The Epistemology of Vernacular Aristotelianism in Renaissance Italy: The Case of Alessandro Piccolomini

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ABSTRACT

Until ten years ago, the existence of vernacular Aristotelianism as a philosophical movement in the Italian Renaissance was virtually ignored by scholarship. After a series of international research projects, we know much more about the Aristotelian vernacular tradition and of its impact on Renaissance and early modern thought, especially regarding its role in disseminating knowledge, in its settling into informal contexts like academies and artisanal workshops, and also in breaking the boundaries between high and low cultures. Vernacular Aristotelianism changed how Aristotle's works were read, understood and used, leading to a better grasp of specific disciplines usually ignored, like meteorology, biology, and mechanics, which promoted the transition from the old Aristotelian-Scholastic scientia to early modern science. This transition in a changing world reshaped the epistemology of intellectuals of the time. In this paper, I focus on one of the most brilliant exponents of vernacular Aristotelianism, that is Alessandro Piccolomini (1508–1579), examining the role he played in creating a new epistemology, which reflects on the most important issues that will come to dominate the discussion in the emergence of early modern science.

1. TOWARDS A NEW EPISTEMOLOGY

Until ten years ago, the existence of vernacular Aristotelianism as a philosophical movement in the Italian Renaissance was virtually ignored by scholarship, which believed that Aristotle was the domain of the clergy and university professors, who wrote and taught in Latin. Scholars assumed that what was written in the vernacular had only informational and divulgative purposes and, therefore, that it was by nature unoriginal and lacking in theoretical depth—not worthy of scholarly interest or of philosophical investigation. They made a simplistic distinction between “serious” scholars—those who read Aristotle in Greek, or at least his most accurate Latin translations, and discussed

his philosophy in Latin—and the “popularizers” of Aristotle’s philosophy, who did not care about philological questions and were generally ignorant of classical languages.¹

There have been some exceptions to this general rule, which, however, have put an emphasis only on the linguistic and literary dimension of vernacular Aristotelianism.² Little or nothing, in contrast, was written on the philosophical and scientific contribution of this movement. The only study that took vernacular works seriously into consideration was Leonardo Olschki’s survey of a number of vernacular Aristotelian

1 See Bianchi 2009 and Lines 2015 for the weaknesses in the study of vernacular Aristotelianism.

2 See the paradigmatic study of Wasik 1935.

writings, regarded as fundamental for the understanding of the development of early modern science and, in particular, for their impact on Galileo Galilei's early thought.³

However, Charles B. Schmitt, the most prominent scholar of Renaissance Aristotelianism, denied that vernacularizations and vulgarisations had any real impact on early modern philosophy and science:

It may have a certain democratic and social value to make important scientific writings available in the language of the common people, but one wonders how often this has contributed to the significant advance of science. Even if important scientific papers were printed in the daily newspapers, I doubt if this would sensibly contribute to the advancement of science – to its diffusion, perhaps; to its advance, no. Those who are capable of making contributions are few, and they usually come into contact with the significant material that interests them. It is also an inescapable fact that during the sixteenth century – and even much later – Latin was the common language through which scientists communicated with one another. Serious scientific and intellectual work of international importance was written in Latin, for this was the language understood by scientific community. Vernacular treatises might have been appropriate

for local shipbuilder or surgeon but, with few exceptions, anything important was still written in Latin.⁴

From the early 1970s when Schmitt wrote these words, the situation has changed considerably. After a series of international research projects⁵ and the cataloguing and examination of more than 300 printed works and 200 manuscripts,⁶ we know much more about the Aristotelian vernacular tradition and of its impact on Renaissance and early modern thought, especially regarding its role in disseminating knowledge, in its settling into informal contexts like academies and artisanal workshops, and also in breaking the boundaries between high and low culture.⁷

Somewhat inevitably, the fate of vernacular Aristotelianism in Renaissance Italy followed that of Renaissance Aristotelianism more generally. Indeed, much twentieth-century historical research viewed Renaissance Aristotelianism in a negative light simply in counterpoint to the emergence of early modern philosophy and neglected to consider how it promoted the intellectual framework that facilitated and conditioned the

3 Olschki 1922, pp. 222–38.

4 Schmitt 1970.

5 AHRC project *Vernacular Aristotelianism in Renaissance Italy c. 1400–c. 1650* led by David Lines, Jill Kraye and Luca Bianchi at the University of Warwick and the Warburg Institute, and the ERC project *Aristotle in the Italian Vernacular: Rethinking Renaissance and Early-Modern Intellectual History (c. 1400–c. 1650)* led by Marco Sgarbi and David Lines at Ca' Foscari University of Venice and at the University of Warwick.

6 <https://vari.warwick.ac.uk/>

7 Bianchi 2012; Sgarbi 2016a.

innovations and discoveries of the new philosophy. These studies understand Aristotelian culture as being stagnant, essentially in a context within which philosophers were obliged to teach the Peripatetic doctrine according to specific canons and standards imposed by the various university regulations. These Aristotelians could hardly be expected to bring radical novelties to their comments and explanations of the Aristotelian texts. In his popular book on Francis Bacon, Anthony Quinton explicitly declared that Aristotelians “saw themselves as orderers and preservers of knowledge, not as its creators.”⁸ Ultimately, they were organizers of knowledge, not philosophers: they were unable to uncover new ideas. More recently, David Wootton has asserted that for Aristotelian philosophy “there was no such thing as new knowledge” and that Renaissance Aristotelians lacked the notion of invention to produce new ideas and to understand the new discoveries being attached to the authority of the Stagirite, as if they were suspended in a world without development.⁹

A contextualist reading of this movement shows that things in fact happened differently.¹⁰ Indeed, vernacular Aristotelianism changed how Aristotle’s works were read, understood and used, leading to a better grasp of specific disciplines usually ignored, like meteorology, biology, and mechanics, which promoted a clear transition from the

old Aristotelian-Scholastic *scientia* to early modern science. This transition in a changing world reshaped the epistemology of intellectuals of the time. Indeed, vernacular writings reflect an interaction and, at times, a merger between completely different scientific and philosophical traditions, showing a strong blend of eclecticism and promoting thus a new cognitive access to reality.

Recent investigations of Renaissance Aristotelian meteorological works reveal a different intellectual attitude towards the object of research in comparison with previous centuries. Authors such as Andrea Bacci, Girolamo Borro, Francesco de’ Vieri, and Vitale Zuccolo published bestsellers on earthquakes, fires, floods, tides and winds. Vernacular meteorology was rich in anecdotes and shows the flexibility of Aristotelian scholars in considering provisional and revisable theories. These works emphasised the importance within the formulation of scientific conjectures of empirical experiments, such as those conducted in the chemical field to develop a more comprehensive explanation of nature. In fact, vernacular works on meteorology tried to elaborate scientific theories corresponding to empirical evidence and experiments, to ancient texts and to religious doctrines, in an attempt to make observation fit within certain epistemological structures, based only on chance and accident. In this epoch of transition, the Aristotelian epistemology applied to meteorological phenomena aims to bring reason to bear on experience in its totality, dissolving

8 Quinton 1980, p. 29.

9 Wootton 2015, p. 74.

10 On the contextual approach see Mercer 2019.

the distinction between sublunary and heavenly bodies.¹¹

Studies of vernacular natural philosophy in the Renaissance pinpoint the strong relevance of the discussion of preternatural phenomena, which involved biological and medical considerations.¹² In particular, a debate of mounting importance in the Renaissance concerned monsters and wonders of nature. Generally, from Aristotle onwards, the appearance of a monster or a wonder of nature was taken as a rupture in the natural order of things, but during the Renaissance, thanks to authors such as Benedetto Varchi,¹³ there was a change of perspective. Monsters and wonders of nature were no longer conceived as an extravagance of nature, but as evidence on which it was necessary to reflect in order to develop a broader explanatory theory of nature. The problem was not so much the monsters as the failure of human reason to explain them. Monsters, wonders and prodigies thus became the paradigm for the enlargement of scientific explanation and not something that had to be expelled from science.

Investigations within Renaissance mechanics show how artisans, architects and engineers were not merely manual workers, but specialists who employed sometimes even complex mathematical

theories and techniques. Far from being mere practitioners, they were very much reliant on the scholarly book-based culture. By virtue of the works of Nicolò Tartaglia, Antonio Guarino, Giuseppe Moleti, and many others who reworked Aristotle's *Mechanical Questions*,¹⁴ mechanics was elevated to a theoretical science from being a mere manual art, began to have recourse to mathematics for understanding the natural world, investigated preternatural effects, and indeed set about producing them for human ends.¹⁵ By means of this new understanding of mechanics there arose a total reconsideration of practical skills and a re-evaluation of the mechanical arts, paving the way for a new idea of knowledge typical of early modern scientists such as Galileo Galilei.¹⁶

From this very brief overview we can begin to understand how in Italy most vernacular Aristotelians were wide-ranging intellectuals who did not simply passively receive and transmit Aristotelian philosophy but were actively engaged in reformulating ideas and thus creating a new epistemology, a vernacular epistemology, which influenced and shaped early modern thought.¹⁷

In this paper, I focus on one of the founders of vernacular Aristotelianism, Alessandro Piccolomini (Siena, 1508–1579). Studies in natural philosophy,

11 Craig Martin has provided the most important contributions in the field see Martin 2006; Martin 2010; Martin 2011; Martin 2012; Martin 2015.

12 Just to list some of the most important contributions see Daston, & Park 1981; Daston 1998; Daston, & Park 1998; Anafi 2000, pp. 16–33; Bitbol-Hespériès 2006.

13 Montemagno Ciseri 2008.

14 Among the many studies see Henninger-Voss 2000; Henninger-Voss 2002; Valleriani 2013; Pisano, & Capecchi 2016; Sgarbi 2016b.

15 Laird 1986, pp. 45–6.

16 Rossi 1997, p. 48. For the most exhaustive research on the topic see Valleriani 2010.

17 Smith 2003, p. 8.

meteorology, astronomy dominated his entire scholarly career, which was spent on the edge of the universities in the informal context of the new-born academies, especially in the Accademia degli Intronati in Siena and in the Accademia degli Inflammati in Padua. However, Piccolomini is much better known today for his literary contributions.¹⁸ A brief list of Piccolomini's scientific and philosophical writings in vernacular and in Latin may provide a glimpse of the breadth of his scientific interests. While in Siena at the Accademia degli Intronati his business was mainly, if not exclusively, literary, but when he arrived in Padua in 1538 the situation radically changed. Piccolomini started his first philosophical and scientific investigation in connection with the university, in particular with the mathematician Federico Delfino, and with the Accademia degli Inflammati, which among its fellows had scientists of the calibre of physician Bernardino Tomitano and anatomist Andreas Vesalius.¹⁹

In 1540 Piccolomini published a Latin translation of Alexander of Aphrodisias's commentary on Aristotle's *Meteorologica*. It included the treatise *De iride*, which contained criticisms of the Bolognese professor Ludovico Boccadiferno.²⁰ Piccolomini's first and most popular work is *De la sfera del mondo*, published in Venice in 1540 with the treatise

Delle stelle fisse.²¹ There were more than fourteen editions during the sixteenth century (1548, 1552, 1553, 1559, 1561, 1561, 1564, 1566, 1570, 1573, 1579, 1595, and an additional two undated), as well as four French translations (1550, 1580, 1608, 1618)²² and two Latin versions (1568, 1588).²³ The Latin and French translations are quite unique and testify both to the international resonance of his work and its urgency for an audience who did not read Italian.²⁴ It would be a similar fate for the Italian works of Galileo, which were soon translated into Latin. Another successful text was *In mechanicas quæstiones Aristotelis, paraphrasis paulo quidem plenior*, published for the first time in Rome in 1547 and subsequently issued in a second Venetian edition in 1565.²⁵ This writing contained the much-debated *Commentarium de certitudine mathematicarum disciplinarum*, which triggered vigorous disputes among the most important mathematicians of his time. Piccolomini's *Paraphrasis* was published in Italian translation by Oreste Vannucci Biringucci in Rome in 1582, but without the *Commentarium de certitudine*.²⁶ In the fifties Piccolomini started his major philosophical enterprise with the attempt to vulgarize the entire corpus of Aristotelian philosophy by rendering

18 Cerreta 1960, pp. 161–72; Belladonna 1972; Belladonna 1987; Buck 1983; Del Fante 1984; Baldi 2001; Cotugno 2006; Refini 2009; Refini 2012.

19 Cerreta 1960, pp. 19–38.

20 Alexander Aphrodisiensis 1540.

21 Piccolomini 1540.

22 Piccolomini 1550. On the importance of this translation see Pantin 2000.

23 Piccolomini 1568.

24 The 1568 edition also contains the translations of *Delle stelle fisse* and *Della grandezza della terra et dell'acqua*.

25 Piccolomini 1547.

26 Piccolomini 1582.

it into the vernacular. In 1551, in Rome he published *L'instrumento della filosofia*, which was a compendium of Aristotelian logic.²⁷ This textbook underwent seven further editions (1552, 1557, 1560, 1565, 1575) before the end of the century. Piccolomini revised his concept of logic in 1576, transforming it into a method, especially for natural philosophy, publishing *Instrumento della filosofia naturale*, which had a further edition of 1585.²⁸ In 1551 he also published *La prima parte della filosofia naturale*, which constituted a philosophical discussion of Aristotle's *Physica* and *De coelo*.²⁹ The three subsequent editions (1552, 1554, 1560) testify to the popularity of this work. In 1554, he published *La seconda parte de la filosofia naturale*,³⁰ which was issued with *La prima parte* in 1565 and 1585. The 1585 edition included Piccolomini's nephew Portio's *La terza parte della filosofia naturale*. In 1558 Piccolomini published *La Prima parte de le Theoriche ò vero Speculationi dei pianeti* and *Della grandezza della terra et dell'acqua*.³¹ The former went through three further editions (1558, 1568, one without a date), while the latter had only one additional edition in 1561, though it was translated in 1608 and 1618 into French, and in 1568 and 1588 into Latin with *De la sfera del mondo*. Finally, in 1578 Piccolomini published his *De noua ecclesiastici calendarii* in Siena.

This concise overview shows Piccolomini to have been one of the most prolific and popular philosophers of his time. We can find his works in the libraries of famous intellectuals like Christoph Clavius, Giordano Bruno, Benet Pereira, Galileo Galilei – just to name a few – to gain a sense of his importance. In spite of his popularity, however, Piccolomini's natural philosophy and his scientific work have generally been neglected by the scholarship.³² It is significant that no study was devoted to this philosophical and scientific figure before 1969.³³ His name seldom features in studies on the debate about mathematical certainty or investigations into the reception of Johannes de Sacrobosco's astronomy in the Renaissance.³⁴ Even the most important investigation into Piccolomini's contribution to science, published in 1969 by Rufus Suter, failed to understand Piccolomini real contribution in the promotion of a new Aristotelian epistemology, epitomizing him as a mere “popularizer of science”, “a marvellously clear and entertaining expositor” of Aristotle.³⁵

The objective of this paper is to provide an insight into Piccolomini's philosophical mind in his historical context, focusing in particular on the role he played in creating a new epistemology – that is, his theory of acquiring

27 Piccolomini 1551a.

28 Piccolomini 1576.

29 Piccolomini 1551b.

30 Piccolomini, 1554.

31 Piccolomini 1558; Piccolomini 1561.

32 Caroti's investigation of natural philosophy is an exception, see Caroti 2003.

33 See Cerreta 1960, pp. 19–48.

34 Giacobbe 1972; De Pace 1993; Mancosu 1999; Cozzoli 2007; Ferraro 2010; Biard 2011; Cozzoli 2011; Duhem 2015, pp. 81–83.

35 Suter 1969, p. 210.

and promoting scientific knowledge. In this way, it may be possible to follow the transformations of Aristotelianism in the crucial period of transition from the Middle Ages to the early modern period.

2. NEW EXPERIENCES AND SCIENTIFIC METHOD

The first element to be assessed in Piccolomini's epistemology is his idea of the scientific method, which revises that of his many fellow exponents of Renaissance Aristotelianism. Indeed, Piccolomini made an important contribution to the elaboration of the Aristotelian methodology of regressus, considered by university professors to be the main tool for scientific discovery. In general, regressus theory comprises two main stages and has its origin in Averroes's interpretation of Aristotelian logic, for which science was possible only by a twofold process. The first step is a kind of resolution (or analysis) and mainly employs the tools of induction and of an argument from effects to cause (also called demonstration τοῦ ὅτι, *quia, quod, ab effectu, ab signo, prius nobis*). The second step is characterized by composition (or synthesis) and always employs the tool of arguing from cause to effect (also called demonstration τοῦ διότι or *propter quid, prius naturae*) in the form of a syllogism.

Scholarship has devoted a great deal of attention to these two steps, but there is as yet no detailed treatment of the origin and history of the intermediate process between these two stages, appearing at the end of the fifteenth century. This process is variously referred

to as mental consideration (*mentalis consideratio*) or negotiation of the intellect (*negotiatio intellectus*). In spite of the absence of enquiry, it is on this intermediate stage of regressus that scholars have placed most weight in establishing continuity or discontinuity between the Aristotelian regressus and early modern epistemology. Among the supporters of the continuity thesis there is William A. Wallace, who saw mental examination as the forerunner of the modern *experimentum*.³⁶ Scholars such as Nicholas Jardine and Paolo Palmieri counter Wallace's interpretation of regressus, which transformed a mental examination into an experiment, implausibly tracing the *periculum* back to a process of controllable experimentation and measurement.³⁷ Jardine pointed out that in none of the regressus theorists is there a "hint that contrived experiment, or indeed any sort of elaborate or systematic appeal to observation, plays a role in scientific inquiry."³⁸

What is, then, this intermediate stage? In 1547, in his famous *Commentarium de certitudine mathematicarum*, Piccolomini wrote against the supporters of regressus theory – in a section repeatedly ignored by scholars – that he had never understood what they meant by negotiation of the intellect, claiming that they were introducing an obscure element into a logical process, which should have been clear and distinct if it was to lead to scientific knowledge.³⁹

36 Wallace 1998, p. 44.

37 Jardine 1976; Palmieri 2007, pp. 420–21.

38 Jardine 1976, p. 304.

39 Palmieri 2007, p. 421.

In his *L'istrumento della filosofia* (1551), Piccolomini sheds light on this obscure process. Here he stated that definition is the only tool that allows for reciprocity and connection between the two kinds of demonstration, providing not only the existence of the cause but also its essence, and thus identifying the convertible middle term for the demonstration *propter quid*. The main aim of the negotiation should therefore be that of finding the definition. Indeed, Piccolomini recognizes that it is hard and laborious to “make the definitions of things,” and after the exclusion of Platonic division as a method for finding definition because it does not lead to necessary conclusions, he proposes a combination of “three methods, that is, division, composition and then syllogism.”⁴⁰

Piccolomini places great emphasis on the process of composition – in particular of the genus with the differences – and establishes two methodical rules. First, it is necessary to combine the differences gradually, without jumping to a conclusion, and according to their degree of extension, beginning with those closer to what is being defined. Second, the genus should be divided in an orderly way into the differences which are necessary in order to reconstruct what is being defined. The work of the mind by means of these two rules is called “negotio,” which is an explicit reference to the negotiation of the intellect. However, Piccolomini points out that these two rational rules are not always sufficient. Indeed, it may happen that determining

between two contradictory differences to attribute to a genus is not possible, and in this specific case one should appeal to sensation and experience.

Sensation and experience, therefore, can be helpful in an affirmative or negative way in selecting which of the two differences is the true one. Nonetheless, Piccolomini is aware of the weakness and provisional character of sensation, which can know only the accidents of things, and for this reason, since it cannot always be overriding, the intellect exchanges and substitutes common characteristics for essential and proper characteristics, falling in error and not determining the real definition and nature of a thing. The role of sensation remains pivotal, and this is the reason why

philosophers sweated in discovering with long observations and care, with anatomies and dissections of animals, plants, stones and of any other thing, for understanding well which nature, part and condition were attributed to and followed by these or those accidents, in such a way as to know gradually the proper accidents of things.⁴¹

It is remarkable that Piccolomini should place such an emphasis on the analytical process of observation based on anatomies and dissections in establishing the true differences which made scientific knowledge possible. It has a precedent in the vernacular treatise of the Venetian physician and surgeon

40 Piccolomini 1551, p. 203.

41 Piccolomini 1551, p. 209.

Nicolò Massa, entitled *Loica* (1549), which represents one of the very few logical textbooks written in Italian before Piccolomini's *L'istrumento della filosofia*. But his knowledge of anatomy and dissection most likely comes from his personal acquaintance with Andreas Vesalius, who himself attended the reunion of the Accademia degli Inflammati during his stay in Padua.⁴² Finally, thanks to Piccolomini's friend Benedetto Varchi we know about the scientific activities of the new-born academies, and among them we can list that of anatomizing and dissecting bodies in open daylight in the presence of a coterie of intellectuals – not only physicians, but also painters and natural philosophers, who were evidently interested in identifying the anatomical details that would then be portrayed in their paintings or described in their treatises.⁴³ Given the extent of this personal experience, it is not surprising that Piccolomini gave such weight to anatomical observation as being capable of distinguishing the most subtle details of matter.

In revising the Aristotelian notion of the negotiation of the intellect he opens up empirical and experimental approaches typical of early modern philosophy, not so far removed from what Wallace himself envisaged, and which we can recognize in important early modern philosophers like Galileo Galilei.⁴⁴

In other works, Piccolomini terms these experiences based on diligent

observation and sensate experiences (*sensate esperienze*). The expression should sound familiar to Galileo's scholarship since it represents one of the technical concepts of his epistemology, occurring more than a hundred times in his works. In *La sfera del mondo* (1540), Piccolomini states that when "frequent sensate experiences are lacking, there is also lack of certainty in the conclusion, and consequently robustness in the sciences."⁴⁵ Indeed, Piccolomini believes that every scientific conclusion should be based on sensate experiences.

But what are sensate experiences? Piccolomini illuminates the matter in the *Della grandezza della terra et dell'acqua* (1558). In the "Proem" he writes that the validity of sensate experiences is superior to the authority of Aristotle, and only when demonstrative reasons and sensate experiences are missing should one follow the Stagirite's words.⁴⁶ Moreover, in a paragraph entitled "Approach adopted by Aristotle to the things made manifest by sensation" he affirms that the idea that sensate experiences were superior to the authority of reason is identical to the approach used by Aristotle himself,⁴⁷ anticipating a central claim that we will find in Galileo's conception: "Aristotle, above all the philosophers, maintained the certainty of sensation [...] Supposing [sensate experience] to be most certain, he taught by philosophizing to discover its cause and what must follow from it."⁴⁸

42 Carlino 2012.

43 Varchi 1859, p. 665.

44 Wallace 1992.

45 Piccolomini 1540, p. 4.

46 Piccolomini 1561, p. 1v.

47 Piccolomini 1561, pp. 7v–8r.

48 Piccolomini 1561, p. 8r.

Furthermore, Piccolomini points out that these sensate experiences concern the investigation of natural phenomena, and that the method of discovery should be that of the physicians:

[...] medicine has risen to that level of excellence in which it stands because the experiences made by diligent and inquisitive observers from time to time have supplied the opportunity for the art of medicine to grow from hand to hand with the investigation of its causes.⁴⁹

Sensate experiences, through diligent observations and experiments, are the only means of acquiring scientific knowledge, that is of discovering the causes of natural phenomena. The case of medicine clearly shows that the accumulation of experience is an essential condition for scientific knowledge. Through sensate experiences and diligent observations even the most disputed problem can be solved. Such is the case, for instance with Aristotle's belief that the equator was not habitable. Indeed, Piccolomini explicitly writes that "about the habitability below the Equinoxial [land], and in many other matters, I trust the sensate experiences that have been made, more than Aristotle himself."⁵⁰ His search for whether there was more earth or water on Earth was primarily led by sensate experiences made through "peregrinations

and navigations."⁵¹ He based his idea of science on the progressive acquisition of sensate experiences, indeed

Geography, like any other science that knows more from sensation, does not depend on one observer and it cannot be acquired just once, but it requires the investigations of more persons, who from time to time, one person finding something that someone else did not, can improve it [Geography], providing more certainty."⁵²

Piccolomini develops an idea of science grounded in the notion of progress, especially in relation to those arts and sciences based on sensation. Indeed, this was a conception itself rooted in the Aristotelian tradition, especially the peculiar interpretation of *Metaphysica* 993 b 2–3, 11–18, and in *Elenchi sophistici* 183 b 17–23, which the famous Pietro Pomponazzi gave of these passages. Pomponazzi continuously asserted throughout his *De naturalium effectuum causis sive de incantationibus* that "science is made by additional discoveries (*scientiae enim fiunt per additamenta*),"⁵³ gained by means of experience. Behind these words lay a conception of science that was provisional and conjectural, especially in the investigation of natural phenomena, which was alien to the previous Aristotelian tradition. Pom-

49 Piccolomini 1561, p. 9v.

50 Piccolomini 1561, p. 2r.

51 Piccolomini 1561, p. 8v.

52 Piccolomini 1561, p. 8v.

53 Pomponazzi 1556, IX, l. 9; Peroratio, l. 15. Roman numbers designate chapters, while Arabic numbers the lines.

ponazzi was very aware of the provisional character of the knowledge of natural phenomena, and for this reason he repeatedly stressed the need for experiments (*experimenta*) and sensate experiences (*sensata*) in order to find a better solution.⁵⁴ Furthermore, he believed in history as a necessary tool for improving the individual and personal experience of natural philosophers and in the necessity of sharing these experiences. Pomponazzi was mentor to many members of the Accademia degli Inflammati, and no doubt his ideas circulated widely at that time and affected Piccolomini's thinking.

Indeed, in Piccolomini's claim that geography cannot be the work of a single scholar lies the idea that science is a collective enterprise advancing across time. Thus he did not confine himself only to the authority of Ptolemy, Strabo, and Pomponius Mela, because they knew only a small part of the terrestrial globe. He based his knowledge on "the most diligent observers" and on "bold navigations made [...] not many decades ago, by the Genoese, and after them by the Portuguese, and finally the Castilians."⁵⁵ But reading about these voyages did not sate his intellectual curiosity, and so he spoke directly with many travellers, navigators and sailors, and had experience of marvellous artisanal armillary spheres, reproductions of the Earth, in the houses of the Cardinal of Carpi, of Cardinal Visio, of the Archbishop of Corfu and of

the Duke of Palliano.⁵⁶ It was by means of one of these spheres that Piccolomini conducted the experiment which proved his hypothesis.⁵⁷

3. MATHEMATICS AND NATURAL PHILOSOPHY

Only if we very carefully consider Piccolomini's epistemological reliance on sensate experiences for the progress of science, can we understand another cornerstone of his epistemology – that is, the controversial relationship between mathematics and scientific knowledge. It is well-known that the *Commentarium de certitudine mathematicarum disciplinarum* rejects the identification of mathematical demonstrations with regressus theory, which means ultimately rejecting the identification of mathematics with natural philosophy based on sensate experiences. However, at the same time Piccolomini held onto the idea that mathematics had that highest degree of certainty of scientific knowledge. How is this possible?

While for Medieval and Renaissance philosophers the highest degree of certainty for mathematics was due to the peculiar form of the regressus' argumentation, for Piccolomini—who based his ideas on Proclus's *Commentary on the First Book of Euclid's Elements* published by Simon Grynaeus in 1533—the certainty of mathematical knowledge results from the fact that mathematical entities are constructed or abstracted in the mind, and thus the mathematician

54 On the importance of experiments and experience see Pomponazzi 1556, I, ll. 8–9; I, ll. 203–204; II, l. 8; IV, l. 178; X, ll. 14–25.

55 Piccolomini 1561, p. 9r.

56 Piccolomini 1561, p. 9v.

57 Piccolomini 1561, p. 10r.

knew these as truths since he himself had made them.⁵⁸ However, for Piccolomini it was impossible for mathematical demonstrations to lead to scientific knowledge because they did not involve any of the four Aristotelian causes by means of which sensate experiences had to be explained. Mathematics, in the wake of the “maker’s knowledge” tradition,⁵⁹ was judged to be certain because its objects were constructed, yet it could not explain natural phenomena, because it did not involve sensate experiences, only artificial products of the mind.

Piccolomini’s epistemological attitude is more fully fleshed out in his *La prima parte dele theoriche overo speculationi dei pianeti* (1558). In the digression “Of whether the representations invented by the astrologers to save the appearances of the planets are based on anything real in nature,” Piccolomini maintained that the “Ptolemaic planetary theory is useful to the practical astronomer but represents nothing real,” just as “Osiander had written fifteen years earlier in his brief preface to Copernicus’ *De revolutionibus* about Copernican theory.”⁶⁰ Piccolomini writes that

Some [critics] hold that Ptolemy and the astrologers whom he followed, and the astrologers who have followed him, represent eccentrics and epicycles as existing in the celestial spheres because they really believe those spheres to be arranged thus

[...] In this regard, first of all I do not wish to stop at this point to argue whether such representations are of possible things or of impossible things, of things friendly toward or inimical toward and repugnant to Nature. For their possibility or their impossibility does nothing, or very little, to secure to the astrologers their intention, which is merely to find some way to save if possible, the appearances of the planets, together with the ability to calculate them, compute them, and predict them from time to time. But I wish to be bold enough to say that if these critics think that Ptolemy and his followers have invented or conformed to such representations in the firm belief that in Nature it is thus, they resolutely deceive themselves. For it is more than enough for the aforesaid astrologers that their representations be able to save for them the appearances among the celestial bodies so that they can compute their motions, positions, and places, whether such representations be true or not true, provided that they succeed in saving the appearances. The other considerations, in which they have little interest, they have left to the natural philosophers.⁶¹

The validity of the astrologers’ reasoning is not diminished simply on the grounds that their mathematical models do not correspond to reality. Piccolomini is clear in saying that while astrologers

58 Proclus 1970, pp. 11–2.

59 Pérez-Ramos 1988.

60 Suter 1969, p. 213.

61 Piccolomini 1558, pp. 22r–v, translated by Suter in Suter 1969, p. 212.

were in the process of inventing their representations, “they had little concern whether the things they were imagining were more necessary than probable or false.”⁶² Indeed

as with logicians there can through force of inference arise a conclusion from false premises, so an effect can be inferred and deduced from a pretended cause. Logicians will conclude by a formally correct inference and a valid syllogism that since every stone is an animal and every man is a stone, therefore necessarily every man is an animal. This true conclusion, though it sustains its truth by itself, would nevertheless still sustain it on the strength of those propositions, if they were true. For the violence and force of the nature of good syllogism would entail it. Similarly, granted that eccentrics and epicycles are not in the nature of things and that the appearances of the planets derive from other proper and true causes which we do not know, nevertheless if they actually existed such same appearances would necessarily be inferable from them. And this suffices for the astrologers.⁶³

In the following passage Piccolomini explains that astrologers, that is mathematicians, deal with “how” a natural

phenomenon happens, rather than “why” it happens.

[...] suppose that we should see a stone strike a wall and with great force, and not knowing the origin of such fury we should imagine that the stone had come from a bow or a crossbow. And suppose that our representations were false and that, as chance would have it, the stone had come from a sling shot. Nevertheless, it would have struck the wall with the same fury if it had come from the imagined bow. For the aforesaid fury of that stone could have derived from more than one cause. Thus again, though the real causes of the many appearances which we see in the planets in the sky are hidden to us, still it is enough for us that, supposing these representations to be true, these appearances which we see would just the same derive from them. This for us is more than sufficient for the calculations and for the predictions and for the notices which we must have for the positions, places, magnitudes, and motions of the planets.⁶⁴

The search for the cause is an activity exclusive to natural philosophers, who deal with sensate experiences, while mathematicians provide only a numerical representation to fit with the movement of celestial bodies. In their description the real causes remain hidden to us. The reason for this ignorance

62 Piccolomini 1558, pp. 22r-v, translated by Suter in Suter 1969, p. 213.

63 Piccolomini 1558, 22v, translated by Suter in Suter 1969, p. 212.

64 Piccolomini 1558, 22v, translated by Suter in Suter 1969, pp. 212–3, slightly modified.

is the fact that “such bodies being too far from us for our senses to acquire truth and certainty about them, which would then have to sustain demonstration.”⁶⁵ For this reason no scientific knowledge seems possible in the field of astronomy, to the extent that—following Lucretius—we should assign to celestial bodies only “some probable causes, or such that if they had been true those effects would necessarily have followed.”⁶⁶ According to Piccolomini, “although an effect cannot have more than one proper, real, and necessary cause,” in mathematical reasoning, “an effect can derive not only probably but also necessarily from more than one cause, not on account of the nature of the causes, but by force of supposition and inference,” as he demonstrated in the case of the stone that strikes a wall.⁶⁷ Mathematical knowledge, therefore, is certain in describing how astronomical events happen, but provides only probable and not scientific, that is casual, knowledge of these events.

4. A NEW VISION OF KNOWLEDGE

In synthesis from what we have seen, Piccolomini developed some novel and original ideas about the importance of sensation, observation and anatomy for science, and about the relation between mathematical and scientific knowledge.

He developed a somewhat fresh and innovative empirical and experiential epistemology, which, nonetheless, being based on sensate experiences, led him to deny the sun’s central position in the universe and to defend the immovability of the earth. Regrettably, Piccolomini did not have Galileo’s telescope for investigating the truth of celestial bodies and their movements. He did not have the technology to prove that Copernicus was right and Ptolemy wrong, to become one of the founders of early modern science and philosophy, but perhaps this is not the correct way to assess his philosophical standing. His strong attachment to the validity of sensation and observation allowed him to develop an epistemology capable of refuting abstract reasoning and authorities that would deny sensate experiences. Indeed, upon improbable principles and hypotheses, natural philosophers

have so obstinately based the reasons for the effects of nature that[,] although they have not often looked at sense itself, but rather have preferred to deny sense, and, following the falsity of their principles, to arrive at inextricable entanglements, proceeding from those reasons they exhaust themselves inventing other principles which square with sense. However, on the contrary, every good philosopher ought always to build upon unimpeded and undeceived sense, and compare with that every discord with which one has to deal.⁶⁸

65 Piccolomini 1558, 23r, translated by Suter in Suter 1969, p. 213.

66 Piccolomini 1558, 23r, translated by Suter in Suter 1969, p. 213.

67 Piccolomini 1558, 23r, translated by Suter in Suter 1969, p. 213.

68 Piccolomini 1560, 75r, translation by Suter in Suter 1969, p. 213, slightly modified.

In *Della grandezza della terra et dell'acqua*, in considering the novelties and discoveries of his time Piccolomini wrote that if the ancients had had the benefit of direct sensate experience (*sen-satamente*) of the New Spain, the city of Tenochtitlan, the lands of Peru and Argentina, they would have changed their opinions on many scientific and philosophical problems.⁶⁹ These novelties were awkward and game-changing facts, which stripped ancient doctrines and books of their authority as repositories of infallible knowledge. There are clearly echoes of what we will find in Galileo when he wrote that if Aristotle were alive and could have looked into the telescope, he would have changed his doctrines. In endorsing Aristotle's epistemology by using sensate experiences against authorities in his *L'istrumento della filosofia*, Piccolomini states that

in order to be more Aristotelian, I shall rely more on unerring sensation, rather than arguments, and I will trust these more than authority: which is as Aristotle himself always does, in the name of reason and sense abandoning all authority, even that of his own teacher.⁷⁰

And again, in his *La prima parte della filosofia naturale* he declared that "to better imitate Aristotle, I will leave Aristotle and his reasons, which will be no more than likely ... each time the sense shows me the opposite to be true ... Nor

do I believe that I can be deemed any less Aristotelian, this being the authentic Aristotelian way of philosophizing."⁷¹

Piccolomini did not fight only for freedom from the authorities, but also for the democratization of knowledge. For a long time in the Middle Ages, as well as later into Humanism, the man of learning was viewed as something akin to a magician who had the power to penetrate the inner nature of reality, the secrets of which had to be kept hidden from the common people to avoid its debasement. Aristotelian philosophy was restricted to a handful of people. This situation changed with the idea of the vulgarization of knowledge promoted by vernacular Aristotelianism, according to which to vulgarize does not simply mean to translate into the vernacular but also to popularize. Thanks primarily to Aristotle's vulgarizers, the value of scholarly secrecy in Renaissance Italy waned, and sharing knowledge became a moral obligation. Knowledge was no longer perceived as predominantly closed or aristocratic;⁷² it is now more open, democratic and egalitarian, even if the access to knowledge was still difficult. In terms of opening up knowledge, Aristotelian vernacular works and authors such as Antonio Tridapale and Giovanni Battista Gelli were ahead of their time, anticipating certain aspects of early modern science and philosophy.⁷³ In 1547 the modest mid-sixteenth-cen-

69 Piccolomini 1561, pp. 28v.

70 Piccolomini 1551, pp. aiiiv-aiiir.

71 Piccolomini 1551, pp. 10–11. For a detailed discussion on this conception see Sgarbi 2017.

72 Rossi 1997, p. 19.

73 Sgarbi 2014; Sgarbi 2016a.

tury intellectual Antonio Tridapale dal Borgo – whose only merit was to be the first to publish a textbook on logic in the Italian vernacular⁷⁴ – put this tendency of Aristotelian epistemology on display in commenting on Alexander the Great’s letter to Aristotle, contained in Plutarch’s *Parallel Lives*. Alexander criticizes Aristotle for having divulged and taught his philosophy – once the prerogative of a few – among the common people and even his enemies. According to Alexander, philosophical knowledge is a form of power that dissipates once it enters the public domain. Tridapale is against the idea that knowledge be the exclusive preserve of a small group of people if it leads to power and domination over others: knowledge must be available to all and, thus, in order to reach as many as possible, it must be written in the vernacular as well as in Latin. According to Giovan Battista Gelli’s *I capricci del Bottai*, published in the same year (1547), whoever believed that “it is not good that every uneducated person should be allowed to know what another has acquired over many years with great effort from Greek and Latin books” was not only a bad Christian, but a terrible human being.⁷⁵ Alexander the Great’s desire to keep all knowledge to himself and thereby maintain his power over other men is therefore to be considered inhuman. The highest ambition of Renaissance Aristotelians who published in the vernacular was not to conceal philosophical doctrines, but

to assist others in gaining knowledge of those things that nature has made available to all human beings, even revealing the most difficult and arcane secrets of nature. Hence the need to popularize philosophy among the people.

Alessandro Piccolomini represents an exceptional exemplar of this tendency. In 1547 he published in Latin his *In mechanicas quaestiones Aristotelis paraphrasis paulo quidem plenior*, itself vulgarized in 1582 by Oreste Vannucci Biringucci under the title *Parafrasi di Monsignor Alessandro Piccolomini ... sopra le Mechaniche d’Aristotele*. Biringucci maintained that in order to “satisfy Piccolomini’s just and ardent desire to benefit all, without prejudice of any kind, easily and happily, he set about adorning our language with every kind of science,” and above all “regretted having written in Latin, alongside certain other fine works, during his best years, and among his studies also this paraphrase of the *Mechaniche d’Aristotele*, because he saw that since it was in Latin it was not accessible to those who could have made the best use of it,” that is “engineers and architects.”⁷⁶ Biringucci discloses that Piccolomini believed it was a mistake to write in Latin rather than the vernacular, because the intended audience was unable to read it.

For Alessandro Piccolomini the purpose of vulgarizing was “bringing those [Aristotelian] doctrines ... into our language, which is well suited ... to every science,” as well as “to untie, and open up, and illuminate a subject

74 Cf. Tridapale dal Borgo 1547, 2r; Sgarbi 2014, pp. 127–53.

75 Gelli 1976, p. 205.

76 Piccolomini 1582, p. 5.

so as to make it accessible, and so open in its intelligence that any who are not entirely uncouth and without ability may understand it, at least most of it.”⁷⁷ The techniques that were employed to make knowledge more accessible to any “uncouth and incapable” intellect differ from those used in straightforward translation. In the words of Piccolomini, a text may be vulgarized by “translating, commenting, or even expounding, annotating, paraphrasing, and abridging ... be it with pure comments, annotations, epitomes, or summaries.”⁷⁸ The objective of vulgarization was, first and foremost, to transmit knowledge to as large a section of society as possible. His targeted groups consisted not only of mature men: some of his works were written for women and youngsters, who for Piccolomini could contribute to the advancement of knowledge.

For Piccolomini, as for many other contemporary vulgarizers of Aristotle, it is absolutely clear that disseminating knowledge is not a case of casting the pearls of knowledge “before swine,” as a certain kind of culture that claimed lordship over knowledge presumed; on the contrary, it is a matter of supplying a vast public that has a thirst for education with the knowledge and the means to achieve cultural emancipation, not only for the sake of progress, but also for the purpose of ethical and moral edification:

It seemed to many ancient philosophers that to publish the sciences and make them clear to everyone was to throw away roses and pearls, and so they concealed what they knew with hieroglyphs, mysteries, fables, symbols, and enigmas, almost more than nature herself. And in so doing they showed themselves to be jealous of power and ungrateful, and unlike the giver of these and other graces. Even so there are some (albeit very few) who seek to defend them, saying that in this way the sciences maintained their reputation and dignity, because they were accessible only to fine minds and to the wealthy and important people And they say that by popularizing them and publishing them, good minds are put on a par with uncouth minds, and those who are notable and important with those who are low-caste and plebeian. Nor do they refrain from attacking those who have sought to defeat ignorance in the world and spread the sciences in all the languages.⁷⁹

What emerges from Piccolomini’s words is an idea of philosophical freedom in opposition to the obscurantism and subtleties of ancient philosophers and university professors alike. In Piccolomini there is a clear awareness that philosophy, and knowledge more generally, is not sectarian. Writing in the vernacular language is not a mere stylistic exercise, but a direct means of transmitting knowledge – a way of

77 Piccolomini 1565, pp. 4–5.

78 Piccolomini 1575, letter to readers.

79 Piccolomini 1582, p. 4.

increasing the stakes which might bring about new discoveries – a means of divulging knowledge to as wide a section of the population as possible. The vernacular epistemology claims full rights in terms of dignity and also in its capacity to express even the most complex philosophical and scientific concepts. Moreover, the use of the native tongue is increasingly felt to be necessary for the purpose of divulging knowledge outside the schools in order to conquer a different public, beyond the small coteries of university professors. Popularization of knowledge gives weight to the idea that early modern philosophy must proceed beyond a blind allegiance to ancient philosophical authorities, hiding behind what Sperone Speroni – Piccolomini's fellow at the *Accademia degli Inflammati* – describes as fables of words. Rather, its task is to add new content to ancient philosophy in order to “advance our industry,” namely our knowledge.⁸⁰

It is clear that within this thinking a new conception of knowledge was gestating, an idea that knowledge is not only power, but power that must be available to all, and here we can see the most radical rupture with a past in which knowledge was kept closely in the hands of clergy and university professors. It constitutes an indisputable impulse towards the democratization of knowledge generated by a new culture and a new Renaissance epistemology, which departed from the culture of Humanism, and which seems to portend

Francis Bacon's ideas of knowledge, power and progress.⁸¹ Power is the domination and taming of nature. In conclusion, Alessandro Piccolomini is a representative of a movement – vernacular Aristotelianism in Renaissance Italy – which is far from being conservative, authority-based and stagnant, as the early modern philosophers proclaimed it to be. He is not only a man of the book, trained in the Latinate seclusion of universities. His mental world is not bounded by knowledge contained in the works of the ancient authorities and largely limited to the small world of the Near East, of the Mediterranean, and of Europe. However, we should be wary of hasty generalizations and conclusions. It would be anachronistic to detach Piccolomini from the scholarly book-based context of his time: even if he is out to criticise them, his references remain those of previous centuries – Aristotle, Ptolemy, Pliny and Sacrobosco. Piccolomini committed himself as ardently to new sensate experiences as to traditional ideas: he used both the new evidence and time-honoured classical authorities to support his theories.

Piccolomini's epistemology was anything but naïve or retrograde and it engages with the most important issues that will come to dominate discussion in the emergence of early modern science. We should not wait for Francis Bacon or Galileo Galilei for the development of an epistemology based on the activities of practitioners and on observations. His scientific thought within the context of vernacular

80 Speroni 1999, p. 184.

81 Vickers 1992.

Aristotelianism provides a glimpse as to how lesser traces and minor figures are often better indicators of the features of an age than major protagonists, since the latter are often unique, while the former represent a whole generation of intellectuals who supplied the impulse for a new way of thinking.

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