

Taming tempestuous Ziz. Weather knowledge in the early modern Italian peninsula

Talk

The Florentine Accademia del Cimento was the first European society to put experimentation at the core of scientific activity and to be supported by a public power.

Most monographs on the Accademia del Cimento have rather left in the shade a very important aspect in the study of this circle of scholars, namely the intellectual and natural-philosophical roots underlying its experimental activity. William Edgar Knowles Middleton, in his 1971 volume entitled *The Experimenters*, barely mentioned the intellectual background of the academy members. *L'Accademia del Cimento: gusti del principe, filosofia e ideologia dell'esperimento*, an essay by Paolo Galluzzi published in 1981, focused instead on the social aspects and the leading role of the prince Leopold – founder and patron of the Academy – leaving out the study of the natural-philosophical theories underlying the meetings of the assembly. In more recent times, Luciano Boschiero has similarly remained anchored to the dichotomy between corpuscularism and Aristotelianism, failing – with the exception of some interesting insights, such as those on Cartesianism – to dissect the subject of the intellectual background in its entirety and complexity.

An important contribution to the issue was instead made by Marco Beretta, who identified certain influences of Lucretius' atomism on the experimental work and speculative discussions of the Florentine circle, and then highlighted how the spread of the philosophical ideas contained in *De rerum natura* was quite profound within the intellectual space of the Grand Duchy of Tuscany.

Following this general historiographical premise, it is now important to consider a tool that is certainly very useful for reconstructing the intellectual background of a scientific academy, namely the study of lists, a work that

opens new research perspectives in the history of science. In fact, within the Cimento's documentary corpus, now kept in the Biblioteca Nazionale Centrale in Florence, there are numerous documents – in many cases completely unpublished – that contain lists of various kinds, from *memoranda* to *desiderata*, passing through inventories and lists of books and authors, on which my paper will focus.

In this regard, the well-known “*lista di quei libri de’ quali mi son servito e sono per servirmi in proposito delle cose sperimentali*” brought to Leopoldo de’ Medici’s attention by Carlo Rinaldini at the end of 1656, harbinger of the start of the Cimento’s experimental activities, as well as the partial list of texts in Vincenzo Viviani’s personal library, and an inventory of the volumes he had purchased until 1661, are certainly valuable evidence. This inventory is of particular interest not only because of the accuracy of the information it contains, such as the edition or purchase price, but also because the volumes are marked – in order of importance – within four boxes, distinguished in a peculiar way in terms of the topics addressed, following the classic pattern of the *Quadrivium* disciplines.

On the historiographical side, one work that should definitely be taken into consideration regarding the study of lists and inventories drawn up by academics, is the pioneering study by Ugo Baldini, focused on the reconstruction of the library of Giovanni Alfonso Borelli. In 1996, Baldini, in addition to the books actually owned by Borelli, also questioned the absences, a very interesting aspect as they also reveal important informations about the philosopher’s intellectual background. Regarding the study of Viviani’s hand-lists, a recent work by Simon Dumas-Primbault has focused on them. He points out that the inventory of volumes purchased “*firstly reveals the specific interests of Viviani*”, as it included numerous texts on cosmology, mathematics and classical geometry, as well as various reprints and reissues from the 16th and 17th centuries.

Such an approach to these sources opens a number of questions about their genesis; if for inventories it is easier to trace their formation, the same cannot be said for other types of lists. How did they build up author-only indices or those that marked a specific moment in a work-in-progress experiment in the

field of natural philosophy? It is evident that in some cases the function of the listed author was to philosophically legitimize an experiment or a work, while in others the intention was to initiate a study or examination of a philosopher's *opera omnia*. Moreover, in other cases a specific text was chosen from the production of the authors, which makes it easier to reconstruct which parts of the volume were considered by the members of the Cimento. With regard to the formation of these selections, in addition to a direct reading of the texts included therein, thus deemed 'worthy' of further study or sharing with other scholars, different factors could also be influential, such as the simple annotation of a text not yet examined but considered important in the first instance. Or, as in the case of Rinaldini's well-known index – in which some doctors advised him to include Paracelsian works – suggestions dictated by third parties deemed competent in the subject matter could also be relevant. And it is also important to look at absences as well as presences within these lists; the exclusion of certain authors and works in favor of others is in fact another valuable source for accurately reconstructing the Academy's philosophical background, providing us with valuable indications not only of the experimental paths that they wanted to pursue, but also of the position that academics wanted to occupy in the European Republic of Letters.

Let us now turn to the analysis of a peculiar and precious testimony, what I have renamed the 'pyramid of knowledge', depicted on the first page of the manuscript copy of the diary together with some fundamental instruments used during the Cimento's experimental activity. The drawing is almost certainly the work of the pen of Alessandro Segni, at the time secretary of the group of scholars. As can be seen from the image, Segni has depicted twelve volumes stacked pyramidally; the author's name is inscribed on the edge of the books, except on the penultimate one, where only the words 'Nova Filosofia' appear. The authors are arranged in a sort of ideal progression of natural philosophy, starting with Aristotle and his commentator Albertus Magnus, and ending with the 'noble father' of the Accademia del Cimento, identified by the members of the assembly as Galileo. The list that is thus configured encourages the reflection on the epistemological value of author-only lists: in this regard, James Delbourgo stated that: "Listing people was an art of self-construction through collective association: the production of a self defined by

a collectivity". In the light of these words, the role of this symbolic iconography, which shows interesting connections with the books depicted in some Florentine paintings of the Mannerist period, such as Giovanni Stradano's portrait of his colleague Alessandro Allori, appears clearer. In fact, Stradano depicted Allori with a small stack of books on his right, surmounted by an armillary sphere. Thus, from bottom to top one can read 'Homerus', 'Euripides' and finally 'Ptolemaus', showing an ascending line from epic to cosmology. Therefore, according to such an interpretation, the 'pyramid of knowledge' would reveal how the academics of the Cimento perceived themselves as the culmination of an ideal progression of natural philosophy, now increasingly detached from Aristotelianism and closely connected to experimentalism, following the new direction impressed by the Galilean method.

But let us now begin to look at the particular list of authors starting from the base of the pyramid, composed of the two tomes bearing the names of Aristotle and Albertus Magnus, who are almost crushed by the weight of the other wise men. The academics of the Cimento intended in this way to visually and symbolically disassociate themselves from the legacy of the Stagirite, a very cumbersome one in many respects, first and foremost that of meteorology, the privileged object of study within this presentation. Indeed, in Florence, during the first half of the 17th century, the influence of Aristotelian doctrines was very strong, casting a long shadow over the discussions and experiments carried out in the field of meteorology. While the activities of the Medici network were greatly influenced by the canonical Aristotelian classifications of atmospheric phenomena, it must also be remembered how many Aristotelian-inspired texts were present in the academicians' libraries, sometimes influencing their way of thinking. In Viviani's library there are in fact texts such as the *Trattato delle metheore* by Francesco de' Vieri, a kind of transposition into vernacular of the *Meteorologica*. And the Cimento's documentary corpus contains some previously unpublished writings on meteorology with a clear Aristotelian imprint, such as a *De mirabilibus naturae effectibus seu metheoris*, attributed to Niccolò Aggiunti, forerunner, with his experiments at the court of Ferdinand II, of those carried out by the Cimento twenty-five years later.

It is then interesting to note that Theophrastus, the first of Aristotle's disciples, is placed not one, but two levels above the master, probably signifying how, in Segni's perspective, even the Stagirite's pupils had partially succeeded in elevating themselves above his theories.

In the line between Aristotle and Theophrastus, on the other hand, are the names of Pliny the Elder and Plutarch, both authors of works on meteorological subjects often considered by the members of the Cimento. If, however, within Pliny's production it is easy to identify the *Naturalis Historia* as an obvious reference, regarding Plutarch it is more complex. Looking for quotations of his works in the documentary corpus (and lists) of the academics, we find references almost exclusively to one text, later included in the *Moralia*, the *De primo frigido*, a short treatise on the origin and properties of the primary quality of cold. Indeed, Carlo Dati had proposed to translate the work into the vernacular; moreover, a list compiled by Vincenzo Viviani contains two brief annotations to the Plutarchean treatise, on the subject – much debated inside the Academy – of the so called “freddo positivo”. It is precisely the keen interest in the quality of cold and the transformations it causes on the water element that could be at the basis of the next name in the pyramid-list of authors, Seneca. There are in fact numerous passages from the *Naturales Quaestiones* taken up by the academicians of the Cimento, such as the third book, dedicated to the treatment of water: here, the Stoic philosopher carefully delved into certain problems that were relevant to the meetings, such as the origin of the springs, a question in which the Grand Duke Ferdinand II himself had ventured, or the intrinsic properties of the element, or the differences in the weight of the various waters in relation to the speed of freezing.

The next level of the pyramid is dedicated to Platonic authors, represented by Macrobius and Giovanni Pico della Mirandola. The two, contrary to their Aristotelian counterpart Theophrastus, are, however, placed in a position inferior to that of the master, whom, in Segni's view, they had failed to equal. For what concerns Macrobius, only three of his works have come down to us, the commentary on the Ciceronian *Somnium Scipionis*, the *Saturnalia* and a treatise on grammar. So we can certainly identify the former as the work that the academics of the Cimento looked to. In this text, the author in fact provided a depiction of the cosmos that conformed to the theses expounded by Plato in

the *Timaeus*: the aim of the work was to demonstrate the consonance and harmony between the *Timaeus* (and Porphyry's lost commentary on it) and Ciceronian work, in a perspective of continuity between Greek and Latin knowledge.

The position of Giovanni Pico della Mirandola, a member of the mythical Florentine Platonic Academy founded by Marsilio Ficino and Cosimo il Vecchio, is completely different. Indeed, it is surprising to find his name in the place of Marsilio Ficino's, through whose lens the academics of the Cimento read the works of Plato, a fundamental part of their intellectual background, translated by Ficino in the second half of the 15th century. But this exclusion from symbolic representation is not the only one for Marsilio Ficino. Perhaps even more astonishing is the total absence of any reference to the figure of Ficino in the eulogy pronounced in 1643 by Carlo Dati in memory of his late maternal uncle Niccolò Arrighetti, another leading figure of Florentine Neo-Platonism between the 16th and 17th centuries. In an attempt to answer this question, one could look in the direction of an important section of Ficino's *Corpus Philosophico-Naturalis*, namely astrology, a discipline against which Giovanni Pico della Mirandola had lashed out in his *Disputationes adversus astrologiam divinatricem*. In fact, Marsilio Ficino, who in the 17th century was often referred to by the epithet "the Florentine astrologer", might have appeared in the eyes of the Cimento as a figure closely linked to an outdated superstitious type of knowledge. And in this regard, Elide Casali pointed out that in the intellectual world of Ferdinand and Leopold's court, astrology was banned, judged as "a by-product of traditional cosmology, unacetable for intellécts open to a true knowledge of reality".

Above Macrobius and Pico della Mirandola we then find two other authors: the first is Galen, whose elevated position certainly represented the privileged role that, according to academics, medicine played in the "encyclopaedia of knowledge". The second is Plato, an authentic cornerstone of the intellectual background of the Cimento; the *Timaeus* is in fact one of the most cited works in the surviving documents. In a letter by Giovanni Alfonso Borelli, he proposed to explain the dilation of water in the process of freezing - assuming that the cold is a simple deprivation of heat - using an elementary structure of water identical to the Platonic one, referring to the theory of geometric solids

displayed by the Pythagorean philosopher. I quote: “i minimi componenti l’acqua siano di figura raccolta, come icosaedri, ottaedri, o di altra simile figura, e che tali minimi acquei siano molto minori dei minimi aerei”.

Let us now come to the penultimate level of the pyramid, the most peculiar as it does not contain the name of an author, but of a current of thought referred to as 'Nova Filosofia'. It is therefore crucial to investigate which works and authors the academics could have ascribed to this category and what Segni and the other members of the Cimento considered to be new in the philosophical-natural panorama of the 17th century. A possible starting point for this operation is certainly Alberto Vanzo's recent work on the Novatores of the Italian Peninsula, in which he highlights their links with Gassendi's corpuscular philosophy and Cartesianism, which in Naples found a privileged place of intellectual spread. And therefore, as Marco Beretta points out in the above-mentioned contribution on the influence of Lucretian philosophy in Florence, that 'Nova Filosofia' first indicated corpuscular philosophy, which – I quote – “called either nuova filosofia or filosofia democritica, was part of the agenda of the Accademia del Cimento”. Trying, however, to enrich this first line of interpretation with new elements, it becomes very useful to search within the surviving documentation of the Cimento for the possible presence of the words "Nova Filosofia", and whether this is associated with one or more works, thus showing direct evidence of the perception of the academics themselves. And indeed, in Carlo Rinaldini's famous list of books, intended to construct an initial outline of the academy's experimental programme, we can find the words “Thomae Obes Nova Filosofia”. The reference, in all probability, was to the English philosopher's *De corpore*, a text published in 1655 in which Hobbes constructed his physics from a direct mechanistic examination of phenomena and the sensations they produce on bodies endowed with receptive capacities. Thus, in *De corpore* Hobbes defined philosophy as the starting point of a deductive and causal science. I quote: “*Philosophy is knowledge acquired by correct reasoning of effects or phenomena from the concepts of their causes or generations, or reciprocally the acquired knowledge of possible generations from known effects*”.

But in this age of the intellectual history, which in accordance with the 'progressive' vision of Segni and the other members of the Cimento preceded

Galilean experimentalism, other authors could certainly be mentioned, such as Francesco Patrizi da Cherso and Niccolò Cabeo, whose theories and 'experiences' on water and its movement were repeatedly put to experimental scrutiny within the Cimento.

Conclusion

I would like now to conclude this presentation, in which an attempt to highlight the natural philosophical background of an academy that is very little studied in this field was made. For more than two centuries, the political-intellectual space of the Grand Duchy of Tuscany had been a very important place for the production and innovation of knowledge; particular attention was paid to meteorology, understood as an all-encompassing study of the sublunar world, thanks to grand dukes-natural philosophers of the calibre of Francis I or Cosimo II. Once he ascended the throne, Ferdinand II was no less important than his predecessors, and was himself the inventor of meteorological instruments – the condensation hygrometer above all – and the promoter of important initiatives in the area, such as the establishment of the first European meteorological network, which he named the Medicean Network. Reflecting therefore on the link between public power and the various philosophers involved in the ambitious projects of Ferdinand and his brother Leopold, we can see how there was a transformation from a circle of courtier-philosophers gravitating around the grand duke, to a more institutionalised experience that initially overlapped with the previous one, borrowing a significant part of its intellectual background.

Concerning the “pyramid of knowledge”, it is also interesting to acknowledge that passages and assertions of the authors included in the pyramid are also to be found in lists of experiments to be carried out and sifted; above all the reproduction of a Cabeo instrument to measure the speed of water and the verification of the truthfulness of some of Pliny the Elder's theories by Vincenzo Viviani.

To summarize, regarding the intellectual background of the Accademia del Cimento, we are not in front of an *itinéraire philosophique* because of the narrow time window in which it operated, so the picture provided here by Segni's hand takes on added importance. Looking even deeper, it can be observed that there was a real awareness on behalf of the members of the circle – under the political-intellectual lead of the prince Leopold de' Medici – that they represented a novelty, or rather, that they were in some way the product of a double novelty, taking place in an intellectual era following the caesura represented by that 'Nova Filosofia', which itself preceded the crucial period of Galilean experimentalism.