CHAPTER 20

Authors, Editors and Newsmongers: Form and Genre in the *Philosophical Transactions* under Henry Oldenburg

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Introduction

The official history of the scientific serial begins in 1665. In January, Denis de Sallo, with a license from Jean-Baptiste Colbert, began publishing the *Journal des Scavans* at Paris; while in London Henry Oldenburg, the Secretary of the Royal Society since the grant of its first Charter in 1662, published the first issue of his *Philosophical Transactions* in late February.[1] These two publications have honourably divided most of the available laurels in the history of scholarly communication between them, with the *Journal* and *Philosophical Transactions* customarily referred to as the world's oldest learned and scientific periodicals respectively.

Historians of science, despite the increasing sophistication with which they delineate and analyse processes of knowledge-making in natural philosophy, tend to treat early scientific periodicals as repositories of source material. Historians of science communication more specifically have tended to work within two principal frameworks which have perhaps overemphasised the significance of these earliest exemplars of the scientific periodical while isolating them from their context: bibliographical and bibliometric approaches on the one hand, which, needing to count from somewhere, presume too far upon the generic coherence of early scientific periodicals; and rhetorical and stylistic approaches on the other, seeking to trace the evolution of modern scientific discourse from its origins.

Such methods have proved very useful, and have much to tell us about the spread and development of new modes of scientific writing and rhetorics of science. What they do not do, however, is tell us very much about what the innovators of the genre, the first founders of scientific journals, hoped to

1 *Journal des Sçavans*, 1 (Paris, 5 January 1665); the date on the first issue of *Transactions* is 6 March, but there is evidence in the correspondence of Christiaan Huygens for its having been printed before that. See Robert Moray to Christiaan Huygens, 13 February 1665 n.s., in *Oeuvres Complètes de Christiaan Huygens* (The Hague: Martinus Nijhoff, 1908) pp. 234–5.

accomplish, and what models they drew upon. Even historians who have addressed the earliest scientific periodicals directly have tended to elide discussions and experiments over the forms in which contemporary actors thought natural-philosophical research should be presented, and to take for granted the fully-fledged birth and immediate hegemony of the scientific article in something like its modern guise as soon as the first scientific periodicals emerged. David Kronick in his survey of early scientific and technical periodicals simply opines that the article was the natural unit of scientific communication and implies that this was immediately recognised; Alan Gross, Joseph Harmon and Michael Reidy, in a cross-period analysis of scientific rhetoric, despite taking the article as their sample and the subject of their enquiry, simply assert that it was born with the emergence of the *Journal des Sçavans* and the *Philosophical Transactions*.[2] Other scholars, such as Charles Bazerman in a book-length study, and Rob Iliffe in an important essay, have produced excellent analyses of particular papers by Isaac Newton in the *Philosophical Transactions*, though neither author considers how far Newton's mode of writing and Oldenburg's editorial approach to it were in fact representative of the early journal. Each draws particular attention to Oldenburg's editorial self-effacement—Iliffe in order to show how Oldenburg retreats from the published text of Newton's first papers on light and colours in the *Philosophical Transactions* in order to help create an identity for a relative unknown, Bazerman in a more general sense to credit Oldenburg with the invention of the persona of the scientific editor.[3]

This chapter challenges the supposition that Oldenburg's scientific editorship was in fact anything like the modern understanding of the role, proposes an answer to the question of what models lay behind the first scientific journal, and argues that the *Philosophical Transactions*, in particular, though widely acknowledged as the earliest scientific periodical, was intended by its founder as a commercial enterprise predicated on his privileged access to the latest natural-philosophical goings-on rather than an editorially neutral vehicle for presenting research in finished form.

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2 David Kronick, *A History of Scientific and Technical Periodicals: The Origins and Development of the Scientific and Technical Press* (Metuchen, NJ: Scarecrow Press, 1962), p. 45; Alan Gross, Joseph Harmon and Michael Reidy, *Communicating Science: The Scientific Article from the 17th Century to the Present* (Oxford: Oxford University Press, 2002), p. vii.

3 Rob Iliffe, 'Author-mongering—the "editor" between producer and consumer', in *The Consumption of Culture, 1600–1800: image, object, text*, ed. Ann Bermingham and John Brewer (London: Routledge, 1995), 166–92; Charles Bazerman, *Shaping Written Knowledge: The Genre and Activity of the Experimental Article* (Madison, WI: University of Wisconsin Press, 1988), esp. ch. 4.

The Origins and Sources of the *Transactions*

What models was Oldenburg drawing upon? He was preceded in his enterprise by the *Journal des Sçavans*, a state-sponsored organ first published by royal privilege by Denis de Sallo, under the supervision and at the initiative of Colbert, a weekly journal intended to give short critical accounts of the latest books in all spheres of learning.[4] The *Journal* featured original contributions in mathematics and science as well as accounts of the latest scientific books, but this material seldom amounted to more than 40% of its content in a given year, with theology typically attracting more coverage than the natural sciences. It seems certain that the *Journal* was in Oldenburg's mind when he founded the *Transactions* in 1665. He had been aware of the French venture since at least late November 1664, when he wrote to Robert Boyle at Oxford mentioning that he had been solicited as the English correspondent for the *Journal* and wondering where he was going to find the time to do it:

> My New correspondent, I hope, will be more punctuall, if I can but be so to him. He hath given me notice by his last, yt they have a dessein in France to publish from time to time a Journall of all what passeth in Europe in matter of knowledge both Philosophicall and Politicall: in order to wch they will print, as he saith, (to give it you in his owne words).
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> …
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> In order to ye execution of wch dessein I am solicited to contribute what I can concerning England, and what is found there, as to excellent persons, things books, being promised to be paid in the like coyne from France of what passeth there and in Italy etc. concerning those particulars. I am very unwilling to decline this taske but yet how to undertake it, being so very single, and having so much already charged upon me, I doe not yet know. But I must remember my Motto, Providebit Dominus.[5]

In this letter Oldenburg quotes, word for word, the text that would later appear as the preface to the first published issue of the Journal. Clearly the remit and function of the *Journal des Sçavans* were understood and discussed before there was a copy to see.

4 For the origins and early editorship of the *Journal*, see Jean-Pierre Vittu, 'La formation d'une institution scientifique: le Journal des Savants de 1664 à 1714', in *Journal des Savants*, 2 (2002), pp. 179–203, at 181–3.

5 Henry Oldenburg to Robert Boyle, 24 November 1664, Royal Society Archives EL/OB/26.

Oldenburg, for his part, had been contemplating an entirely different sort of editorial project—he asked Boyle, as far back as August, to come up with potential subscribers for a manuscript newsletter service, "both of state and literary news".[6] It is not difficult to see what put the idea in Oldenburg's head. His letters to Boyle show that he was already providing exactly that service, as well as acting as his translator and publishing agent. The letters to Boyle have a predictable structure from the early- to mid-1660s, beginning with news of the progress of Boyle's works through the press, followed by reports on the activity of the Royal Society and of scientific news from overseas; then domestic and foreign political news, usually in that order.[7]

The manuscript service Oldenburg contemplated was plainly to be an extension of the service he provided to Boyle, and was to be aimed at wealthy clients who, like Boyle, had a distinct interest in the world of learning. The special emphasis on natural philosophy was an obvious move. As well as his responsibilities to Boyle, Oldenburg kept up correspondences with natural philosophers in Britain and Europe as part of his secretarial work for the Royal Society. It was thus scientific news (especially from the continent) that Oldenburg was in a unique position to supply. He proposed to charge eight to ten pounds a year for the service; a tidy addition to his income for what would presumably have cost him relatively little extra effort.[8] Having identified a commodity to supply, however, Oldenburg found he had overestimated the demand for it. Nothing came of the proposed service. It was mooted during the period when Henry Muddiman's manuscript newsletter service was circulating widely in London and the provinces, and it is perhaps worth noting that the *Philosophical Transactions* as it eventually emerged from Oldenburg's projected news service was careful to carve out its own terrain, not encroaching on the political ground of Muddiman's newsletter, and confining itself more narrowly to the new natural philosophical learning than the *Journal des Sçavans*. It is also worth noting that Oldenburg's venture was launched at a time and place in which independent political periodicals were proscribed, and if, as seems likely, he originally had a more straightforwardly political news venture in mind, it is important to note the combination of competitive pressure and legal restrictions upon it.

If the manuscript newsletter service proved abortive, however, *Philosophical Transactions* was much more of an immediate success. Oldenburg was

6 A.R. Hall and M.B. Hall, eds., *The Correspondence of Henry Oldenburg*, 13 vols. (Madison: University of Wisconsin Press, 1966), 2: 210, Oldenburg to Boyle (22 August 1664).

7 See for example Oldenburg to Boyle, RS EL/OB/8, 22 June 1663.

8 Hall and Hall, eds., *Oldenburg Correspondence*, 2: 210 (22 August 1664).

apparently unable to find a worthwhile number of subscribers willing to pay eight to ten pounds per annum for a personalised service, but he found over 300 buyers willing to pay ten or eleven shillings a year for a printed one.[9] This is worth lingering briefly over, since it may indicate that the wealthy and curious only valued the new learning at a certain rate, or held a different view of the relative importance of print and manuscript in the Republic of Letters than is sometimes thought. Either Oldenburg misread the demand, or he read the demand correctly but misjudged his sales pitch. In the first case, that could indicate that the readers he targeted felt they had sufficient personal access to the world of learning not to need an introduction to it; or that they were unwilling to pay at the rate demanded but would be happy to at a lower rate; or even moral disapproval (a dislike of the attempt to commodify the personal and intellectual relations that constituted the Republic of Letters in forms—i.e. manuscript letters—that too nearly embodied the forms of those relations freely undertaken). If this was so, there was no corresponding objection to those relations being exploited in print, perhaps because it was sufficiently unlike those relations in being general, mechanical, a trade. Or it might be that the literary element of Oldenburg's project was not enough of a distinguishing feature to give it an edge over existing manuscript news from better-established sources—Muddiman, for instance. At all events the much greater appetite for a printed than a manuscript service implies limits to the value added by manuscript communication within the Republic of Letters. This stands in contrast to much of what we know of the history of news, where manuscript communication is widely supposed to add value to print. Where this holds in Oldenburg's case, it holds insofar as his journal is a mixed medium—a printed periodical depending on and embedded in a radial network of manuscript communications.

It was also undoubtedly the case that Oldenburg chose his title with an eye to the connotations of news then attached to the word 'transactions'. A search of the English Short Title Catalogue for publications with 'transactions' in the title between 1640 and 1700 yields 449 results, of which the large majority are news pamphlets of three sheets or fewer, or serials.[10] The term typically refers either to institutional proceedings (as of Parliament), to the acts of a corporate body (such as the Army), or to international relations. The title does not straightforwardly announce the periodical nature of Oldenburg's project,

9 This calculation is based on Oldenburg's estimate of 300 copies as the break-even figure for sales of the *Transactions* in summer 1665. See Hall and Hall, eds., *Oldenburg Correspondence*, 2: 646.

10 See *English Short Title Catalogue* <http://estc.bl.uk/> [10.03.15].

but it does deliberately play upon the term's association with news in the minds of readers. Among the antecedents for the *Philosophical Transactions*, then, were the projected *Journal des Sçavans*, the culture of circulating political news in manuscript during the Restoration and in print before it, and Oldenburg's own failed attempt at a mixed natural-philosophical and political newsletter. It is reasonable to suppose, and what we know of the evolution of Oldenburg's project further suggests, that these represented limiting conditions as well as models for the enterprise. Besides these factors, Oldenburg's venture was launched at a time and place where periodical publishing had shrunk dramatically in comparison with the preceding twenty years and where press censorship was become perhaps as severe as it had ever been in England.[11] *Philosophical Transactions* stood a little outside these conditions. It appeared under the imprimatur of the Royal Society itself, which was permitted by its charter of incorporation of 1662 to appoint printers and to licence books for printing on its own authority.[12] Exemption from the existing oversight structures of the book trade was a rare privilege. The price of this exemption from religious and political censorship was to become part of the mechanism of state control, responsible for the religious and political acceptability of what was issued under the Society's imprimatur.[13] Furthermore, like many innovators in early news and periodical publishing, including Théophraste Renaudot and Denis de Sallo in France and Henry Muddiman, Roger L'Estrange and Marchamont Nedham in England, Oldenburg himself worked within the structures of state authority, acting as a licenser for a brief period and later an occasional translator of intercepted diplomatic dispatches for the Secretary of State (and prominent early Fellow of the Royal Society), Sir Joseph Williamson.[14]

The decision to award the imprimatur rested with the Society's Council, and a minute of 1 March 1665 records that the *Philosophical Transactions* was supposed to be looked over by the Council and approved prior to licensing. Whether or not this actually happened is a nice question. The first issue certainly was licensed in this fashion, but of the 136 monthly issues put out under

11 On Restoration censorship, see Annabel Patterson, *Censorship and Interpretation: The conditions of Writing and Reading in Early Modern England* (Cambridge: Cambridge University Press, 1984), p. 13; Anne Dunan-Page and Beth Lynch, eds., *Roger L'Estrange and the making of Restoration Culture* (Aldershot: Ashgate, 2008), 'Introduction', pp. 1–7.

12 [Royal Society], *Charters and Statutes of the Royal Society* (London, 1752), p. 19.

13 Adrian Johns, *The Nature of the Book: Print and Knowledge in the Making* (Chicago: University of Chicago Press, 1998), p. 493.

14 Marie Boas Hall, *Henry Oldenburg: Shaping the Royal Society* (Oxford: Oxford University Press, 2002), pp. 289–90.

Oldenburg's direction by no means all rate a mention in the minutes of the Council; by contrast, when other books were printed under the Society's licence the fact is invariably officially recorded. The evidence of the Society's minutes is not entirely reliable—independent witnesses, such as John Evelyn's diary, occasionally point to events not recorded in the minute-books—but the surviving record points to a lack of systematic oversight, and Oldenburg's own personal and printed declarations make it clear that ultimate editorial and financial responsibility for the journal was his alone.[15]

Oldenburg went to some lengths to emphasise this in the early issues of the *Transactions*. The first issue, for March 1665, is quite heavily dependent on French reports and activity for its contents—about seven of the fourteen pages of natural-philosophical material in Issue 1 are French-derived. Two articles are lifted directly out of the first few numbers of the *Journal des Sçavans*. The very first article in the journal, a brief summary of Giuseppe Campani's *Ragguaglio di nuove Osservationi* entitled 'An Account of the Improvement of Optick Glasses', is borrowed from the French periodical.[16] The original—as is typical of the *Journal*—takes as its heading the title of the book to which it refers. Oldenburg, equally typically, puts it under a subject heading. Oldenburg's opening paragraph is a complex digest of the origins and transmission of what he intends to convey, but does not acknowledge the form in which he received it. Neither does he make clear (although it is not precisely dissimulated) that this is direct translation. Instead of the rapid summary of Campani's claims provided in the last paragraph of the French version, Oldenburg shifts instead into a discussion—under a separate heading—of a similar set of remarkable observations by an English astronomer (Robert Hooke). More generally, De Sallo indicates where a book was printed, and whether and where it was for sale in Paris; Oldenburg usually gives the place of publication, but unsystematically, until he settles into the practice of putting the review sections at the back of the journal. This is an important general distinction between the *Journal* and the *Transactions*—the former takes the Paris book trade as its underlying structural principle, the latter a complex network of private and semi-public correspondence.

15 See for instance E.S. de Beer, ed., *The Diary of John Evelyn* (London: Everyman, 2006), p. 419—entry for 5 October 1664, in which Evelyn reports some experiments on the descent of bodies in water which are reported in the minutes, and the demonstration of a newly invented musical instrument, which is not. Cf. Thomas Birch, *History of the Royal Society*, 4 vols. (London: A. Millar, 1756–7), 1: 472 for the same date.

16 *Philosophical Transactions* (hereafter *PT*), 1: 1 (1665), pp. 2–3.

The second piece in issue one of *Philosophical Transactions* to be borrowed from *Journal des Sçavans* is the obituary for Pierre de Fermat.[17] This was acknowledged as having been "lately published beyond the seas" but, again, neglects to explicitly refer to its source. Once again there are some omissions in the English version—the *Journal's* explanation of the logic of posting obituary notices in the first place, a practice never adopted in the *Transactions*, and the enumeration of the eminent mathematicians with whom Fermat corresponded, probably for reasons of space. Any reference the *Journal* makes to itself—explaining that it proposes to give a catalogue of Fermat's best works rather than a full-blown elegy, for instance—is quietly dropped in Oldenburg's version. But there is also an apparent effort to make the obituary seem as though it has been communicated to Oldenburg personally. Oldenburg frames the account as reported speech—"saith the author of the letter"—whereas De Sallo acknowledges having received the news of Fermat's death but the remainder of the piece reads as if written in his own words.[18] Oldenburg evidently had a copy of the *Journal*, and there is no evidence of personal communication from De Sallo in the surviving correspondence.

The importance of the letter as a framing device for Oldenburg, one that pointed up his personal position in a European network of scholarly communication, was a vital part of his strategy for promoting the early *Transactions*. Oldenburg eventually settled into a practice of collating those sections of his periodical which function as book reviews into a single section in the back of each issue; thus, that part of his publication which most obviously imitated the function of the *Journal des Sçavans* was very visibly, and I suggest deliberately, circumscribed.

The practice of recopying from overseas printed sources without attribution was also typical of printed news in Europe; the mutual borrowings of the *Journal des Sçavans* and the *Philosophical Transactions* in subsequent years were sometimes signalled, sometimes not. It is possible that these first instances point to Oldenburg's concern about appearing too obviously indebted to the *Journal*, or to a competitive anxiety that prevailed in his first issue but settled down subsequently—Oldenburg enjoyed a clear field for the next nine months in any event, when the editors of the *Journal* incurred the displeasure of the Papal Nuncio in Paris with an enthusiastic review of a

17 *PT* 1: 1 (6 March 1665), 'The Character, Lately Published beyond the Seas, of an Eminent Person, not Long Since Dead at Tholose, where he was a Councillor of Parliament', pp. 15–16; appearing in *JDS* 1 (9 February 1665) as 'Eloge de Monsieur de Fermat, Conseiller au Parlement de Toulouse', pp. 69–72.

18 *JDS* 1: 1 (5 January 1665), p. 3.

notably Gallican theological work; his complaint effectually compelled Colbert to order publication suspended.[19] I have drawn attention to these instances, however, to show Oldenburg's practice—especially early on—of deliberately concealing his source material and privileging his own status in the circuit of natural-philosophical exchange. In what follows I draw attention to two broad strategies on Oldenburg's part: on the one hand the positioning of the *Transactions* as a news publication, filled with direct appeals to its public in the form of advertisements and solicitations; the partial or fragmentary nature of much of what he published, including pieces of simple rumour and hearsay; the reconfiguration of discrete scraps of information or news on related topics into items under a single heading; and within all this Oldenburg's own visibility as editor and compiler. The second concerns Oldenburg's positioning of his journal between two broad groups of readers, as manifested in the selection of material, as well as the surprising lack of direct experimental reporting. Rather than a full-fledged experimental report in the words of the experimenter, an item in the early *Transactions* under Oldenburg often consisted of the editor taking brief notice of something—which might well be an experiment, whether projected or already performed, or else a book, an event, or an observation.

The Content

What follows is a detailed description of some early issues of the journal, intended to draw out the formal variety and the often fragmentary, patched-together nature of its contents, as well as the importance and *visibility* of Oldenburg's position as editor. The first issue of volume two, from the third year of the journal's publication (1667), to take an example at random, is twenty-four pages long and features seven items, including—as is usual with the first issue of a new volume—an author's preface (Oldenburg most frequently refers to himself as the author or publisher of the journal). The substantive articles are as a follows:

1) a list of "Inquiries for Suratte and other parts of the East Indies" a set of requests for information and observations in natural history (*PT* 2: 23 [1667], pp. 415–22);

19 Jean-Pierre Vittu, 'La formation d'une Institution Scientifique: Le *Journal des Savants* de 1665 à 1714', *Journal des Savants* (2002), pp. 179–203, at 183.

2) a one-paragraph notice of a large lodestone given to the Society by Edward Cotton. The announcement is given the billing of a separate item, despite its brevity (*PT* 2: 23 [1667], p. 423);
3) a confection of magnetical titbits of information, queries, and desiderata, under the title "Some Observables about Loadstones, and Sea-Compasses" (*PT* 2: 23 [1667], pp. 423–4).

Oldenburg draws here upon a query of Ismaël Boulliau's and recent proceedings of the Royal Society, an observation from William, Lord Brereton, and another by an unidentified "honourable person", and some suggestions for experiments to be performed.[20] The entry *reports* very little, but draws together elements from Oldenburg's correspondence and recent proceedings of Royal Society meetings to eke out a little item on magnetism, and to try to generate and publicise an exchange between French and English natural philosophers on the subject.[21] The two short pieces on magnetism serve multiple functions, then. Cotton's gift is publicly acknowledged in a form that also acts as an announcement of the Society's experimental capabilities, drawing attention rather to the promise of future experiments than to reports of ones already performed, as well as promoting an international exchange.

4) recommendations for experiments on plant respiration, again compiled by Oldenburg, out of a query from John Beale, the Somerset clergyman and writer on agriculture, with some reflections by Boyle (*PT* 2: 23 [1667], pp. 424–5).

These refer back to experiments already proposed two years previously, in May 1665; there is no record of these discussions either in the Royal Society's journals or in Oldenburg's correspondence.[22] Oldenburg appears to have pieced this together himself, and draws upon old material to galvanise interest in future experiments. There were instances in the early *Transactions* where

20 Probably Boyle, who was frequently given that epithet in the *Transactions*.

21 See Birch, *History*, 2: 152. The 'note' to which Oldenburg refers as the origin of the query has not survived.

22 Though there are three extant letters between Boyle and Beale for January 1666/7, and although Oldenburg sometimes served as an intermediary in the correspondence between them (see for instance the references to Beale in Oldenburg's letters to Boyle of July 1665), there are no remaining traces of these discussions anywhere but in Birch and the *Transactions*, at an interval of almost two years. For the correspondences between Beale and Boyle and Oldenburg, see Boyle, *Correspondence*, ed. Michael Hunter, Antonio Clericuzio & Lawrence M. Principe, 6 vols. (London: Pickering & Chatto, 2001), 3: 275–9, 2: 490.

Oldenburg drew attention to areas of investigation or fields of knowledge that the Society had only touched upon, apparently with a view to enlisting other researchers and virtuosi into acquiring and passing on information.

5) Edmund King's observations on ants, including their generation and behaviour, is a much more straightforward and unmediated report, delivered in the investigator's own voice (*PT* 2: 23 [1667], pp. 425–8).

Again, however, Oldenburg has contrived to insinuate himself into the production of the piece. It is described as having been "Communicated by Doctor Edmund King … at the instance of the Publisher, as followeth".[23] There is no surviving evidence that Oldenburg originally solicited the paper, which King had already read out to a meeting of the Royal Society six months previously, in September, and which had subsequently been added to the Society's register book. Oldenburg's 'instance' presumably consisted either of an exhortation to produce the paper in the first place, or to publish it once produced; the announcing of it here draws attention to the fact of Oldenburg's influence in natural philosophical circles, and its effect on his role as a purveyor of natural philosophical news.

Finally, Oldenburg contributes an account of Samuel Chappuzeau's history of gemstones.[24] He is thus instrumentally involved in the production or compilation of six out of the seven pieces appearing in number 23 of the journal, though only the preface is actually signed by him as an author. A number of points arise: first, by no means all the content is particularly recent. Oldenburg reaches back two years or more in the search for useful material. Second, there is as much emphasis on projected experiments as on ones actually completed. Third, the issue is not much indebted to the Royal Society's current activity for its content. Fourth, Oldenburg's representation of other men's material or intended research is notably dialogical in character. Without making the claim explicit, he appears to conceive of his journal as an agent in the discourse of natural philosophy, not as merely a passive reflection of it.

There is considerable epistemic complexity to such a position. T.H. Huxley's famous remark in the late nineteenth century that if all books were deleted from existence except the *Transactions* it would serve as an adequate record of humanity's intellectual achievement implies a straightforward identification of scientific knowledge with the scientific journal in its periodical form that few of his seventeenth or eighteenth century predecessors shared—a point

23 *PT* 2: 23 (1667), p. 425.

24 *Histoire des Joyaux et des principales richesses de l'Orient,* Geneva 1665, in *PT* 2: 23 (1667), pp. 429–32.

amply demonstrated by the proliferation, and in a few cases the runaway successes, of eighteenth-century encyclopedia projects and digests and abridgements of existing journals.[25] Furthermore, even at the time of Huxley's writing the volume of non-periodical publishing in the sciences remained very high, as it had been for the preceding two hundred years. Other scholars of the scientific periodical have noted the fact that the early journals were primarily instruments "for communicating scientific information, not repositories of scientific knowledge".[26] Neither of these accounts is entirely adequate to describe the position of Oldenburg's periodical, since its purpose is at least partly to help shape the endeavour of natural philosophy, to create relations that had not previously existed, to cajole and encourage participation, and to corral in one place data that otherwise lay disparate. It is the case that *Transactions* more closely resembles, in its early years and in its execution, an instrument of communication than a repository; yet this was evidently not the whole story. The form of agency intended by Oldenburg for *Transactions* was not critical or evaluative—he was careful, except in instances where the Royal Society's claim to a discovery or innovation was challenged or ignored, not to pass critical comment upon what he reported, and his accounts of books, in particular, were scrupulously neutral. The other exception was for attacks upon or presumptions against Robert Boyle, whose treatment in the journal may be understood as a special case.[27] Conversely, the *Journal des Sçavans* freely adopted pronounced critical positions in relation to the books and pamphlets in its pages, yet understood its primary purpose much more than Oldenburg did his as the straightforward holding up of a mirror to the Republic of Letters.

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25 "If all the books in the world, except the Philosophical Transactions, were destroyed, it is safe to say that the foundations of physical science would remain unshaken, and the vast intellectual progress of the last two centuries would be largely, though incompletely recorded". Huxley, 1866, quoted in Dwight Atkinson, *Scientific Discourse in Sociohistorical Context: The* Philosophical Transactions *of the Royal Society, 1675–1975* (London: Routledge, 1999), p. 17.

26 Kronick, *History of Scientific Periodicals*, p. 67.

27 For an example of Oldenburg's defence of the Royal Society's claims against the challenges of natural philosophers overseas, see his preface to issue 27, in which he repudiated an issue put out by persons unknown during his imprisonment in the Tower of London in summer 1667, in terms that rejected, not the theft of his intellectual property, but the apparent endorsement in the pirate issue of French claims to priority in human blood transfusion. For Oldenburg's defence of Boyle, see the case of George Sinclair, in *PT* 4 (1669), pp. 1017–18; or his critique of a partial Latin edition of Boyle's works, printed at Geneva, which failed to attach the dates of the vernacular editions or to acknowledge the prior existence of Latin editions of parts of Boyle's works *PT* 11 (1676), p. 767.

The next issue consisted mainly of experiments, discoveries and inventions—some directly and some indirectly reported. Few of these had been primarily communicated to Oldenburg—pieces about blood transfusion by Jean Denis and anatomical work by Jean Pequet were translated by him out of the *Journal des Sçavans*, for instance—and others were drawn from papers given before the Royal Society, such as Edmund King's accounts of transfusion experiments and Christopher Merret's work on plant grafting. This issue *was* closely based on Royal Society activity and most of it was recent; Oldenburg reached back as far as January for a couple of items (the issue was published in May), but no further, and those pieces are included because of their relevance to current debates.[28] The only piece derived directly from a letter to Oldenburg in this issue is Boulliau's observation of a new star.[29] Oldenburg's visible involvement is confined to selection and arrangement, and some translation. It is notable, once again, that the emphasis is on some idea of dialogue in natural philosophy; individual reports and research results are juxtaposed with related investigations by others, and Boulliau's letter does double duty by including a letter from the Danzig astronomer, Johannes Hevelius. The published journal creates a virtual and visible communication between natural philosophers who might previously have had no contact with one another, as well as reporting the communications of those who already did.

The notion that Oldenburg actively promoted debate and even controversy between natural philosophers is familiar—when Adrien Auzout questioned the performance of some of Robert Hooke's instrument designs, Oldenburg annotated the French astronomer's letters to him before showing them to Hooke in the evident hope of urging Hooke to a forceful refutation, and those annotations are much cited.[30] They show a straightforward promotion of communication between natural philosophers as well as Oldenburg's sense that well-managed controversy would make for good copy in the journal.

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28 See, for instance, the notice that Hooke had been working on ways of measuring stellar distances and planetary diameters: *PT* 2 (1667), p. 459. This was dredged up in relation to Towneley's letter contesting Adrien Auzout's priority in the invention of the filar micrometer. That letter was produced at a meeting of 4 April (See Birch, *History* 2: 164), and Hooke's techniques are mentioned and then deferred, in order to generate further interest in a debate with the intimation that it would be ongoing. The original references by Hooke to his work on this appear in the minutes for the Society's meeting of January 9 1666/7 (Birch, *History* 2: 139).

29 'Observations of the Star, called Nebulosa, in the Girdle of Andromeda', *PT* 2 (1667), pp. 459–60.

30 See for example Marie Boas Hall, *Henry Oldenburg*, p. 141; and Lisa Jardine, *The Man who Measured London: The Curious Life of Robert Hooke* (London: HarperCollins, 2003), p. 200.

The examples discussed above, of Oldenburg generating the *appearance* of philosophers' being in communication with one another through juxtaposition of their work in his journal discussed above are less obtrusive ways of achieving a similar end. Such a valorisation of philosophical dialogue, whether it was real or implied by editorial artifice, has an important consequence. It creates the impression in the reader that the *Transactions* represented a unique public space in which ideas and knowledge-claims were introduced to those of others (though Oldenburg puts no mechanism for appraising rival knowledge-claims in place, and explicitly disclaims the authority to do so). The journal itself then becomes a form of advocacy for a way of proceeding in natural philosophy, but it is not an evaluative tool *per se*. By bringing disparate communications on related subjects into one place Oldenburg helped to create, for highly interested commercial reasons, an ideal of disinterested communication.

Transactions number 26 once again consists of a mixture of items communicated to Oldenburg, some of them derived from recent Society activity, most of them not. The three letters, from Thomas Sherley, Nathaniel Fairfax and Samuel Colepresse that make up a good part of the issue were not shown to the Society prior to their appearance in the journal.[31] All three are edited down to the details Oldenburg wants, and Colepresse's letter, which contains accounts of two spectacular birth defects, is put alongside a translation of part of a French letter which mentions transfusion experiments as well as short accounts of two birth defects observed in Paris.[32] There are no experimental reports, although the first item is a list of experiments in gunnery designed by Moray, together with a request to readers to perform them and to report the results back to Oldenburg. The most substantial piece in the issue is a review of Athanasius Kircher's recently published *China Illustrata*. Again, neither the review nor the book itself was communicated to the Society. Number 26 is a fairly desultory issue, with little of note reported; the only piece avowedly communicated to Oldenburg for use in the journal is Moray's, and it suggests, along with other recent examples such as the enquiries for Hungary and Transylvania and the 'Directions for Seamen', that the Royal Society as a corporate body understood the journal's utility to lie in co-ordinating a disparate group of researchers in the gathering of data. Crucially, however, the notion of the journal as a place in which to publish finished research seems not to have taken root in the early years. Concern on this point seems to have been displaced

31 *PT* 2 (1667), pp. 480–4, under four separate headings.

32 'Extract of a Letter written from Paris, Containing an Account of Some Effects of the Transfusion of the Bloud; & of Two Monstrous Births, &c', *PT* 2 (1667), pp. 479–80.

onto Thomas Sprat's apologia for the early Royal Society, with senior Fellows being instructed to cull material from the Society's registers to flesh out the journal and deflect accusations of unproductivity.[33]

It is a moot point, therefore, whether the word 'contribution' is really appropriate to many of the pieces printed in the earliest issues, since the manner in which a text is presented has often undergone substantial changes from that in which the experimenter or observer, and nominal author of the piece, communicated it to Oldenburg. There are grounds for confusion, too, over whether pieces were being sent to Oldenburg either in his capacity as representative of the Royal Society or as the compiler of *Transactions*, or indeed whether any such distinction was really observed. The origins of the practice of knowingly submitting pieces to the *Transactions* are consequently hard to trace with any precision. Sometimes letters and papers were inserted with negligible or no alteration, sometimes they were extensively pruned and commented upon, sometimes they were simply rewritten.

In addition to frequent, complex and deliberately visible editorial mediation, Oldenburg's *Transactions* are by no means a straightforward record of Royal Society activity. Consider the following table (Table 20.1, below), comparing the provenance and placement of substantive articles—i.e. discounting errata, accounts of books, and advertisements to the reader or prefaces, virtually all of which were composed by Oldenburg himself. (The sample covers the first three complete years of Oldenburg's editorship as well as the last three.)

There is an ever more pronounced tendency over the period of Oldenburg's editorship to differentiate the content of the journal from the Society's activity. It is important to note that these figures are based on the Royal Society's minutes, and there is occasional evidence from the diaries of Robert Hooke and Evelyn of reports heard and matters discussed in meetings not mentioned in the official record. Nevertheless, the figures we have point to a striking conclusion; that the early *Transactions* is an even-handed mix of foreign and domestic material, and that a Fellow of the Society leafing through a copy would encounter a significant proportion of natural-philosophical news that he would not have previously met with even if he attended Society meetings with religious regularity. It is also reasonable to assume that the domestic Fellowship represented a significant proportion of the periodical's natural market.

33 Cf. Birch, *History,* 2: 176, 23 May 1667: "It being moved again, that such instances, as are to be inserted in the History of the Society, might be resolved upon, it was ordered, that it should be left to the president and Dr Wilkins to agree upon such, as they should think fit for the purpose". Sprat's apologetic *History of the Royal Society* was published in 1667.

TABLE 20.1 *Statistical breakdown of substantive articles in the* Philosophical Transactions *during the first and last three completed years of Oldenburg's editorship.*[34]

Year	Volume number	Articles of foreign origin	Articles not featured in RS minutes	Total no. of substantive articles	Average length of substantive articles (pages per article)
1665/6	1 (covers two years)	61 (51%)	62 (53%)	118	2.55
1667	2	18 (32%)	26 (46%)	56	2.8
1674	9	17 (50%)	18 (53%)	34	3.76
1675	10	22 (50%)	29 (65%)	44	4.54
1676	11	16	21	34	5.11

The conspicuously outlying figure for the proportion of material originating outside the British Isles—volume two, for 1667—can perhaps be explained with reference to Oldenburg's imprisonment during the summer months on suspicion of passing information to the enemy during the second Anglo-Dutch war (almost exactly co-extensive with the Transactions).[35] The figures for 1665–6, though apparently of a piece with the later volumes, mask some interesting fluctuations within the period actually covered by volume one, again probably caused by external factors—the first two issues are very strongly dependent on material reported inside the Royal Society at some stage, followed by a period of two months in which Oldenburg drew heavily upon external sources without communicating them to the Society, until late June 1665 when the Court, and many leading Fellows of the Society with

34 'Substantive', for the present purpose, means an individually-titled item in the *Transactions* that is neither an editorial note, advertisement, table of contents, or errata section. Accounts of books, typically grouped together under that heading at the back of the periodical, have also not been considered. In the category of 'Articles of foreign origin', 'foreign' means articles that are identified as being by a correspondent who was not a subject of the English monarch (thus, a letter originating in Constantinople, about Constantinople, from an English, Scottish or Irish subject resident in or travelling through Constantinople, is not considered to be of foreign origin).

35 Oldenburg's imprisonment was for suspect sentiments in a letter to one of his Parisian correspondents, according to Samuel Pepys, in the aftermath of the successful Dutch raid on the Medway in June 1667. See Hall, *Henry Oldenburg*, pp. 115–18.

them, decamped to Oxford during the plague.[36] The Society did not meet for several months, reconvening in February 1666, but during that time Oldenburg remained in London, maintained correspondence with the Continent, and sent copy for the journal to be printed at Oxford under the supervision of Boyle and Sir Robert Moray. The fact that the Society was neither in a position to generate natural-philosophical news, nor really to receive it, for a period of over six months worked a conspicuous change in the vectors of information-gathering and dissemination in the *Transactions*, at a time when the direction of Oldenburg's enterprise was not fixed and he himself still casting about for a viable pattern to follow. The enforced reorientation of the periodical's content, towards news from overseas and news not reported in the record of the Society, introduced an emphasis to the journal and a way of managing information and readership that Oldenburg never abandoned.

Other attempts to classify articles in the early *Transactions* according to formal or genre attributes reveal similar divisions. Twenty-six pieces out of 44 in Volume 10 (1675), for example, are in epistolary form (59%). Among those, 12 go unreported in the Society (46%). The same figures in 1667 are 24 articles in the form of letters out of 55 (43%), of which 9 were not communicated to the Society (38%). Only in the overall length of a substantive article, and the proportion of direct experimental reporting in the Transactions communicated to or performed in the Society's meetings—where experiment is defined in the strict sense that the experimenter creates the conditions that produce the phenomenon under observation—do we find really distinct upward or downward trends during the period of Oldenburg's editorship. Substantive articles increase in average length from 2.5–2.8 quarto pages per article during the first three years to about 4.5 pages per article during the last three; experimental articles reported in the Society, meanwhile, remain fairly consistent during the same period (19% of total substantive articles in 1667 versus 19.6% in 1675). Again, then, the hegemony of the experimental journal article over early scientific communication that many historians anticipate and some actually find simply does not materialise during the lifetime of its founder, nor does it confine itself to channelling the activity of the institution with which he was closely associated. More generally, if Ellen Valle is right in her emphasis upon the distinction between the decline in apparent editorial mediation—by which she means an editorial position that increasingly confined itself to a paratextual frame—we can also infer that the words of the actual observer in the reporting of natural and experimental phenomena began to be more

36 Birch, *History*, 2: 60 (28 June 1665).

highly valued during the first decade of the journal's existence, but that this had not translated into a greater emphasis on the reporting of experiment nor in a straightforward merging of the journal with the Society, as is shown by the profusion of material in it that was never reported in meetings.[37]

What did all this enable Oldenburg to do? It allowed him to dole out prestige through publication, to create dialogue, to propose research agendas, to generate results by juxtaposing discrete observations from different locations, and to mediate between the Society and the rest of the learned world (and vice versa). He deployed many of the techniques of contemporary news writing to persuade his readers of the credibility of his sources (because he often gets to name his source a good deal of the work is done for him, but where his witness to an event is unlikely to be widely known to his readers he sometimes conceals the witness's name and makes a point of vouching for his veracity in the article heading); he reports some things that are simple hearsay; and there is a strong degree of emphasis on the extraordinary and the monstrous. There are exchanges between natural philosophers that take place entirely within its pages, as in the exchanges between Robert Hooke and Adrien Auzout in 1665, or the challenge of the Jesuits of Liège to Isaac Newton's optical theories in the mid-1670s; others where two sides of a dialogue appear in different printed titles (as in successive issues in 1668, for instance, when an initial critique by Christiaan Huygens of a book by the Scottish mathematician James Gregory in the *Journal des Sçavans* was met by Gregory's rejoinders in the *Transactions*, with the exchange proliferating between the two journals over several months.)[38]

37 Ellen Valle, 'Reporting the Doings of the Curious: Authors and Editors in the *Philosophical Transactions* of the Royal Society of London', in *News Discourse in Early Modern Britain: Selected Papers of CHINED 2004*, ed. Nicholas Brownlees (Bern: Peter Lang, 2006), pp. 71–90. It should also be noted that it would frequently happen, particularly where Oldenburg's correspondents in the English provinces were concerned, that the reporter's purpose was *not* to act as a direct witness to the phenomenon reported but rather to vouch for the general veracity of the person who could. (See for example the letters from Samuel Colepresse and Nathaniel Fairfax, *Oldenburg Correspondence*, 2: 386–8 and 392–5.) Provincial virtuosi came to act partly as information gathering agents for Oldenburg and the *Transactions*.

38 For Hooke's exchanges with Auzout, see *PT* 1 (1665), 'Considerations of M. Auzout on Mr. Hook's new Instrument for Grinding Optick-Glasses', pp. 57–63; and *PT* 1 (1665), 'Mr. Hook's answer to Monsieur Auzout's Considerations, in a Letter to the Publisher of these Transactions', pp. 64–9. Newton's with the Jesuits at Liège, *PT* 10 (1675), 'A Letter of Mr. Franc. Linus, Written to the Publisher from Liege the 25th of Febr. 1675. st. n. being a Reply to the Letter Printed in Numb. 110. by Way of Answer to a Former Letter of the Same Mr. Linus, Concerning Mr. Isaac Newton's Theory of Light and Colours', pp. 499–501; and for Gregory's responses to Huygens, see *PT* 3 (1668), p. 732, and *PT* 3 (1668), p. 882.

The question of where the journal stood in relation to the Royal Society has long been a vexed issue.[39] The numbers above show no very certain relation between the material presented in the *Transactions* and that originating in or shown to the Society, though each body is significantly represented in the other. There are obvious respects in which they are closely associated. But the *Transactions* under Oldenburg is not merely a digest of recent Society activity, and therefore cannot be understood as simply having the job of representing the Society to the rest of the world. Oldenburg did have that job—his role as secretary carried exactly such a responsibility—but he refrained from entirely fusing his duties with the production of the journal. May Katzen hears in Oldenburg's preface to the first volume the "first sound, as it were, of a scientific editor's voice".[40] Certainly that preface is the closest thing we have to a foundational document for the *Transactions*, and helps to answer the question of what Oldenburg intended for a vernacular journal that apparently shared the aims of but was to be carefully distinguished from the Royal Society he also represented. But Katzen's statement is problematic without a definition of "scientific editor", or a more concrete investigation of Oldenburg's editorial practice of the kind I have outlined. The introduction reads as follows:

> Whereas there is nothing more necessary for promoting the improvement of Philosophical Matters, than the communicating to such, as apply their Studies and Endevours that way, such things as are discovered or put in practise by others; it is therefore thought fit to employ the Press, as the most proper way to gratifie those, whose engagement in such Studies, and delight in the advancement of Learning and profitable Discoveries, doth entitle them to the knowledge of what this Kingdom, or other parts of the World, do, from time to time, afford, as well of the progress of the Studies, Labours, and attempts of the Curious and learned in things of this kind, as of their compleat Discoveries and performances: To the end, that such Productions being clearly and truly communicated, desires after solid and usefull knowledge may be further entertained, ingenious Endeavours and Undertakings cherished, and those, addicted to and conversant in such matters, may be invited and encouraged to search, try,

39 Oldenburg's own protestations about the independence of the early journal from the Royal Society are recorded in an editorial note to *PT* 1 (1666), pp. 213–14, as well as in his correspondence.

40 May F. Katzen, 'The Changing Appearance of Research Journals in Science and Technology', in *Development of Science Publishing in Europe*, ed. A.J. Meadows (Amsterdam: Elsevier, 1980), p. 193.

> and find out new things, impart their knowledge to one another, and contribute what they can to the Grand design of improving Natural knowledge, and perfecting all Philosophical Arts, and Sciences, All for the Glory of God, the Honour and Advantage of these Kingdoms, and the Universal Good of Mankind.[41]

Oldenburg casts the journal as a facilitator for the free exchange of knowledge, working within a select community (the sense of entitlement to participation that he evokes represents the world of natural philosophers as a closed system, with its own obligations, courtesies and privileges, properly understood by and accessible to initiates only). He gives his journal, which "it is thought fit to employ the press" upon producing, the status of an agreed-upon necessity, something called into being by the demands of the learned world and deriving from that larger authority rather than from his own initiative. He also insists on the value of process, as well as results, in natural philosophy, when he refers to the necessity of keeping up to date with "the progress of the Studies, Labours, and attempts of the curious and learned" as distinct from "their compleat Discoveries and performances". This is what really stakes out the territory which Oldenburg intends to claim for the *Transactions* and which is to consist, at least in part, of reporting on a culture of research as much as on its specific outcomes. Natural philosophers could be relied upon to publish and to publicise their own capital works and grand courses of investigation, but the everyday detail, the who-was-working-on-what, the review of the latest book, had no established outlet, and Oldenburg was partly engaged in creating a market for this.

Another way to describe this phenomenon would be to say that Oldenburg sought to capitalise on the emergent sense of a culture that constantly produced news, even if in any given week it was perhaps news of a fairly minor sort. The early *Transactions* is more aptly described as a newsletter than as a learned journal, and recognising this is essential to an understanding of its conception and organisation. This indicates an important respect in which the emergence of natural-philosophical institutions *did* influence the creation of natural-philosophical periodicals, because learned societies and scientific academies adopted a periodical structure of their own. It was not merely the prestige of his position or the privilege of access to the Royal Society's meetings and records that ensured Oldenburg's supply of material; the notion on which the journal initially thrived, the appetite for reports on the culture and daily workings of natural philosophy itself, depended upon the Royal Society,

41 *PT* 1: 1–2.

which by its very existence imposed a rhythm, a periodic taking of stock, on the activities of the natural philosophical community. Weekly meetings of the Society helped to create an expectation of weekly developments, and if there were no breakthroughs to be reported in a given week there would at least be goings-on. The Society's voluntary structure and amateur organisation may have disclaimed regulatory authority over the practice and culture of natural philosophy but it certainly had a regularising effect upon it, helping to create a demand which Oldenburg's journal worked to supplement and exploit. In this respect the emergence of the scientific periodical parallels the development of the English newsbook, whose dependence on the weekly supply of information from parliamentary proceedings for its content, and on the rhythms of the postal network for its specific periodicity and the day of its actual appearance Joad Raymond has demonstrated elsewhere.[42]

The periodicity of Oldenburg's journal is perhaps its most distinguishing formal characteristic. Samuel Hartlib and his collaborators had preceded Oldenburg in publishing works of natural philosophy by compiling and editing discrete treatises on given subjects from various sources into single works.[43] Oldenburg was on good terms with members of the Hartlib circle, including Hartlib himself, and the Hartlibian project for the reform of learning and for gathering and disseminating knowledge is one of the acknowledged antecedents both of the Royal Society and of the *Transactions*. The prominence of information-gathering schemes in the early journal—questionnaires for dispatching to specific parts of the world, general heads of enquiries for seamen bound for far voyages, and lists of experimental desiderata all feature regularly—are perhaps the most obvious instances of Hartlibian schemes made manifest in the *Transactions*. It is true that Oldenburg's case is stripped of the explicitly Utopian and irenic content of Hartlib's designs, but it should not be assumed that he had simply imbibed this from the Royal Society, whose aversion to political and theological dissensions was early inscribed into its proceedings. Oldenburg's own religious sympathies, and his close affiliation with the work and family of Robert Boyle, point to an alternative set of formative influences. Monthly periodicals were an innovation; vanishingly rare if not actually unknown among mid-seventeenth-century printed newsbooks, and

42 See Joad Raymond, *The Invention of the Newspaper: English Newsbooks 1641–1649* (Oxford: Oxford University Press, 1996), p. 104; and Paul Arblaster, 'Posts, Newsletters, Newspapers: England in a European system of communications', *Media History*, 11 (2005), pp. 21–36.

43 Mark Greengrass, 'Hartlib, Samuel (*c.* 1600–1662)', *Oxford Dictionary of National Biography*, Oxford University Press, 2004; online edn., Oct 2007 <http://www.oxforddnb.com/view/article/12500> [14 March 2015].

uncommon in any other form.[44] It is important, therefore, to assess what Oldenburg intended by settling upon it for the *Transactions*. After all, the proximate models for his project, including English newsbooks, his own newsletter project, and the *Journal des Sçavans*, adopted weekly periodicity; and its extreme rarity among political news publications surely stems from the perception that to appear any less frequently than weekly was commercial suicide, and that readers had come to view weekly (or better) publication as an indispensable characteristic of periodical news. That competitive pressure may have had its origins in other constraints, but by the 1660s it seems plain that monthly news was by definition old news—although this was not necessarily true of month-old news appearing in a weekly news periodical. By deciding not to conform to a weekly publication schedule Oldenburg was making a commercial calculation that also had a bearing on the specific networks he wished to exploit.

The commercial calculation was that his readers would tolerate a monthly periodical treating recent events if it were tailored to a specific set of interests. Oldenburg typically produced less monthly copy than the newsbook editors of the 1640s and 50s, but not invariably so; the usual length of early issues of *Transactions* was two sheets, increasing to three or more by the 1670s, compared to four weekly issues of one sheet each per month for newsbooks. To recap—Oldenburg was resisting both the periodicity imposed by the meetings of the Royal Society on the London natural-philosophical community and much the most common model of periodical publication then current, including that adopted by the *Journal des Sçavans*. (In fact the *Journal*'s periodicity would fluctuate a good deal over the next two decades, sometimes appearing weekly, sometimes monthly, sometimes fortnightly. *Transactions* looks stable and Oldenburg's decision canny by comparison, although he could not have known this in advance.) What were the possible advantages of monthly publication from Oldenburg's point of view? Several possibilities can be envisaged; first, it enforced the distinction between the activity of the Royal Society and the *Transactions*, and between the *Transactions* and the *Journal des Sçavans*. Oldenburg was careful to ensure that the content of the *Transactions* did not simply match what went on in the Society, and it is therefore likely that he also wished to avoid too simple a formal identification between institution and journal. Second, monthly publication afforded him greater flexibility with regard to what the journal might contain. Third, dividing a month's worth of material into four weekly parts might run the risk of diluting sales, as readers

44 The notable exception was *The Present State of Europe*, published in London from 1689. See Charles E. Clark, *The Public Prints: The Newspaper in Anglo-American Culture, 1665–1740* (Oxford: Oxford University Press, 1994), p. 56n.

with more particular natural-philosophical interests would buy a given issue but not others. Fourth, the journal continued to be enmeshed in Oldenburg's correspondence which was the source of much of the *Transactions* and would have risked either tying his epistolary exchanges, many of which were international, to a punishing weekly schedule or, more probably, compelled him to send out issues of the journal in batches of several at a time, so that his correspondents would scarcely benefit from the more rapid tempo of publication.

The *Transactions*, even if under Oldenburg's editorial regime it was better adapted in some respects to the formal requirements of periodical news than to the definitive presentation of natural-philosophical research, nevertheless inscribed a different relationship between periodical and reader than was typical of periodical news. For one thing, the reader was often also a contributor; or might expect to see his own work referred to, and be moved to respond. More generally, the early journal was frequently used to propagate research agendas or data-gathering schemes about far-flung places that sailors, travellers or merchant adventurers were best placed to answer, and abounded in invitations to the reader to participate in, replicate or extend the research presented or proposed in it. The notion of collective enterprise in the journal's writing was not simply essential, it was championed—though at the same time Oldenburg was careful not to let the impression develop that the journal could easily sustain itself without his input.

David Kronick has argued that once experiments came to be regarded as the basic common units of scientific investigation, the proliferation of journals to accommodate reports of them followed naturally, since the ordinary course of research tended to produce accounts that needed to be published but might not be long enough for a book.[45] This process occurred much later than he apparently realised and entirely disregards the social relations and institutional structures that governed the vectors of pre-modern natural-philosophical communication, gathering momentum in parallel with the increasing degrees of specialisation in research and differentiation between disciplines in the nineteenth century. The work of subsequent historians has problematised the extent to which the status of experiment could be said to have been secured in the years immediately following the Restoration, and emphasis has been laid here upon the need to handle the journal's early development with similar caution.[46] Oldenburg launched it with a view to making a living, and what he

45 Kronick, *History of Scientific and Technical Periodicals*, p. 45.

46 The crucial study of the establishment of experiment as the irreducible basis of claims to scientific knowledge is Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump* (Princeton, NJ: Princeton University Press, 1985).

was selling was not only knowledge but a sense of participation in a culture—and using his innovation to foster a culture of actual participation. The journal sought to broaden the community of natural philosophers by forging relations between individuals and groups. Names and knowledge-claims were juxtaposed in print that might in practice have very little to do with one another, extending, into a virtual realm, the forums for discussion provided by the Royal Society. Oldenburg's enforcement of the distinction between his journal and the Society was, I suggest, part of the same impulse, intended to give the *Transactions* an agent's role in the constitution of natural philosophical discourse and communities. It was also a canny commercial move on the publisher's part, since the Society was the most easily accessible part of the natural market for the journal and Oldenburg stood to lose considerably if what he printed was simply a digest of the Society's weekly activity, since there would then be no compelling reason for the Fellows to buy it.

Oldenburg's death did not, as might have been expected given the journal's strong dependence upon his networks of correspondents, lead immediately to the collapse of the *Transactions*, but it did lead to its immediate, if discreet, reinvention. The six issues put out by Nehemiah Grew between September 1677 and March 1678 conspicuously do nothing to draw attention to the change of editorship, a continuation, for more than a year after Oldenburg's death, frequently overlooked by historians.[47] These issues were not simply a stopgap—they drew far back into the archives of the Society for the bulk of their contents and reflect a notably different conception of the journal, one that matches the Society's intention to bring to light material languishing in their archives. A minute of the Society's Council from January 1678 further reinforces the distinction between the *Transactions* as conceived by Oldenburg and the work of publishing finished research, since it envisaged an entirely new publications regime:

> 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.[48]

47 *PT* 12 (1677–8), issues 137–42.

48 Birch, *History of the Royal Society*, 3: 369–70.

The issues are handled separately, one proposing an annual round-up of programmatically-completed research carried out under the Royal Society's direction, the other, the back-dated publishing, in a form not specified, of material from the Society's archives. Decisions concerning what is fit to be published are put into the hands of the Society. These proposals would have brought the Royal Society's publications under the direct control and oversight of the Council as never before, in effect proposing a system of peer review of a kind that had not existed under Oldenburg's editorship. The first project never materialised (under the Royal Society's name, at least; but the series of works put out by Robert Hooke in 1678 under the title Lectures and Collections bear considerable similarity, consisting mainly of discrete researches gathered by topic, with Hooke's own work interspersed with related material from other natural philosophers and correspondents of the Society). There is a striking similarity, however, between the second proposal and what actually appeared under the name of the *Philosophical Transactions* in 1677–8. This is not to say that the journal as it had come to be recognised disappeared entirely—within this period numbers 139–41 have a sizeable proportion of recent material originally communicated directly to the Society—but there is a palpable change of direction, with a great deal more material drawn from the archives or excerpted out of the *Journal des Sçavans* than had been Oldenburg's usual practice. The notion of separating the Society's programme of experimental publication from the storehouse of information that had gradually accumulated in its registers, and publishing the experimental work in clumps four or five times a year, would enable the Society to conduct more detailed investigations without the pressure of monthly deadlines, and this at the very moment at which Hooke, with a renewed access of energy, was staging experiments and demonstrations in the Society that were spread out over the course of several weeks or more. This represented in practice a pretty sharp break with Oldenburg's handling of the journal, effectively making it much more of a Society concern, Grew being entitled to mine the archives for publishable material in accordance with Council directives and by their authority, and thus slackening its dependence upon Oldenburg's network of correspondents. The period of publication became much longer, issues appearing every two to three months. In short, the issues put out by Grew represent not a stop-gap measure so much as a new conception of the journal, itself the outcome of an attempt by the Society to re-energise its experimental work and to tie its publications more closely to that endeavour.

There were objections from within the Society over attempts to continue the enterprise of the *Transactions*—particularly from Robert Hooke, the Society's curator of experiments since 1664, who had not been induced by

Oldenburg's death to forgive what he considered Oldenburg's carelessness at best, treachery at worst, in communicating Hooke's ideas for balance-spring watches to the Continent and then using the resulting claim to priority in the invention by Christiaan Huygens to try and secure an English patent on it. Hooke prevailed on the Council to permit him to replace the journal with his own *Philosophical Collections*, of which seven issues appeared erratically between 1679 and 1682. On 7 August 1679 the Council again ordered Hooke to proceed with the publishing of his experimental work for the Society and of the *Transactions*, as separate enterprises. This refers to an evident dissatisfaction with the state of the Society's publications—the *Transactions* had not appeared since January.[49] The order was reissued in December, together with a reiteration of the plans for a more systematic experimental programme to be organised by the Society with publication not just as its eventual goal but inscribed into the project from the beginning.[50]

These plans would effectively have made of the *Transactions* an institutional newsletter, giving a sample of the Royal Society's activity, the odds and ends that passed through its meetings but would not form part of its directed researches, and its connections with natural philosophers outside London. The frequency with which they ought to appear was debated—between August and December of 1679 the Council made various suggestions about the periodicity of the new *Transactions*, ranging from once a week to once a quarter—but the surrounding projects indicate plainly enough that to the very limited extent that the *Transactions* had previously functioned as a research journal, such was no longer to be their purpose.[51] Once it had become clear that Hooke's *Philosophical Collections* would not meet the Society's wishes, orders were issued to resurrect the *Transactions* under the same name—presumably with a view to inheriting the brand, so to speak, that Oldenburg had created, and this eventually happened once Hooke was pushed out of the Secretaryship in 1682 and replaced with Francis Aston and the Oxford-based natural historian and antiquarian Robert Plot.

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49 Birch, *History of the Royal Society*, 3: 501. It seems evident from the handling of the case that both parties felt a degree of proprietorial interest in Hooke's experimental contributions to the Society; Hooke was continually urged to attempt this or something like it by the Society, though he was told, presumably because he held out for it, that he would retain control over the presentation and organisation of the material. Part of the point of publishing Hooke's work was also to fill up gaps in the Society's registers, which the Council remarked upon from time to time.

50 Birch, *History of the Royal Society*, 3: 510–1.

51 Birch, *History of the Royal Society*, 3: 501, 504, 513–4.

Conclusion

The foregoing rapid overview of the range of alternatives contemplated for replacing or reconfiguring the *Transactions* after Oldenburg's death conveys not just the fluidity of the form of early scientific periodicals, even within a single title, but the distinct sense that Oldenburg's model for it did not straightforwardly address what the Royal Society ideally wished. It suggests the epistemic limitations of that model: namely, that while Oldenburg sought to encourage particular strands of research and to shape natural philosophical communities to his own and the Royal Society's ends, the experimental journal article was by no means securely established as a normative mode of scientific communication by the time of his death. It is also important to note that Oldenburg's distinctive concern for the commercial viability of his journal—a concern that was crucial to its form, periodicity, editorial stance and even its geographical orientation—was not shared by his successors, and that the journal, from which he managed to eke out a small annual profit during his lifetime, made considerable losses for the next 250 years.[52]

The European orientation of *Philosophical Transactions* and the profit motive are the two most conspicuous attributes of Oldenburg's innovation not to be continued by future natural-philosophical journals, or indeed by the *Transactions* itself, and these are also the two attributes it notably shares with early modern periodical printed news. But although Oldenburg drew extensively upon models of news communication for his journal, although he relied, like many prominent news-writers, upon a privileged position within the apparatus of state for his capacity to gather, publish and distribute natural-philosophical intelligence (in his use of the Royal Society's unique printing privilege, his right, briefly abrogated in summer 1667, to correspond freely with the Continent, and his access to the diplomatic bag for transmitting and receiving letters), and although the *Transactions* became part of a European circuit of communication that included numerous other printed periodicals borrowing from one another as they found convenient, the most important aspect of his innovation—periodicity—would come to signify very differently in the natural-philosophical world than in the realm of political news. What the scientific periodical came to embody, denuded of Oldenburg's editorial strategies, his networks of correspondents and his commercial preoccupations, was an open-ended collectivity in the enterprise of natural philosophy. It was this, I suggest, that led to the continual increase in the number of scientific

52 See Aileen Fyfe, 'Journals, Learned Societies and Money', *Notes and Records of the Royal Society*, 69 (2015), pp. 277–99 (esp. Figures 1, 2 and 3).

periodicals over the next century—albeit usually with much less frequent periodicity than Oldenburg had plumped for. During that time scientific periodicals were often slow to appear, distinctively institutional in character, and many of them ran at significant losses. It would take two centuries for scientific knowledge, as such, to come to be identified with the specialist periodical literature; but the periodical could and did usefully stand for collective enterprise, as a way of representing the activity of learned societies and national academies, and to gradually assume the outlines of the system of registration and accreditation that it would become.