

Commemorating Three and Half Centuries of the First Ever Periodical in Science: Philosophical Transactions

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The Merry Monarch, Charles the Second's reign is associated with great events in 17th century Britain. Here are my favorite kudos for the King: The Royal Society of London [1,2] and the Philosophical Transactions. A Royal charter in November 1662 permitted the start of a learned society the 'Royal Society of London for Improving Natural Knowledge'. Arguably, the first of its kind, the RSL was granted a rather cryptic (democratic?) motto "*Nullius in verba*" or "take nobody's word for it"; a majestic coat of arms; three golden lions, passant, guardant and facing left - exactly as in the 'English' Royal coat of arms; and another world's first [3], the appearance of a periodical journal "giving some Account of the Present Undertakings, Studies and Labours of the Ingenious in many considerable parts of the world". The journal began as a completely personal venture by Mr. Henry Oldenburg, Secretary of the said society, needless to say with the Good King's imprimatur and license. Incredibly, in the middle of the great plague (1665) - the time when the Cambridge University shut down, Isaac Newton had to scoot back to Woolsthorpe plus not to mention the fire of London in 1666 - the honorable Secretary had voluntarily taken up to be the presenter, author, publisher, and editor of the Philosophical Transactions.

Whether one takes the longue duree view of history with Renaissance in the central role or not, without questions, the 16th century was no longer the middle ages for Europe. As a matter of fact by this time Ferdinand Magellan and Nicolaus Copernicus have shown that the world is a globe that orbits around the sun, just as the other planets in the sky. Access to the Americas has been discovered and fortunes from the new world were starting to build up in the coffers of seafaring nations. Maritime growth paralleled advances and reliance on 'philosophy' AKA science and technology. Roger Bacon's three-century-old emphasis on Scientific methods was gaining acceptance; doctrinal skepticism, demands for reforms were pandemic and nations were opening to new alternatives. Besides, movements for changes exposed new social and political fault lines that permitted the powerful to seek extra-religious alliances.

By the 17th century, the Anglo-Spanish wars (1586-1604) have ended with a decisive naval supremacy in favor of Britain. Thanks to tobacco cultivation, the first British (permanent) settlement in the Americas started in 1607, at Jamestown in Virginia, promised a firmer and profitable financial future. The English civil war has also ended. The commonwealth leader and dictator Oliver Cromwell's passing in 1658 arguably took away Lord Edward Coke's sentiment of "Magna Carta will have no sovereign". Because in 1660, on his 30th birthday Charles-II was brought back from exile and reinstated as the King of England, Ireland and Scotland.

Re-crowning relaxed public manners and came hand in hand with the reopening of public houses and theaters. In 1611, as William Shakespeare was approaching the end of his life, English language took a quantum jump from another direction with Robert Barker's (king's printer) production of the King James Version of the Bible (KJB). Although, not quite at the level of Samuel Johnson's (1755) legendary lexicon, but Edward Phillips' publication in 1658 of 'The new world of English words', was an important dictionary. The contributions of philosophers, poets and the KJB were transforming English into a

language of discourse. Furthermore, the prospect of riches from ideas and better practices garnered thru philosophy was not overlooked - to sum up at the peak of the Restoration period the time was ripe for both the society and the journal. Perhaps not totally, coincidentally, the first issue of Oldenburg's transactions appeared in print the same year (1667) as the epic Paradise Lost by the poet laureate and pamphleteer John Milton.

Of the five physical senses, vision was impacted most by technology in the 1600's. New optical instruments extended by hundred times what could be seen, and seeing most certainly believes. Spots on the sun; moon like satellites orbiting faraway planets or a single drop of water teeming with a myriad of mobile microscopic organism were totally uncharted vistas. Christian Huygen's genius is common knowledge, but suffices to note here that around 1656 he has kicked Galileo Galilei's idea of pendulum as essentially a toy, up several notches to a precise pendulum movement in a chronographic watch. Huygen is also credited with his namesake design (1662) of the first compound eyepiece. Anton van Leeuwenhoek 'fabrics merchant' and instrument maker reputedly fabricated hundreds of lenses before selecting the one for his record breaking, 270X microscope. Leeuwenhoek would go on to make discoveries that are recognized even today. There was more to Leeuwenhoek, to wit, soon he would become a regular contributor to the RLS!

The transactions appeared on the first Monday of each month, and the topics Oldenburg selected to write about were a mix of the sublime and the practical. Some may label silk worms, whale fat, miner's pay and the like as of 'commercial', but not mercantile and certainly on the whole ingenious, as advertised. For instance, the first story in the first issue [2,3], was an account on improving optical glasses, it described the findings of one Signor Giuseppe Campani regarding the making of lenses that apparently did not produce an 'iris' of rainbow colors around images. Aberrations in optical systems were a major headache and any claims to ameliorate these were major news! Other stories included reports on forthcoming publication entitled 'New Observations and Experiments in order to an Experimental History of Cold' by Robert Boyle, of (ideal gas) law fame; controversy on the predictability of comets paths; whaling off Bermuda; minerals; a malformed monstrous calf fetus; success of 'Christian Hugen's pendulum watch' in a nautical trail for the longitudes by certain Major Holms. The last entry of this first issue, Number 1, was an obituary of Monseieur de Fermat 'not long since dead (12 Jan, 1665) at Tholouse'.

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Another early story was on Mr. (Robert) Hook's observation on the 9th of May 1664, at about 9 O'clock in the night of a dark spot on the third belt of Jupiter. Hook reportedly noticed that in two hours' time, the spot on the surface of the planet travelled a distance of about the radius. Once again, proof that there was more to Mr. Hook than Hook's Law of elastic springs. As it happens in 1674, Oldenburg and Hook would be in dispute over Hook's invention of coil springs for watches.

This was really not a moneymaking proposition ever, but Oldenburg continued to be editor/publisher until his death in 1677. The Transaction continued under a number of publishers until 1752, when it was totally taken over by the RSL and has been in print ever since!

There had been pamphlets, including scientific pamphlets long before the Transactions but this was a regularly appearing periodical that focused on science. By virtue of the March 6, 1665, dateline and dedication to the significant technical matters throughout its era, *De facto*, Philosophical Transactions is the first-ever scientific periodical!

I have reasoned that London, March 6, 1665, was right for Philosophical Transactions. However, one needs people: Charles-II was the perfect king and Henry Oldenburg a real *deus ex machina* who made the first science periodical a reality. Another royal action that impacts our story is the king's granting an exemption to Isaac Newton from the ordination requirement [as an Anglican priest] demanded of the Fellows of the "College of the Holy and Undivided Trinity". This was in 1669, at the time of Isaac's appointment as the 2nd Lucasian Chair in Mathematics; a Professorship at Cambridge University funded by Henry Lucas in 1663 and formally established by the same king in 1664. Newton argued that an active role in the Church of England would be at odds with the demands of the mathematics professor. Thus astutely sidestepping his own 1667 declaration, that "I [Isaac] will either set Theology as the object of my studies and take holy orders

when the time prescribed by these statutes arrives, or will resign from the college", plus the royal permission avoided a face off between the Anglican Church and Newton's personal, Christian but unorthodox faith. Arguably, Charles' religious undertones likely help tip the case in Newton's favor.

Mr. Henry Oldenburg was also a historical character [4] in his own right; according to excerpts [5] from the 1812- Chalmers Biography, he was a scion of Oldenburg, in Westphalia, Germany. Yes, Westphalia, where 'the treaty ending the Eighty-year' war' and Dutch republic etc. happened. Oldenburg a polyglot and acquaintance of the powerful in Britain was also some time consul of Lower Saxony during the reign of Charles-I. During Oliver Cromwell's time he was tutor to lord Henry Obrien at Oxford and later to William lord Kelvin. Not surprisingly, after Cromwell's passing, Oldenburg was influential in convincing the royal coterie about the merits of starting a Royal Society. In the journal he initiated many of the practices that we take for granted today. For instance we owe it to Oldenburg's editorship for setting up the standards of scientific publication, prompt response, peer review (certification), priority (registration), book review, obituaries and others.

The challenges for journal publishers remain great plus the future of publishing is murky. We need today's King Charles and Oldenburgs to lead us thru sustainable scientific journalism, for the next 350 exciting years.

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