors were manifestly highly independent, in practice and in theory. I now focus briefly on Edmond Halley and Robert Hooke here because, by comparison with Oldenburg, their cases represent the most significantly different institutional and professional relationships to the Transactions among its early editors.

Between 1679 and 1682, the Transactions was replaced by Robert Hooke's Philosophical Collections. Hooke, who had profoundly mistrusted Oldenburg and was determined to replace the Transactions, lobbied the Society extensively for permission to produce his own periodical and eventually prevailed.^{xxi} The fact that Hooke had to fight so hard shows at the very least that the Society supported the continuation of the Transactions; although there was no theoretical obstacle to Hooke's launching an alternative title independently, his eagerness to secure its endorsement suggests that proceeding without it would have meant doing without the Society's imprimatur and perhaps being deprived of material communicated to it.

The closest the Society came to bringing the periodical formally under its oversight was in 1686, in response to the abrupt resignation of both the Society's secretaries, who had revived the Transactions after Hooke's Collections lapsed in 1682 and published it jointly. From 1682 to 1685 one Secretary was usually London-based and the other in Oxford,^{xxii} in an attempt to establish closer institutional links between the Royal Society and Oxford's nascent Philosophical Society. In 1686 Edmond Halley was

appointed as the Society's salaried Clerk, and the publication of the Transactions was soon added to the list of his duties.^{xxiii} This is unique in the Society's pre-20th-century history, in that editorial responsibility for the journal now belonged to one of the Society's salaried employees, the Clerk, rather than an honorary officer and member of the council (the Secretary). The institution had not merely specified the Clerk's duties but had apparently imposed the financial risk of publication upon him.^{xxiv} The Clerkship was explicitly intended to absorb the 'laborious part'^{xxv} of the Secretary's functions, responsible for keeping the minutes and drafting correspondence as well as the Transactions, and his subordinate status was spelled out.^{xxvi} Strikingly, the financial risk remained Halley's.

Adrian Johns views this episode as the Society assuming control of the Transactions, by putting it in the hands of a man who was supposed to take instruction from the Council, and did not enjoy Oldenburg's 'freedom of action of a gentleman'.^{xxvii} Yet Halley evidently did not view his instructions as binding. He justified a long interval between issues in 1687 by explaining that his energies (and his finances) had been tied up in the publication of Isaac Newton's *Principia Mathematica*, [shift note to end of sentence] which Halley gradually coaxed out of the Cambridge mathematician over a period of years and supervised through the press.^{xxviii} He also put out no issues of the Transactions between 1689 and 1691.^{xxix}

Halley was also a rare early instance of a highly active researcher having editorial responsibility for the periodical. During both his periods of editorship – as Clerk, between 1686 and 1692, and as Secretary, between 1714 and 1719 – he published a great deal of his own work in the Transactions. Sixteen of his own research papers appeared during his first stint, and twenty during the second (rising to twenty-nine if we include the papers he submitted to volume 31 (1720-21), retrospectively compiled by his successor as Secretary, James Jurin). By using the Transactions as a vehicle for his privately-conducted research, Halley fulfilled his obligations to the Society to produce the periodical, but also refashioned it to his own ends. In 1692 he offered to support the Transactions by supplying 'de proprio' a quarter of the material for the journal. The Society apparently turned him down, and Richard Waller, secretary since 1687, agreed to take over the editorship, though Halley nevertheless contributed nine papers over the next two years.^{xxx}

Nonetheless, a pattern emerges. Halley and Hooke both used their editorial positions for publishing their own work, or for promoting their own research agendas. The Society was willing to countenance alternative titles or structures of editorship – but only for as long as the periodical continued to appear reasonably regularly (meaning, in practice, at least once a quarter, and ideally monthly). Waller took over the editorship from Halley in 1692 after complex negotiations, and Hans Sloane from Waller in 1695.^{xxxi} Sloane and Waller are among the earliest instances of what would prove to be a durable tradition, at least until 1752, of appointing Secretaries with significant independent incomes, who could weather with equanimity if not indifference the costs that publishing the Transactions usually entailed.

These were by no means insignificant – Sloane estimated that publishing the Transactions had cost him over £1500 in twenty years.^{xxxii} (The fact that the Secretaries personally bankrolled the periodical probably contributed to their editorial independence.)

The Society itself, by contrast, spent almost nothing on publishing prior to 1682.^{xxxiii} There are some negligible exceptions: a couple of small payments to the Society's designated printer, John Martyn, for jobbing printing and for an occasional small stock of copies of the Transactions, and for 100 extra copies of an early issue entirely dedicated to a natural-historical questionnaire for distribution for seamen and travellers bound for distant voyages.^{xxxiv} Potentially more significant was the £40 salary paid annually to Oldenburg from 1667 until his death, which could be considered a partial subsidy of the Transactions on the part of the Society.^{xxxv} This was the last instance of a regular payment to a secretary until 1719, however. Robert Plot and Edmond Halley were offered salaries of £40 specifically to undertake the publication of the Transactions along with the Society's correspondence;^{xxxvi} both turned the offer down. The general impression is that publishing, particularly during the Oldenburg era, was a very low institutional priority. The Society spent nothing on any of the books associated with its first two decades – either on Hooke's *Micrographia* (1665), or even on Sprat's *History of the Royal Society* (1667), a work produced at the Society's behest and under their direct supervision.^{xxxvii}

Throughout the post-Oldenburg period, and for the rest of the seventeenth century, we find the Society's council simultaneously concerned to ensure the smooth continuation of some form of periodical publishing in natural philosophy, while not wishing to have to assume direct editorial or financial responsibility for it. The Transactions was evidently convenient for the Society as a venue in which to be able to order the publication of particular papers; yet editors were allowed to run it as they thought fit, with considerable discretion over periodicity, content, and even where the printing was done.^{xxxviii} On one point the Society remained consistent: the person in charge of the Transactions, or its equivalent, was also the person responsible for the Society's correspondence. Hooke was given permission to start a periodical at the moment his fellow-secretary, Nehemiah Grew, stepped back from his role as correspondence secretary, and the same responsibility had devolved to Halley as Clerk before he was asked to take on the Transactions.

Experimenting with publishing: what purpose did the Society see for publishing natural philosophy? (1767 words)

Despite its apparent concern for the continuation of the Transactions, however, there is plenty of evidence that the Society did not regard the Transactions as a fully adequate representation of its activity in print. The Society's reluctance to take direct control of the periodical is circumstantial evidence for this; and the decision to publish Thomas Sprat's *History* is also suggestive. The longest of the three parts of Sprat's book consists of research presented or conducted in meetings of the Royal Society, none of which had previously appeared in the Transactions. Along with Hooke's *Micrographia* it is one of

two important books issued under the Society's imprimatur which may be said to have been commissioned by the institution.^{xxxix} This separate presentation of the Society's work, in a specifically apologetic context, at a time when the Transactions had been in print for two and a half years, indicates doubts that the periodical reflected enough credit upon the Society to deflect the criticisms which had begun to be aimed at it.^{xl} This is not surprising: much of what was published in the Transactions manifestly had nothing to do with the Society, and there was little evidence of programmatic institutional research in the rest. Both propositions are also circumstantial evidence for the idea that the notion of the Transactions as a natural venue in which to publish discrete, adequately complete pieces of research had not yet taken hold.

In December 1676 the Society contemplated a new form of publication that would specifically promote Society-sponsored research. It elected a committee, with both Oldenburg and Hooke among the members, to comb the Society's archives for publishable material.^{xli} Then Oldenburg's sudden death, in the late summer of 1677, cast sudden doubt on the future of the Transactions.^{xlii} The Society took the opportunity to re-examine the whole question of institutional publishing.^{xliii} On 2 January 1677/8 the Council passed the following two orders:

That there be prepared once a year a collection of all such matters, as have been handled that year, concerning four, five or more subjects, which have been well prosecuted, and completed; which may be printed in the name of the Society against the anniversary election-day:

That the Register-books of the Society be perused; and that what shall be thought fit by the council to be published, be drawn out and printed accordingly.^{xliv}

This envisages two strands to Royal Society publishing, both of them more closely tied to the institution than any that had previously existed; one formally linked to a renewed programme of experimentation and the other taking advantage of a repository of material languishing unpublished in the Society's archives. Strikingly, there is no mention in this model of the Transactions, or anything like it. The first order calls only for annual periodicity, and for the production of books or pamphlets grouped by subject rather than in periodical form; the second involves no periodicity at all. It is not clear from the order alone how the Society proposed to manage the research programme, but a related issue was discussed in the Society in December 1677 which may have fed into the broader discussions of the Society's publishing strategy.

Nehemiah Grew, newly appointed alongside Hooke as Secretary, was a rare early instance in the Royal Society of an individual being paid to undertake a particular programme of research.^{xlv} And in 1676 and 1677, he was again paid for a series of botanical demonstrations accompanied by illustrations. Grew gave the twelfth of these 'concerning flowers' on 6 December 1677, after which, it was proposed that

he be encouraged to print it. John Wallis suggested ‘that it was proper to print all that kind in quarto, that they might be bound together’.^{xlvi} The example of Grew’s Society-sponsored research, coupled with Wallis’s input about the appropriate format for publishing such research, may have informed the proposals for future publications made the following month.

The Society also had models from the Continent for the institutional publishing of sustained research programmes. The *Saggi di Naturali Esperienze* of the Florentine Accademia del Cimento had been published in 1667, consisting of a selection of the academy’s experiments in book form.^{xlvii} Between 1669 and 1676 the Académie Royale des Sciences had published four volumes of collaboratively-produced botanical and anatomical research carried out under its auspices. The *Mémoires pour servir à l’histoire naturelle des Animaux*, in particular, was the serially expanded result of anatomical dissections carried out in the Royal Library at Paris over several years, starting life as an account of a single dissection reported in a quarto pamphlet and ending in 1671 as a Royal Folio volume, lavishly illustrated by Sébastien Leclerc, of 31 anatomical descriptions (supplemented in 1676 by a further 19). Both the Académie in Paris and the Cimento appear to have viewed book form as the appropriate form of publication for institutionally-sponsored research; a view the Society appears, on the evidence of the January orders, to have shared.^{xlviii}

At first glance, neither form of publishing proposed by the Royal Society in January 1677/8 materialized.^{xlix} There were no thematic collections issued annually in the Society’s name, nor were anthologies of material from the Society’s archive issued under the editorial control of the Council, despite Council returning to the idea several times over the course of a year and more. Instead, *Philosophical Transactions* resumed publication, edited by Grew, in February 1678 and continued to appear until February 1679. Yet several things were published which, upon closer inspection, closely resemble the Council’s proposals.

The issues of the *Transactions* put out by Grew – especially those covering the six months between January and June 1678 – could in fact be seen as embodying the Council’s plan to mine the Society’s archive for material, with number 137 (Jan/Feb 1678) featuring items originally communicated to the Society by Sir Robert Moray in 1661. Other items dated from 1661, 1666 and 1668.ⁱ Although the *Transactions* continued to be printed under the same title, evidently the injunction to scour the early archives for publishable contributions had been obeyed. The next few issues were a mixture of material drawn from the Society’s earliest years with letters communicated since Oldenburg’s death.ⁱⁱ

Meanwhile there were several publications put out within the Society’s orbit that appear to relate to the order to prosecute and publish thematically grouped research. Grew’s lectures on flowers and seeds, whose collective publication Wallis had advocated, eventually appeared as Part 4 of *The Anatomy of Plants* (London, 1682); Robert Hooke also published a series of thematically organised collections of papers and lectures, some by himself and some by other people, under the general title of *Lectures and*

Collections (not to be confused with his Philosophical Collections discussed above) in 1678. Lectures and Collections consist of two sets of discourses, one entitled *Cometa* and the other *Microscopium*. Both collections have multiple authors, but are signed and paginated as a single volume. The immediate occasion for *Cometa* was Hooke's observations of the comet of April 1677; these are linked to a set of general speculations based on his own observations (and others') of the comets of 1664 and 1665.^{lii} From there he segues into a problem proposed by Christopher Wren for finding a comet's parallax, and a discussion of the properties of luminescent bodies. This sets the scene for a paper of Boyle's on two new types of phosphorus, and a series of astronomical observations by Jean Gallet, Giandomenico Cassini, and Edmond Halley.^{liii} Cassini's observations and reflections upon them, as well as his 'Observation of the Diurnal motion of [Saturn]', are extracted from the *Journal des Sçavans*.^{liiv}

Microscopium is similarly constructed – in this case the point of departure is a pair of letters received from Leeuwenhoek in 1677, followed by an account of Hooke's efforts to replicate Leeuwenhoek's observations (made necessary by the fact that Leeuwenhoek refused to share the technology he used to make them). Hooke then moves on to a critique of the claims of a French book on microscopy by P. Cherubine, which he claimed to have 'casually met with' 'whilst this Discourse was Printing' and whose author had seen fit to criticise some of Hooke's own efforts published in *Micrographia*.^{liv} The last item is a letter of anatomical observations communicated by James Young, not microscopical and not particularly connected to the theme proposed by the tract's title.

In short, these are thematic tracts drawing upon multiple authors, published under the Society's imprimatur. They feature accounts of recent books, excerpts from foreign periodicals, and draw on work in allied fields. They bear a similarity to the publications called for in Council in January 1677/8 that has never been remarked on; a similarity striking enough to suggest either that they were produced in response to the Council's directive, or that the Council's directive had originated with Hooke himself, as a way of gaining the Society's approval for a venture he had in mind. They rely upon the same range of resources as Oldenburg's *Transactions* – Royal Society activity, private communication, books, and foreign printed periodicals – but configure them differently, using Hooke's own experimental work, accounts of his methodology, and speculations as the binding thread.

It is true that these thematic tracts were not published in the Society's name. Nevertheless, examining Hooke's tracts alongside Grew's efforts as editor of the *Transactions*, there are good grounds for seeing the publishing activities of the Society's two secretaries in 1678 as a two-pronged solution to the problem of how to replace Oldenburg and his periodical: a solution founded upon a simultaneous attempt to draw upon experimental work linked to the Royal Society while endeavouring to include the best of the research communicated to it.

Oldenburg's periodical had put the Society at the centre of a network of scientific communication; Grew's and Hooke's respective publications had the capacity to demonstrate its productivity in matters

of research.^{lvi} It is also notable that Hooke's tracts and Grew's Transactions were flexible enough to absorb some of the functions of Oldenburg's journal. Grew published more recent communications alongside work from the furthest recesses of the Society's archive, while Hooke attached current work by Continental scholars to his tracts that did not strictly address the theme of his own experiments and observations but was at least in allied fields (planetary astronomy in *Cometa*, anatomical observations in *Microscopium*.)

Whose knowledge? Research, registration and publishing, 1677-1687 (1279 words)

The Society theoretically had the basis for an alternative model to the Transactions. Hooke and Grew, in their attempts to satisfy the Council's directives, were drawing in different ways upon the Society's registers. Originally the generic name for the Society's records (and for the man who kept them – a post that became the Secretaryship after the Society's incorporation in 1662), the registers had come specifically to mean the record of experiments shown to the Society and of research communications brought in by fellows, set down in the Register-book series. Various functions originally embodied in the register split off and became separate archival series around the time of the Society's incorporation in 1662 and 1663. The records of debates in the Society, for instance, became the Journal-books. The record of specific orders became the Council minutes. Letters were copied into separate books. Thus, the register's purpose became more closely identified with the accreditation of discoveries and knowledge-claims.^{lvii}

Despite their role as an independent and impartial record of individual discovery, the registers were also intended as a record of the Society's research productivity. This is clear from the Society's early account books. The Society from 1663 to 1687 laid out considerable sums of money – often up to a third of its total outlay, and sometimes more – on salaries for experimental staff, the Curator and his assistants (Richard Shortgrave and later Henry Hunt), and bills for equipment and materials. There were also piecemeal payments to Grew for his botanical lectures.^{lviii} This investment gave the Society plausible claims of ownership on the resulting experimental research in its registers. The write-ups of Hooke's work as Curator of Experiments belonged in them. As Curator – though not (later?) as Secretary – Hooke was a paid employee; and the experiments he devised and carried out in that capacity were paid for by the Royal Society. The absence of social equality between Hooke and the majority of the fellowship, most crucially expressed in the fact that Hooke was successively the salaried employee of Robert Boyle and the Royal Society, has been a major theme of work documenting the struggles Hooke faced in securing credit for his discoveries. Both Steven Shapin and Stephen Pumfrey note that Hooke resisted the Society's attempts to curb his freedom of action as curator.^{lix} In many cases Hooke had not handed over his work as directed, because he distrusted the Society's communication practices as embodied in Oldenburg.^{lx}

Neither Pumfrey nor Shapin tackle this directly, but the question of why the Royal Society sought to bring Hooke firmly under control, other than simply to assert their authority and remind him of his place, is critical to understanding the development of an institutional publishing strategy – of how knowledge was to be used and disseminated, as well as made, by the institution. The gap left in the record by Hooke's failure to deliver his work was plainly a matter of concern: Hooke was repeatedly called upon either to submit, publish, or methodise his curatorial work for the Society between 1679 and 1687, and Council resolutions were passed to make sure that he could not continue to withhold future work from the Society. At the same time the Society moved to restrict the Curator's freedom, insisting on prior approval of written descriptions of proposed experiments and written accounts to be delivered the following week.^{lxi} The Society was doing all it could to secure a supply of experimental knowledge-claims that it could claim as its own and dispose of as it saw fit.

Where the Society could not claim direct ownership of knowledge-claims it was more circumspect. Hooke was put in charge of the Society's correspondence in December 1678 and he immediately endeavoured to bring the institution's communicative function under close control. He proposed a journal specifically of 'particulars read in the Society, that [...] shall not be sold or sent' to anyone but Fellows and officially designated correspondents of the Society, who would be identified by their capacity to communicate useful material of their own. Timeliness was also an important factor – external contributions were to be communicated to the Society as soon as received.^{lxii} This is an intensely restricted idea of publication, so much so that it scarcely deserves the term. For Hooke, uncontrolled communication so thoroughly compromised the rights of the individual discoverer that the Society had to become a virtually closed circuit in order to make it a secure space for disclosing discovery.

Hooke's limited-circulation journal never materialised. Soon afterwards, in August 1679, Hooke agreed to undertake a philosophical newsletter based on information from the Society's correspondents. There was a crucial proviso, however; if he wished to draw material from the registers for publication, he would require the author's and the Council's approval before it was published.^{lxiii} This is an important clarification of the Society's position with regard to the registers. The authority to publish such material, vested jointly in the Society and the author, claims at the very least joint ownership not just of experiments carried out before the Society but also of any material communicated to the Society that they thought worthy of registration. The Council's formulation is probably best understood as a joint power of veto over material freely communicated to it, and seems mainly intended to distinguish between what was suitable for a periodical (correspondence) and what was not (properly articulated knowledge claims read or performed before the Society and attributed to particular authors).

The Society's vision of a natural philosophical periodical at this time, therefore, appears to have been limited to seeing it as a vehicle for communications from outside the institution – a vision that

Oldenburg had helped create by refashioning letters into items of natural-philosophical news and by the continuous stream of external material he brought into the Society and into the Transactions. This has an epistemic aspect: it implied that knowledge-claims in the Transactions had a different status from those to which the Society could credibly stand witness.^{lxiv} Not only did these external knowledge claims not belong to the Society, the Society could have little role in assenting to them and thus help to create them as facts. Work conducted inside the Society, over which it could claim ownership by virtue of having paid for it and which the fellowship could help secure epistemically by acting as witness to it, required an independent experimental programme, and, ideally, a different publishing format; books or tracts, a form that lacked the ambiguous status and authorship of a periodical and could clarify the distinction between what the Society might claim and what it merely reported.

After the early efforts, represented by Grew's version of the Transactions and Hooke's Lectures and Collections, these modes of publication fizzled out. The initial obstacle to the project proved to be Hooke himself; simultaneously responsible for the Society's experimental programme, its correspondence, maintaining its books and papers, the ordering and publishing of his work as Curator of Experiments, for the compilation and publication of a periodical, his two endowed lectureships, and his architectural work, he simply failed to keep up. The minutes from this period are full of gaps, his curatorial work was not published in his lifetime, and only seven issues of the Philosophical Collections were published in the three and a half years from 1679 to 1682.^{lxv}

Yet Hooke's failures did not mean these projects were immediately abandoned. The Society continued to solicit his experimental back catalogue until the late 1680s. Meanwhile new, specialist Curators of Experiments were appointed in 1682.^{lxvi} They were committed to particular courses of experiment and specific subjects, probably in the hope that their work would naturally yield the kinds of annual thematic tracts envisaged in the 1670s. The institution reconfigured itself to produce more systematic, publishable research of a kind it could claim to own – because it had paid for it. Meanwhile, virtually all Society directives concerning the Transactions during this period – concerning specifically periodical publishing, in other words – connect it with correspondence.^{lxvii}

Oldenburg's death forced the Society to consider what the Transactions – or equivalent – ought to consist of, and it opted for the communication of natural philosophical news, aiming to relay information from individual correspondents back to all. At the same time it put more effort into developing the Society as a research institute, as a producer of collectively witnessed natural and experimental knowledge which it had the right to dispose of as it pleased. It invested its limited funds in experimental knowledge production rather than in publishing or communication.^{lxviii} The difference is between being an entrepot for knowledge-claims, and a manufacturer of them. The latter does not necessarily imply that the Society claimed the right to final adjudication of knowledge, but it does imply

an important epistemic difference between what was to be published as a periodical and what was to appear in ‘the Society’s name.’^{lxxix}

The abandoning of experimental enterprise (1463)

By 1687, however, the attempt to publish Society-sponsored research had more or less collapsed. The last serving Curator, Denis Papin, left to take up an offer of employment on the Continent, and the specialist Curators of 1682 had left office. Halley, invited to take up a Curatorial post in 1684, declined. The Society employed no experimental demonstrator for most of the next twenty years.^{lxxx} The shift was the result of a combination of factors. First, Hooke’s being voted out of the Secretaryship in 1682, and simultaneously out of the Council, probably removed some of the pressure to keep the Society’s involvement in periodical publishing entirely distinct from its research practice. It is notable, for instance, that from 1682 the prefaces or advertisements attached by successive editors to the first issues of their respective tenures start to refer to the Transactions as a kind of safety net and friendly surround for fugitive pieces, ‘[that] collects small tracts, that would otherwise be lost’.^{lxxxi} They also begin to connect the activity of the periodical more explicitly with work carried on before the Royal Society. Second, the Society began in 1686 to dabble in other forms of publishing, and to do so for the first time as an investor. The fellows elected to fund the posthumous publication of Francis Willughby’s *Historia Piscium* (1686), a hugely expensive illustrated work that proved essentially unsalable and stretched the Society’s thin resources even further – Francis Aston noted his relief and astonishment that the Society would still have £135 cash in hand ‘after all our great expense’.^{lxxxii}

The third factor was Edmond Halley’s appointment as editor. Here we must distinguish carefully between Halley’s position and Hooke’s; although Halley as Clerk was technically the Council’s subordinate, over whom it had more direct and explicit authority than any of his predecessors, it had none over his extensive astronomical and mathematical research – which it had over Hooke’s, Grew’s, and the succession of paid Curators of the early 1680s. Halley used many of his own communications to the Society, as we have seen, to flesh out issues of the Transactions put out under his editorship, but the publication of these was freely undertaken; it belonged to him, not to the institution, in spite of his subordinate position. Equally crucially, very little appeared in the Transactions under Halley that had not also been presented or communicated to the Society. The combination of publishing distractions, financial difficulty, and the inability to retain Curators, all added to the importance of the Transactions to the Society, and it became a fuller representation of what the Society was doing.

The fourth factor, and probably the most effective in the long term, was Hans Sloane. When he assumed the editorship in 1695, the Royal Society’s sponsorship of experiment had essentially been in abeyance for eight years. He served as editor for nineteen years, and later as President for a further fourteen. Cromwell Mortimer, who served as secretary-editor from 1728 until 1750, and thus for most of Sloane’s presidency, became his neighbour in Bloomsbury Square at Sloane’s request, and the number of papers

edited for the Transactions during this period, which have ended up in the Sloane papers in the British library, suggesting his continuing influence.^{lxxiii} Sloane thus provided a long spell of institutional continuity, something the Transactions had lacked for the two decades following Oldenburg's death.

The Transactions manifestly stabilised under Sloane. It settled into a slower periodicity, usually coming out every two or three months, and it scarcely rated a mention in the Society's Council during his editorship. When Sloane stepped down as secretary, in 1714, and was replaced by Edmond Halley, Halley explicitly enumerated the periodical's functions. First, the preservation of fugitive tracts too short for a book; second, the publication of letters communicated to the Society (stripped, as Halley rather baldly put it, of 'preambles, conclusions and [...] useless parts'); and third, the printing of such experiments performed before it 'as the Society shall be pleased to order or permit the publishing of'. This formally acknowledges the Society's input, identifies the periodical's function with registration, and sets correspondence and primary research on an equal footing in the Transactions. Crucially, it is also the first preface not to insist on the official separation between the Transactions and the Society. From this point it can safely be said that the quasi-official status of the Transactions was established, and editors did not bother to try to proclaim the Transactions' independence. No subsequent editor affixed a preface to the periodical; and in 1719 James Jurin (then only an author, but from 1721 secretary-editor as well), was blithely content to explain to John Woodward, who complained of the treatment of his work in a paper of Jurin's, that the Society had ordered its publication.^{lxxiv}

As the functions of registration and communication increasingly merged in the Transactions, it came to provide a more straightforward reflection of Royal Society activity – itself simplified by the long-term abandonment, during the 1690s and early 1700s, of systematic, Society-sponsored experimental research.^{lxxv} The Society's chief resource, for knowledge production or communication, was now the papers correspondents chose to share with it. With the mainstream of Royal Society activity now taken up with listening to the papers of individual researchers, the dual function of the register – to be a durable register of individual knowledge-claims and a repository of the Society's research – was gone. These factors effectively turned the Transactions into something indistinguishable from a representative institutional periodical.

The distinction between the functions of registration and communication was finally effaced in the 1730s and 1740s, when the Society abandoned its practice of archiving letters (external communications) and papers (accounts delivered directly by fellows or of experiments actually performed before the Society) in separate series. Cromwell Mortimer, the Secretary, could by 1742 argue that the distinction was pointless, since they were 'absolutely of the same nature'.^{lxxvi} He proposed replacing them for the future with a continuous series of Guard-books of original papers, arranged in chronological order, to which the Journal-books of the Society's meetings would serve as a guide. The Transactions was part of the organising principle – papers selected for printing were marked in the archive with their published title

and a number indicating where they came in the printed sequence, and it is very rare to find that the archival and printed sequences do not match. The *Transactions*' new role of reflecting the Royal Society was thus symbolised by its formal incorporation into the archive.

Conclusion

This formally collapsed what had once seemed an important distinction between letters and papers. These categories are partly the manifestation of formal attributes, but they also imply an epistemic change, one that is important in the conception of the natural philosophical periodical – a distinction related to the question raised above, between the status of material witnessed by the Society and what was merely communicated to it. The epistolary form of many early scientific articles drew attention to the role of wider social relations in the constitution of natural knowledge, emphasising newsworthiness, dialogue, and provisionality; the paper, and the system of registers underlying it, in theory amounted to an adequately complete, indeed publishable account of a particular knowledge-claim. Papers were of two kinds; those brought in by Fellows, sometimes with accompanying demonstrations, and the results of experiments performed by curators and paid for by the Society. As Halley's 1714 preface showed, the difference between letters and papers had by that time effectively disappeared in the *Philosophical Transactions*. The deliberate elimination of the distinction as an archival category reflects the extent to which it had ceased to be important at the institutional level as well; and this represents a tacit abandoning of the Society's expectation of publishing courses of experimental work, but also shows the extent to which the *Transactions* had ceased to be primarily a clearing-house for natural-philosophical information and become instead a reflection of the mainstream of Royal Society activity. The Society had taken a long time to recognise these facts in practice, and would take even longer to admit it formally, but by ceasing to distinguish between letters and papers it acknowledged that a transformation had taken place, both in institutional structure and in the nature of the *Transactions*. A form of periodical publishing had emerged that would later be characterised as 'learned society *Transactions*' in the historiography of science of the eighteenth and nineteenth centuries. This category has assumed increasing importance in recent research, as scholars argue that these 'learned society *Transactions*' and the earliest scientific 'journals', properly so called, were distinct actors' categories.^{lxxvii}

The Royal Society assumed financial and editorial responsibility for the *Transactions* in 1752. As in 1700, it was faced with a choice to acknowledge or repudiate the periodical after it had been publicly attacked; and this time the Society took it over.^{lxxviii} Yet to do so was no longer a significant leap but an admission that the *Transactions* did in fact represent the Society, and that the Society might take care to exercise more control and extract more advantage from the

association – that the periodical actually be run ‘for the sole use and benefit of this Society’, as the Earl of Macclesfield put it.^{lxxix}

The periodical survived for so long partly because the Society wished it to, and took some steps – though well short of serious investment or proper editorial control – to ensure that it did. In other words, even before 1752, the Society provided the Transactions with a valuable measure of institutional care and assistance. Yet the arm’s-length support of the Society did not guarantee the periodical form primacy within the world of natural philosophical publishing, nor even within the Society itself. Indeed the Royal Society’s discussions in the late 1670s and early 1680s about the appropriate formats for natural-philosophical publishing reveal that the scientific periodical was regarded as being better suited to the reporting of individual claims to knowledge than asserting the Society’s own. The point was not so much that the periodical form itself had secondary epistemic status, as that much of the material that went into it could not have been primarily witnessed or assented to by the Society itself; the Society could neither consistently claim ownership of such material, nor guarantee its epistemic status. The Society wanted the Transactions to continue; but it did not, at least for a long time, regard it as the proper outlet for its own research ambitions.

The transformation of the Transactions into a record of Society activity in the very late seventeenth and first decades of the eighteenth centuries indicates a shift in the communication of natural knowledge. The early history of the periodical reflects a gradual shifting of priorities in the institution too, as the foundational expectation that the learned society would be as much a site of primary knowledge production as of dissemination and accreditation was abandoned, and the notion of periodical publishing reoriented accordingly. Knowledge production in the Royal Society came to be invested in the individual research communication, in either letter or in paper form, rather than an experimental programme. David Kronick’s observation that periodicals associated with learned societies had a better chance of survival is undoubtedly right; but in order actually to become a learned society periodical, the Transactions had to absorb functions of registration and research communication that the Society had at certain times been resolved to keep separate.

- ⁱ Jean-Pierre Vittu, 'La formation d'une institution scientifique: le Journal des Savants de 1664 à 1714', in *Journal des Savants* (2002) 179-203.
- ⁱⁱ For an account of Colbert's oversight see Jacob Soll, *The Information Master* (Ann Arbor, University of Michigan Press, 2009), pp. 100-103.
- ⁱⁱⁱ See for instance James E. McClellan III, *Science reorganised: scientific societies in the eighteenth century*, (Columbia University Press, New York, 1985), pp. 52-4; Peter Dear, *Revolutionising the sciences: European knowledge and its ambitions, 1500-1700* (Palgrave, Basingstoke, 2001), pp. 120-122; Steven Shapin, 'O Henry', *Isis* **78** (1987) 417-24; John Henry, 'The origins of modern science: Henry Oldenburg's contribution', *Brit. J. Hist. Sci* **21** (1988) 103-109; Charles Bazerman, *Shaping written knowledge: the genre and activity of the experimental article* (University of Wisconsin Press, Madison, 1988); Alan Gross, Joseph Hamron and Mike Reidy, *Communicating science: the scientific article from the seventeenth century to the present* (Oxford University Press, Oxford, 2002), pp. 3-4; Adrian Johns, *The nature of the book: print and knowledge in the making* (University of Chicago Press, Chicago, 1998), pp. 531-532
- ^{iv} David Kronick, *A history of scientific and technical periodicals: the origins and development of the scientific press, 1665-1790* (Scarecrow, Metuchen (NJ), 1976), pp. 110-112
- ^v Johns' arguments on the engagements of natural philosophy with the early modern print trade in general are advanced in *The Nature of the Book*, and the specific case of the *Philosophical Transactions* in 'Miscellaneous methods: authors, societies and journals in early modern England', *Br. J. Hist. Sci.* **33**, 159-186 (2000).
- ^{vi} Henry Oldenburg, 'Advertisement', PT 2 (1667); Richard Waller, 'Preface' PT 17 (1692), pp. 581-2; Francis Aston and Robert Plot, PT 13 (143); Royal Society CMO/4 20 Feb. 1751/2.
- ^{vii} 'Introduction' to the present special issue. [note to copyeditor – this will have to be finalised once we have the page layout of the entire issue.]
- ^{viii} The pamphlet was actually by William King: *The Transactioneer: with some of his Philosophical Fancies, in two Dialogues* (London, 1700). For a discussion see Palmira Fontes da Costa, *The singular and the making of knowledge at the Royal Society of London in the eighteenth century* (Cambridge Scholars Publishing, Newcastle upon Tyne, 2009), pp. 93-8.
- ^{ix} Harris was a cleric, an author, a lecturer on natural-philosophical subjects and a recent Boyle lecturer. L. Stewart, 'Harris, John (c. 1666-1719)', *Oxford Dictionary of National Biography*, Oxford University Press, 2004; online edn, May 2009 [<http://www.oxforddnb.com/view/article/12397>, accessed 4 June 2015].
- ^x BL Sloane MSS 4026 f. 253.
- ^{xi} W.H. Quarell, and M. Mare, trans, *London in 1710: from the travels of Zacharias Conrad von Uffenbach* (faber & Faber, London, 1934).
- ^{xii} See for example RS JBO/13, 7 Jun. 1722, 25 Oct. 1722, 23 Nov. 1722, 6 Dec. 1722, 17 Jan. 1722/3.
- ^{xiii} From the same period as n.6, above, see RS JBO/13: 12 Jan. 1721/2, 17 May 1722, 18 Oct. 1722.
- ^{xiv} RS JBO/13 19 Jan. 1721/2; John Lowthorp, *The Philosophical Transactions and Collections to the end of the year 1700. Abridg'd and Dispos'd under General Heads*, 3 vols. (Publisher, London, 1705-7).
- ^{xv} See for instance Thomas Birch, *History of the Royal Society of London*, 4 vols (A. Millar, London, 1756-57), III pp. 104, 142, 155, 163, 169, 176, 179, 213, 225, 299, 372, 434, 451, 488.
- ^{xvi} Marie Boas Hall, *Henry Oldenburg: Shaping the Royal Society* (Oxford University Press, Oxford, 2002), p. 156
- ^{xvii} See Niall Hodson's essay elsewhere in this special issue [* check he's still 'in'].
- ^{xviii} On this see Moxham, 'Form and Genre in Early Science Journals', in Joad Raymond and Noah Moxham (eds.), *News Networks in Early Modern Europe* (forthcoming, Brill, 2016).
- ^{xix} Oldenburg had hoped that the periodical would yield up to £150 per annum, though in practice he claimed it had never made him more than £40; Oldenburg, *Correspondence* III p. 69, and IV pp. 58-9
- ^{xx} Halley was paid £13 10s for 60 copies each of five issues of the *Transactions* in 1687. Royal Society Account Books, RS AB/1/1/3 (1687). The subsidy was originally negotiated by Francis Aston and Robert Plot as their condition for relaunching the *Transactions* in January 1682/3. Birch, *History* IV pp. 170-1.
- ^{xxi} H.W. Robinson and W. Adams, eds., *The Diary of Robert Hooke 1672-1680* (Taylor & Francis, London, 1935), p. 331; for the full extent of Hooke's campaign against the continuation of Oldenburg's *Transactions*, see Johns, 'Miscellaneous Methods', 172-4.
- ^{xxii} Francis Aston in London, and Robert Plot in Oxford from 1682-4, succeeded by William Musgrave in 1684-5. Birch, *History* IV pp. 170-171.
- ^{xxiii} Birch, *History* IV p. 462. The order of Council theoretically required Halley to submit the copy to a Secretary for approval before publication.
- ^{xxiv} Birch, *History* IV pp. 453, 455. With Hooke and Oldenburg there had been no question of imposition, since each launched his publication on his own initiative.
- ^{xxv} Francis Aston to William Musgrave, 18 December 1685; printed in R.T. Gunther (ed.), *Early Science in Oxford* (13 vols), (Oxford University Press, Oxford, 1923-1945) XII p. 106. Birch, *History* IV p. 229.

- ^{xxvi} Birch, History IV p. 453.
- ^{xxvii} Johns, The nature of the book p.540.
- ^{xxviii} See R.S. Westfall, *Never at Rest: A Biography of Isaac Newton* (Cambridge University Press, Cambridge, 1987), pp. 444-65, and Alan Cook, *Edmond Halley: Charting the Heavens and the Seas* (Oxford University Press, Oxford, 1999), pp. 147-164.
- ^{xxix} PT 16 (1686), 297 ('Advertisement').
- ^{xxx} RS CMO/2 7 Dec. 1692; Hooke, Diary
- ^{xxxi} Not only was Halley apparently considered (see above, and n.27) but Robert Plot was offered '40ll per an. for corresp. and transactions'; he also turned them down, and Waller, after discussions with Hooke, took over. Hooke continued to be involved, however, negotiating with booksellers on Waller's behalf and correcting sheets for the press. See Hooke, Diary 1688-1693 in Gunther, *Early Science in Oxford* X pp. 214-5, 217, 222-4, 262.
- ^{xxxii} BL Sloane MS 4026, ff.270-1. The burdensome costs of publishing scientific periodicals are analysed in more detail and in longer perspective by Aileen Fyfe, elsewhere in this special issue; the Society published the Transactions after 1752 at a continuous loss until the mid-twentieth century.
- ^{xxxiii} See above, when the Society began to take a large institutional subscription.
- ^{xxxiv} RS AB/1/1/1 (1667).
- ^{xxxv} For payment of Oldenburg's salary, see RS AB/1/1/1 (1667-1672) and RS AB/1/1/2 (1673-1677). The Society understood at that point that they risked losing Oldenburg's services, as he petitioned for their assistance with his application for the post of Latin Secretary to the government. Birch, History III pp. 355-6.
- ^{xxxvi} See n.xxxi, above, for the proposed salaries for Halley and Plot; and RS AB/1/1/3 (1719), for the evidence of secretarial salaries in 1719.
- ^{xxxvii} On Society involvement with *Micrographia* and its collaborative genesis between Hooke and Christopher Wren, see Lisa Jardine, *On a grander scale: the outstanding life of Sir Christopher Wren* (HarperCollins, London, 2002), pp. 276-8; for the Society's input into Sprat's History, see Birch, History I p. 507, and II pp. 2, 3, 7, 47, 51, 158, 163.
- ^{xxxviii} Francis Aston and Robert Plot agreed that the printing of issues 144-176 should be undertaken in Oxford; see R.T. Gunther, *Early Science in Oxford*, 15 vols, (Oxford, [printed for the subscribers], 1923-67) XII, p.13.
- ^{xxxix} Royal Society accounts, which survive in reasonable detail for the period immediately after the foundation, record only minute payments to printers in this period, most likely for jobbing printing. See below.
- ^{xl} Contemporary criticisms of the Society include those of Thomas Hobbes, outlined in Steven Shapin and Simon Schaffer, *Leviathan and the Air-pump: Hobbes, Boyle and the experimental life* (Princeton University Press, Princeton, 1985); Samuel Sorbière's *Relation d'une Voyage en Angleterre* (Louis Billaine, Paris, 1664), misinterpreted as a criticism by Thomas Sprat; and Oldenburg's acknowledgement to Boyle of 18 September 1666 that there were murmurings about the Society's productivity: wherein he mentions seeing Christopher Wren's plan for rebuilding London and reflects that if the model had been shown to the King it would have 'given the Society a name, and made them popular, and availed not a little to answer those who continually ask, what have they done?'. Oldenburg Correspondence III pp. ??? Lorenzo Magalotti also reports, from a little later, Charles II's habit of referring to the fellows as 'my fools' (see W.E.K. Middleton, 'What did Charles II call the Fellows of the Royal Society, Not. Rec. Roy. Soc. 31 (1977), 13-17; and, ironically, the work of the two most notable apologists for the Royal Society, Joseph Glanvill and Sprat himself, provoked a flurry of pamphlets on the other side from Henry Stubbe.
- ^{xli} Birch, History III p. 328.
- ^{xlii} Birch, History III pp. 342, 352, p. 366.
- ^{xliiii} Birch, History III p. 366.
- ^{xliv} Birch, History III pp. 369-70
- ^{xliv} Grew's work for the Society had a long history; in 1672-73, the wealthier Fellows had raised a subscription to pay him a £50 salary to give a series of botanical demonstrations in 1672 and 1673. See Michael Hunter, 'Early problems in professionalizing scientific research: Nehemiah Grew (1641-1712) and the Royal Society', in *Establishing the New Science: The Experience of the Early Royal Society* (Boydell & Brewer, Woodbridge, 1989), pp. 261-278.
- ^{xlvi} Birch, History III p. 3; RS AB/1/1/3 (1678).
- ^{xlvii} See Mario Biagioli, 'Scientific Revolution, social bricolage, and etiquette', in R. Porter and M. Teich (eds.), *the Scientific Revolution in National Context* (Cambridge University Press, Cambridge, 1996), pp. 11-55.
- ^{xlviii} The Society knew of the existence of both works. Hooke reported on the contents of the Saggi in March 1667/8 (Birch, History II p.257). Oldenburg reviewed the earliest, pamphlet forms of the Parisian dissections in the *Philosophical Transactions* – but was unable to obtain copies, because they were produced in very limited print runs (200 copies) and distributed primarily as royal gifts. See Anita Guerrini, 'The King's animals and the King's books: the illustrations for the Paris Academy's *Histoire des Animaux*', *Annals of Science* 67, 383-404 (2010); and Noah Moxham, 'Edward Tyson's *Phocaena*: publishing comparative anatomy in seventeenth-century England and France', *Not. Rec. R. Soc.* 66 (2012), 252-271.

- ^{xlix} Marie Boas Hall, in *Promoting experimental learning: experiment and the Royal Society 1660-1727* (CUP Cambridge, 1993), discusses Grew's Transactions in connection with the January Council orders but fails to note that the project had been mooted in December 1676, when Oldenburg was still alive, and does not make the connection between Hooke's Lectures and Collections and the thematic tracts proposed in January (pp. 107-9).
- ^l Letters from Robert Moray on Hebridean tides published in number 137 are to be found in the Society's register-books dated 1661; by Henry Powle, from 1666; and by Jonathan Goddard, from 1661. RS RBO/1/19, RBO/3/34, and RBO/1/27.
- ^{li} '[An Account of a Book Entitled] ANTIΔIATPIBH, Sive Animadversiones in Malachiae Thrustoni M.D. Diatribam in Respirationis Usu primario'. PT 12 (1677-8) 1072-4.
- ^{lii} For a discussion of these observations, the international controversy over an aberrant observation by Johannes Hevelius, and the delicate problem of how to discount it without violating codes of civility, see S. Shapin, *A social history of truth: civility and science in seventeenth-century England* (University of Chicago Press, Chicago, 1994), pp. 266-91
- ^{liii} Hooke had published short tracts before; *An attempt to prove the motion of the earth from observations* (John Martyn, London, 1673), *Animadversiones upon the first part of the Machina Coelestis* (John Martyn, London, 1674), *A description of Helioscopes* (John Martyn, London, 1676), and *Lampas* (John Martyn, London, 1676); but the tracts in *Lectures and Collections* are unique in the range of authors and materials drawn upon.
- ^{liv} The attributions to the Journal are made explicitly in Hooke's text. Hooke, *Lectures and Collections*, pp. 73, 78.
- ^{lv} Hooke, *Lectures and Collections* (John Martyn, London, 1678), p. 101.
- ^{lvi} See n.38, above.
- ^{lvii} Adrian Johns and Rob Iliffe, among others, have written about the function of registration in the Society as a system of accrediting discover, and they see Hooke's hostility to the Transactions as evidence that the periodical under Oldenburg extended this function. In addition to Johns, 'Miscellaneous methods', see Rob Iliffe, 'In the warehouse': privacy, property and priority in the early Royal Society', *Hist. Sci.* **30**, 29-68 (1992).
- ^{lviii} RS AB/1/1/1 – see for instance 1667, during which Shortgrave and Hooke between them are paid over £100 of a total outlay of a little over £200. For Grew's lecture payments, see RS AB/1/1/2, 1677 & 1678.
- ^{lix} Stephen Pumfrey, 'Ideas above his station: a social study of Robert Hooke's curatorship of experiments', *Hist. Sci.* **29** (1991) 131-156; and Steven Shapin, 'Who was Robert Hooke?', in M. Hunter and S. Schaffer (eds.), *Robert Hooke: New Studies* (Boydell, Woodbridge, 1989) pp. 253-285.
- ^{lx} Birch, *History III* p. 501
- ^{lxi} Birch, *History III* pp. 501, 514; *IV* pp. 229-30, 237, 496.
- ^{lxii} Birch, *History III* p. 450.
- ^{lxiii} Birch, *History III* p. 491. The minute specifies that the periodical should be based on material 'he shall meet with from his correspondents'. The future tense indicates that the correspondence should be reasonably current; but 'his' is ambiguous, since it makes no distinction between personal and secretarial correspondence.
- ^{lxiv} For the technologies of collective witnessing, see in particular Shapin, 'The house of experiment in seventeenth-century England', *Isis* **79** (1988) 373-404.
- ^{lxv} For the gaps left by Hooke as minutes secretary, see Birch *History III* pp. 375, 381, 426, 430, 453, 464, 469. The publication of his works after death was undertaken, in a confessedly unsatisfactory and piecemeal fashion, by Richard Waller in *Posthumous Works* (London, 1705), with some remaining fugitive pieces published by William Derham (*Philosophical Experiments and observations*, (London, 1726).
- ^{lxvi} Frederick Slare and Edward Tyson, respectively, with responsibility for chemistry and anatomy. Birch, *History IV* pp. 177-8.
- ^{lxvii} See above, but particularly the instructions to Hooke to continue the Transactions or Collections of July 3 and August 8 1679 (Birch, *History III* pp. 451, 491 and 501).
- ^{lxviii} For the technologies of collective witnessing, see in particular Shapin, 'The house of experiment in seventeenth-century England', *Isis* **79** (1988) 373-404.
- ^{lxix} The formulation used for the proposed publication of thematic tracts in January 1677/8 (see above). It is important to understand this as distinct from merely appearing under the Society's imprimatur; the extent of the effort to secure the supply of experiment from the curators, and to give them rigorous rules for proposing, performing and submitting experiments, all suggest a Society endeavouring not merely to be casually associated with experimental research but to take possession of it by the only means at its disposal.
- ^{lxx} See Hall, *Promoting experimental learning* pp. 87-9.
- ^{lxxi} See the prefaces published by Aston and Plot (PT **13**, 2 (1683)) and Waller (PT **17**, 581-2 (1693)) respectively. The quotation is from Waller.
- ^{lxxii} Aston to William Musgrave, 25 Mar. 1686, in Gunther, *Early Science in Oxford XII* pp. 309-10. For a detailed account of the book's publication history, see S. Kusakawa, 'The *Historia Piscium* 1686', *Notes & Records of the Royal Society* vol pages (2000).
- ^{lxxiii} See especially BL Sloane MSS 4025 and 4026, *passim*.

^{lxxiv} The Correspondence of James Jurin (1684-1750), ed. A. Rusnock (Rodopi, Amsterdam, 1996) p. 81. Jurin to Woodward, 15 Feb. 1719.

^{lxxv} With its finances no longer tied up in paying for experiments and Curators, the Society exhibited a willingness for the first time to contemplate paying editors to undertake ‘corresp. and Transactions’, as discussed above, n. xxx; in the event the task fell to independently wealthy Secretaries.

^{lxxvi} RS CMO/3, 12 Jul. 1742.

^{lxxvii} See in particular Jonathan Topham, ‘Anthologizing the book of nature: the circulation of knowledge and the origins of the scientific journal in late Georgian Britain’, in *The circulation of knowledge between Britain, India and China* (ed. B. Lightman, G. McOuat and L. Stewart) pp. 119-52 (Brill, Leiden, 2013); Iain Watts, ‘We want no authors: William Nicholson and the contested role of the scientific journal in Britain, 1789-1813’, *Br. J. Hist. Sci.* **47**, 397-419 (2014).

^{lxxviii} For a discussion of John Hill’s attacks on the Society and the Transactions, see George Rousseau, *The notorious Sir John Hill: the man destroyed by ambition in the age of celebrity* (Lehigh University Press, Bethlehem, PA, 2012), pp. 65-83.

^{lxxix} RS CMO/4, 19 Mar. 1751/2.