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Comment

NEARLY FIVE CENTURIES OF SCIENCE BOOKS

Science books and networks in the Renaissance. An interview with Adrian Johns

Interview by Giovanni Blandino

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ABSTRACT: The interview portrays the role of scientific books during the Renaissance. Books written within the tradition of skilled technical and intellectual practice shaped the way that led to the birth of modern science. Rooted in a panorama characterized by the multiplicity of cultural authorities, scientific books deeply influenced Renaissance culture and created networks interlaced with the existing trade channels. Big single-authored works, typical in the Renaissance, thereafter would be replaced by smaller-scale publications.

Can we find something that we can define as a "scientific book" in the Renaissance?

It depends exactly on what you mean by science, because in the Renaissance there is not something that corresponds to what we call science. And certainly, there are no scientists. This is a social category that appears in the XIX century. But having said that, there are books that, I think, would fall under any definition of science you might use. I am talking especially about those books which fall into the tradition of skilled technical and intellectual practice. In astronomy, mathematical astronomy, there are Copernicus' *De Revolutionibus*, in 1543, Christopher Clavius and Georg von Puerbach. In this field you see something we can define as scientific books.
In anatomy, that is another skilled technical practice, you have Andreas Vesalius, also in 1543, and then a succession of people after him, principally coming out from the Paduan school: Colombo[1], Fabricius[2] and William Harvey, who was educated in Padua (only later he returned to live in England and he actually published in the Low Countries). Those authors' books will count under almost any definition of scientific book.
And then there are a variety of books that may not necessarily count as scientific books, but they were a phenomenon of the time. Astrology, alchemy, what sometimes is called chemical philosophy and Paracelsianism became extremely important in the publishing industry – especially astrology, because it was put out in almanacs every year. To conclude, I think that there are a lot of things that you can count as scientific books in the Renaissance.

What were the main features of these books?

If you are looking at really authoritative things like Copernicus or Vesalius, they tend to be single volume, large and very expensive books, printed in 500 to 1000 copies. They are usually in Latin and directed to a fairly restricted technical audience. But when you think at things like astrology there is a move to the use of vernacular and to a bigger amount of copies for larger audiences. At that time it became very controversial whether you can circulate authoritative knowledge in the vernacular.

Who were the authors of these books and what audience were they written for?

Concerning astronomy and anatomy, authors tend to be experts, if you can call them that, because this is not a category that exists in the early modern period. We can talk about technically skilled, recognized and licensed individuals: anatomists (there was anatomy at the university in licensed positions as well) and astronomers are often tied to universities or officials in the Jesuits. Copernicus is an interesting almost outsider, because he is actually a Church official, but he was not part of the university, he lived rather in isolation in Frauenburg. Then, increasingly, there are figures attached not to university, but to other cultural powers, in particular royal courts. So you will find court positions, court mathematicians and court philosophers. Galileo is somebody who famously made the transition between the university mathematician and the court philosopher, in about 1610. And these figures tend to pioneer different motives of publications that have to do with patronage, elegant courtly rhetoric, and debates.
Some of these books were very technical, so usually they were written for other technical people. For example, Copernicus began his *De Revolutionibus* by warning that only people who were skilled in geometry should open it.
The first audience tends to be their peers, people who are also skilled practitioners. Vernacular works often were written for people in training to become practitioners, for example books that have to do with surgery, often written in English or German rather than in Latin. And I think they are directed to people who are training to become surgeons. Sometimes maybe they were advertisements too: the readers thought that the person who wrote such a book would be a good tutor, so they went to that tutor to learn their surgery. These books were mediating or influencing in that way.
Another kind of audience has to do with trade and merchant activity. There is a genre of books about navigation, for ship captains. Especially by the late XVI century there is a thriving industry producing publications of that kind. It was fundamental to the expanding trade networks of countries like the Netherlands and England.

In which cultural humus are scientific books rooted? Did Renaissance philosophical trends influence them somehow and, if so, to what extent?

There are very different backgrounds, especially if you think of them in terms of institutions. Universities**,** first and foremost the oldest ones, then royal courts, in the Renaissance obviously growing centers, and big cities: London, Paris and Venice, where there are merchant trades and craftsmen who wanted to know about things like navigating or metallurgy. Then, there is a last kind of "soil" for scientific books: people wanting to get more out of the land, by learning better husbandry, by getting knowledge of the nature of living beings, or by learning about minerals and mining – e.g., from Paracelsian books, or something like Agricola's *De Re Metallica*.
And philosophical trends did influence these books in a major way. There is an enormous variety of publishing after the translation of the Neoplatonic texts in the late XV century and Hermeticism permeates the chemical publications almost from the late XV century. And it concerns not just what we think of as high-cultural works: vernacular treatises of the Paracelsian kind made appeal to hermetic doctrines**.**

On the other side, how did scientific books shape the Renaissance culture and the new image of man?

I am not sure where you can draw the boundary between Renaissance culture and scientific books. But I could say that works like Copernicus represent a radical shift of the sense of what it is to be human. When you move the Earth away from the centre of the cosmos, it is not just a technical change, it is a change in the entire cosmology and it has implications for things like providence: why do we think the world was created if we are no longer central to it?
One quite dramatic influence of that kind is after Copernicus' book. From the late XVI century you start to see hints that not only might the Earth be going around the sun, but there might be other suns too. By the 1620s and 1630s, that is becoming an explicit argument that the Universe might have lots of 'solar systems,' not just ours, in which case there might be other inhabited worlds too. This has a radical

decentralizing effect on what we think the role of man is. So by the time you get to the late XVI century, Renaissance culture has become permeated by ideas that often came from the world of scientific books.
Moreover, books influenced Renaissance culture by spreading beyond Latin reading élites or academic audiences. You start to find books on cosmology written in English or German – and this was very controversial for a while – spreading out to a broad urban public, the kind of readers that did not exist before.

How did books manage to spread knowledge around Europe? What sort of network did they create?

The first thing to say is just about a quantitative issue. Typically, in early modern period if you print a book, you produce roughly a thousand copies. That is at least one order of magnitude greater than you would produce normally with handwriting. So there are many more books around; and that has an economic impact too. Books are available more cheaply and you are more likely to be able to afford them and to have access to them. Then there are other, less obvious things: there is a huge reprinting trade, for example. As a book moves out from Frankfurt, Venice or Amsterdam – the major printing centers – it may be reprinted in provincial places, in Geneva for example. That creates knock-on effects, with new editions, new versions and translations.
The other thing to say is that the printing houses that survived and flourished where those that were situated close to existing trade networks. We tend to notice that in the first 50 years after printing was invented, printing houses popped up everywhere. What we have noticed less is that in the 50 years after that, most of the initial printing houses collapsed. The ones left were those situated on existing trade networks, in places like Leipzig, Frankfurt, Venice, Amsterdam - cities with great trading entrepreneurship. That means that there you can get capital to print big books. It takes a long time to print something like *De Revolutionibus*, and you need the capital to invest in it, but you also need to have access to routes, through which you are going to make that investment back by selling copies across Europe. You might sell two copies in Rome, but the best outcome is when you can also sell two copies in Paris, two in London, two in Madrid, and so on as far as a place like Moscow. So what you find is that books not only create intellectual networks, but they also survive on the base of trade networks that were already there.

To what extent did books contribute to lead to the birth of modern science? Without books, would modern science have been the same?

It is clear that it would not have been the same. Think of what the process is that we mean when we talk about the birth of modern science. It is usually denoted by books: you have Copernicus' *De Revolutionibus,* Kepler's *New Astronomy*, Vesalius' *De Humani Corporis Fabrica*, Harvey on the circulation, Newton's Principia and so on. What we take to be the birth of modern science is in fact just a sequence of publications with the effects they had. So in that case, it is not just that without books modern science would not have been the same, but that this process would not have existed at all in the terms we now think of.
Moreover, if you think of science as an institutional practice, characterized not by ideas but by ways of authoring and communicating, books had another sort of influence. Things like scientific journals or concepts like intellectual property, which are real structuring agents of modern science, are products of the book industry in the XVII and XVIII centuries. Scientific journals, for example, originally date from the late XVII century and have carried on continuously since then. So modern science would not have been recognizable without the book industry.

Can you describe us the relationship between science books and centers of power during the Renaissance (national monarchies, the Church and the Renaissance courts)?

In the Renaissance the centers of cultural power moved out from what had been the centers in the past, the great cathedrals and the universities. With the rise of courts and later of the academies, you find an increasing multiplicity of cultural authorities. And the world of scientific books relates to that. You see

around Renaissance courts new kind of offices – Galileo is a pioneer of some of these – which are directed towards patrons rather than academic peers. The patrons could economically underwrite publications too and they could circulate books under the wing of their patronage, which certainly happened with Galileo.
There was also of course a regulative system that came out of the centers of power: things like licensing systems, privilege systems and early forms of intellectual property. The Church did not just ban books, it also edited some of them to allow them to circulate in redacted form. Those things had an impact on what can be published and in what ways.
Furthermore, with the rise of academies through the late XVII century, science books take on new forms, which are appropriate to the new kind of patronage and legitimation. In particular there is a move away from single authored very lavishly illustrated Renaissance books - things like Robert Fludd and Athanasius Kircher - towards things like the *Philosophical Transactions*, the *Journal des Scavans*, and the *Acta Eruditorum* coming out of Leipzig - multi-authored periodic publications which are much more collective endeavors**.** The model involved is much more about circulation rather than simply publication: journals expect readers to respond to what they read with new papers, contributing back into the center.
In that sense, Newton's *Principia*, which we always think is the beginning of modern science, could be also regarded as the end of something: it is one of the last big authoritative universal statements. After that, you find a decreasing number of those things, possibly the last one being Darwin's *The Origin of Species*. The centrality of the big single-authored work, that you find with Copernicus, Kepler, Vesalius and Newton, is increasingly replaced by smaller-scale research publications. That too is something you begin to see in the XVII century.

Notes and references

[1] Realdo Colombo (ca.1515-1559).
[2] Girolamo Fabrici d'Acquapendente (1533-1619).

Author

As well as being a professor in the Department of History, Adrian Johns chairs the Committee on Conceptual and Historical Studies of Science. He is the author of *Death of a Pirate: British and the Making of the Information Age* (W.W. Norton, 2010), *Piracy: The Intellectual Property Wars from Gutenberg to Gates* (University of Chicago Press, 2009), and *The Nature of the Book: Print and Knowledge in the Making* (University of Chicago Press, 1998). Johns has published widely in the history of science and the history of the book. Educated in Britain at the University of Cambridge, he has also taught at the University of Kent at Canterbury, the University of California, San Diego, and the California Institute of Technology. E-mail: johns@uchicago.edu.

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