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Introduction

Pietro Daniel Omodeo

Bernardino Telesio of Cosenza is one of the Renaissance thinkers who most strenuously defended the ideal of inductive science. He envisaged an inquiry of nature firmly anchored in empirical observation in a time in which this was far from common. A priori approaches, resting on standard *corpora* and a set of acknowledged authorities, prevailed in higher education and scholarly debates, despite the rise of a new practical culture in wide sectors of society. Telesio, who has been aptly called *uomo di un sol libro* (man of one book),[1] continuously revised his major work *De rerum natura iuxta propria principia* throughout his life. This 'work of a life' underwent various changes, substantial amendments and extensions, and appeared in three editions (Rome 1565, Naples 1570 and 1586). But its fundamental message was clear from the outset: Telesio urged natural philosophers to embrace an empirical, sensible investigation of the world. This method, contrasting with the 'bookish culture of the Schools', would provide the basis for a renewal of a philosophy ideally addressing *nature itself* instead of abstract metaphysics. His contemporaries celebrated him for this attitude as a restorer of pre-Socratic naturalism, as is documented by the triangular exchanges between himself, his pupil, the physician Antonio Persio of Matera, and the neo-Platonic philosopher Francesco Patrizi.[2] The 1570 edition began with a programmatic chapter (later adopted as the *prooemium* to the last edition) asserting that "The structure of the world and the nature of the bodies it entails should not be investigated through reason, as the ancients did, but they should be perceived by means of the senses and derived from the things themselves."[3] Telesio's refusal of abstract rationalism coupled with an anti-Aristotelian and anti-Scholastic drive resulted in opposing reactions: the indignation of university professors and ecclesiastical authorities on the one hand and the admiration of generations of *novatores* on the other. He also composed a series of *opuscula* dealing with aspects of the natural world, ranging from meteorology to the doctrine of the soul,

[1] Garin, "Postilla telesiana", 444.
[2] See Garin, "Nota telesiana: Antonio Persio" and Puliafito, "Introduzione" to Telesio, *Delle cose naturali*.
[3] Telesio, *De rerum natura iuxta propria principia, liber primus, et secundus, denuo editi* (1570), f. 2*r*: "Cap. 1. Mundi constructionem corporumque in eo contentorum naturam non ratione, quod Antiquioribus factum est, inqirendam, sed sensu percipiendam et ab ipsis habendam esse rebus." Cf. Bondì, "Introduzione" to Telesio, *La natura secondo i suoi princìpi*, p. XVI.

as integral components of his all-encompassing natural philosophy.[4] Those *opuscula* were partly published as lone-standing essays (as was the case with *Ad Felicem Momonam iris* on the rainbow in 1566), partly attached to Telesio's main work (*De mari*, *De his quae in aere fiunt* and *De colorum generatione* accompanying the 1570 edition), and partly printed in a posthumous collection of *meteorologica* and *parva naturalia* edited by Antonio Persio under the title *Varii de naturalibus rebus libelli* (Venice, 1590).[5]

Materialist historians of science have suggested that the social roots of Telesio's sensualism are the same as those which determined the emergence of modern empirical science. In the context of a practically-oriented society, that of early European capitalism, the traditional divides between practitioners and learned élites were challenged and revised; in this context, a new class of scholars emerged, that of proto-scientists who combined the empirical knowledge of artist-engineers and the systematic reasoning of university scholars and learned humanists. The Renaissance produced many instances of this new type of intellectual: from Leonardo da Vinci to Girolamo Cardano, Niccolò Tartaglia, Guidobaldo Del Monte, Giovanni Battista Benedetti, Simon Stevin and Galileo Galilei.[6] The Marxist historian Edgar Zilsel indicated the 'magnetic philosopher' William Gilbert as the champion of modern experimentalism and stressed that he shared the critical attitude and radical anti-Aristotelianism of Italian philosophers such as Telesio, Tommaso Campanella, Giordano Bruno and Patrizi. However, he remarked that their naturalism should be seen as the "older brother, not the father" of experimental science, since Gilbert's science *directly* stemmed from the practical knowledge of miners, foundrymen, navigators and instrument-makers, and not from sheer philosophical discourses as in Telesio.[7] Interestingly enough, Zilsel describes Francis Bacon, together with Gilbert and Galileo, as another exemplar of the modern scientist, in spite of the fact that his contribution to science remained limited to its philosophical legitimation. Bacon's science-oriented philosophy rested on inductive logic, rejected metaphysics and aimed at the advancement of knowledge for the benefit of mankind.[8] Regrettably, Zilsel failed to take into account Bacon's keen interest in Telesio's ideas, despite the ideal link between the latter's sensualism and the former's empiricism.[9] Moreover, although the technological utopia of the

[4] Granada, "Introduzione" to Telesio, *Varii de naturalibus rebus libelli ab Antonio Persio editi* [1590], p. XII.
[5] Cf. Telesio, *Ad Felicem Moimonam iris* [1566] and *Varii de naturalibus rebus libelli ab Antonio Persio editi* [1590].
[6] Zilsel, "Sociological Roots of Science". Among the many scholarly works drawing on Zilselian premises, see Renn, *Galileo in Context*. For a discussion of Zilsel's intellectual milieu cf. Long, *Artisan/Practitioners and the Rise of the New Sciences*, Chap. 1.
[7] Id., "The Origins of William Gilbert's Scientific Method", 24.
[8] Id., "Sociological Roots of Science", 943-945.
[9] See *infra*, Bondì, Chap. 1.

Nova Atlantis (1627) is foreign to Telesio, his philosophical work played a comparable role in promoting scientific culture – if not that of the Royal Society, undeniably that of the *Accademia dei Lincei* surrounding Galileian science; Telesio was also often credited with being the founder of the *Accademia cosentina* in his hometown.[10] Differently from Bacon, and in addition to his advocacy of empiricism and his rejection of transcendence as a source of natural explanation, Telesio provided another significant contribution to the scientific culture of his age. Indeed, his work stands out as the first modern attempt at a new foundation, and systematic elaboration, of natural philosophy. His most daring idea was that the entire architecture of natural philosophy could be erected on foundations different from those inherited from the past and that the principles of nature should be established anew, independently of academic traditions and scholarly authority. Such an uneasy but ambitious path was followed by his admirers, *in primis* Patrizi, Bruno and Campanella. Soon, the philosophical assessment of the first principles of nature and of its 'laws' became an integral part of the scientific debates, as is evidenced by the philosophical systems of René Descartes, Pierre Gassendi and of other scholars of their century. In their age, that of mechanical philosophy, problems of physics, astronomy and physiology were embedded within heated controversies over competing systems of nature.

A witness of the European reception of Telesio, the Oxford erudite librarian Robert Burton, mentioned him in a curious passage on "air rectified" of his multifaceted Renaissance encyclopaedia, *The Anatomy of Melancholy* (1621):

> Or, to omit all smaller controversies, as matters of less moment, and examine that main paradox of the Earth's motion, now so much in question: Aristarchus Samius, Pythagoras, maintained it of old, Democritus, and many of their scholars. Didacus Astunica, Anthony Foscarinus, a Carmelite, and some other commentators, will have Job to insinuate as much [...]. Howsoever, it is revived since by Copernicus, not as a truth, but a supposition, as he himself confesseth in the Preface to Pope Nicholas, but now maintained in good earnest by Calcagninus, Telesius, Kepler, Rothman, Gilbert, Digges, Galileo, Campanella, and especially by Lansbergius [...], by Origanus, and some others of his followers.[11]

Burton includes Telesio among the realist Copernicans and defenders of terrestrial motion. In the above-mentioned passage, he discusses heliocentric theory referring to more or less legendary forerunners of Copernicus in antiquity, in accordance with a widespread cliché. The

[10] See *infra*, Giannini, Chap. 11.
[11] Burton, *Anatomy of Melancholy*, pt. 2, sec. 2, 52. On the British reception of Telesio, see Plastina, "Telesio nell'Inghilterra del Seicento".

supporters of the reconcilability of terrestrial motion and biblical exegesis, and eventually natural philosophers and astronomers, follow in Burton's list. Burton brings together Celio Calcagnini, the humanistic author of a sceptical exercise defending terrestrial motion, *Quod coelum stet, Terra autem moveatur* (written around 1518-1519 and first printed in 1544), with affirmed mathematicians and astronomers, who upheld either heliocentrism or only the axial rotation of the Earth, e.g. the German ephemerist David Origanus. Telesio's follower, Campanella, earned a place next to Galileo Galilei and Johannes Kepler owing to his *Apologia pro Galilaeo* (written in 1616 and first printed in 1622), a defence of Galileo which was actually meant to defend the philosophical freedom to discuss and argue in favour of Copernicus in the year of the Roman censure of the main theses of *De revolutionibus orbium coelestium*.[12] In this context, the mention of Telesio strikes the modern historian of Renaissance science because he is seldom mentioned among the protagonists of the 'Scientific Revolution' and never among those of the 'Copernican Revolution'.

Telesio did not adhere to the doctrine of terrestrial motion and did not take Copernicus into account in his monumental work. Astronomy remained peripheral to his intellectual endeavour. His most important study in this field is the booklet *De cometis et lacteo circulo* (*On Comets and the Milky Way*), written around 1580 and published posthumously by Persio (1590). Revising earlier opinions of his, he rejected the sublunary location of all comets and the explanation of their light as inflammations, and embraced an 'optical theory' according to which they reflect solar rays. Although he did not cast into doubt the existence of material spheres in the heavens nor the origin of comets from terrestrial exhalations, he derived evidence, on the basis of the observation of the comets of 1577 and 1572 (actually a supernova), that cometary bodies can trespass the boundaries of the sublunary world, and therefore that heavenly spheres are permeable. As to the Milky Way, discussed in the same treatise, he regarded it as a heavenly phenomenon, a condensation of celestial matter in the sphere of the fixed stars.[13] Thus, in spite of the ambitious program of a universal reform of natural philosophy

[12] The mention of Democritus, among the ancients, is puzzling. It would have been more apt to mention him, in a cosmological discussion, as a supporter of the plurality of worlds and, perhaps, of space infinity but not of terrestrial motion and heliocentrism. Actually it was Bruno's intention to back Copernican astronomy with an atomistic physics reminiscent of ancient doctrines, followed in this by the English reviver of the Epicurean philosophy, Nicholas Hill. Since both names are remarkably absent, one is tempted to see Burton's Democritus as an allusion to these controversial atomists, suspected of impiety and persecuted by religious authorities. For a comprehensive discussion of the Renaissance cosmological context, see my *Copernicus in the Cultural Debates of the Renaissance*. As to Telesio's conception of space, it has been argued that his rejection of the Aristotelian theory of places and the idea that it is independent of and prior to bodies contributed to the affirmation of modern views of space as homogeneous and absolute. See Schuhmann, "Le concept de l'espace chez Telesio".

[13] Cf. Granada, *Bernardino Telesio: Sobre los cometas y la Vía Láctea*, especially the introduction by the editor. For a summary, also see my review in the *Journal for the History of Astronomy*.

along an anti-Aristotelian line of thought, Telesio was not receptive to the most disruptive astronomical doctrines of his time. His astronomical views even presented a glaring contradiction such as the maintenance of Alpetragian celestial spheres despite their penetration by comets.[14] How then could Burton include Telesio among those scholars who read Copernicus in a *realist manner*, those who neglected the epistemological *caveat* of the anonymous *Letter to the reader* of *De revolutionibus* to consider the heliocentric theory as a 'mere' hypothesis for the mathematical sake of simplicity?[15] Is this really a sign of confusion on Burton's part? Or rather an insinuation, perhaps a hint to the ongoing debates on the status of geometry and physics in the explanation of the heavens? In this context, the reference to Telesio might be an ex-post reading mediated by the involvement in the astronomical controversies on the status of hypotheses by some of his estimators.

The Copernican philosopher Bruno, for one, acknowledged Telesio in *De la causa principio e uno* (1584) as "giudiciosissimo Telesio consentino" (the very discerning Telesio of Cosenza)[16] and began his 'physical' defence of heliocentric astronomy, *La cena de le ceneri* (1584), with a reference to the Telesian bipolarity of nature, the opposition between solar warmth and terrestrial coldness: "Two [are] the contrary and active first principles, heat and cold. Two, the first parents of the things in nature, the Sun and the Earth."[17] Doctrines that fell even closer to Telesio's were propagated by Campanella – the forceful defender of Galileo's *libertas philosophandi* in the years of the Affaire, the revolutionary who drafted his utopic views in *Città del Sole* and the survivor of the jails of Neapolitan and Roman Inquisitions who hazardously fled to France and attended the literary circles of Richelieu's Paris. Campanella dedicated to the powerful cardinal the Paris edition of *De sensu rerum et magia* (1637). In this work he stressed the ontological basis of Telesian sensualism, i.e. a vitalistic conception of nature based on the assumption of universal sensitivity: "That which is in the effects has to be in the causes, therefore the elements and the whole have sensation."[18] Following Telesio's philosophy, Campanella posited two opposed principles of the world, *sole* (Sun) and *terra*

[14] Lerner, "La physique céleste de Telesio".
[15] Burton's synthesis of the astronomical debates of the time seems to confuse the *Letter to the reader* with Copernicus's dedication to the pope, thereby ignoring Johannes Kepler's disclosure of the identity of the author of the epistle as the theologian Andreas Osiander, in *Astronomia nova* (1609).
[16] Bruno, *Opere italiane*, *De la causa* III, 677.
[17] Ibid., *Cena* I, 443: Doi [sono] cotrari et attivi principii: il caldo et il freddo. Doi primi parenti de le cose naturali: il Sole e la Terra." Engl. trans. from *Ash Wednesday Supper*, 82.
[18] Campanella, *Del senso delle cose e della magia* I 1: "Ciò ch'è negli effetti esser nelle cause, e però gli elementi e il mondo sentire." For a general introduction to Campanella's philosophy, see Ernst, *Tommaso Campanella*.

(Earth), both endowed with sensitivity which they communicate to the plants and animals they generate.[19]

These examples show that the meaning of Telesio's work for the scientific debates of the Renaissance goes beyond the limits of mathematical astronomy and particular sciences. For his early readers, Telesio's main achievement was his daring project to establish a new basis for the sciences by composing a philosophical system capable of providing a viable alternative to Aristotelianism. He regarded nature as a process ruled by the eternal struggle between the two active principles of heavenly warmth and terrestrial coldness ruling over matter.[20] Telesio claimed that individual natural beings universally follow a principle of self-preservation, emphasizing a concept of *conatus* which in the seventeenth century bridged views on physical inertia and animal life.[21] Self-preservation also allowed him to link the explanation of natural tendencies with human behaviour. In the last edition of *De rerum natura*, Telesio expanded on the domain of ethics and politics. In his view, the virtues first emerge as a support and regulation of primary vital functions and then evolve into complex moral systems aimed at satisfying the needs of society. The further assumption that individual drives are unwittingly co-opted in the universal realization of the common good earned Telesio a place among modern theological-political thinkers.[22]

Telesio was concerned not only with the general but also with the particular. He devoted his *opuscula* to the solution of particular scientific problems. The nine booklets gathered by Persio in 1590 comprised four brief treatises on issues that pertained to meteorology according to the Aristotelian tradition. Specifically, they dealt with comets and the Milky Way, winds and earthquakes, the rainbow and the sea, including the problem of the sea tides. The remaining five booklets dealt with problems of natural history that used to be labelled *parva naturalia*. One dealt with the unity of the soul against Galen, the others with the function of respiration, the nature of colours, taste and sleep. These writings meant to offer naturalistic explanations of these natural phenomena in line with the doctrine expounded in *De rerum natura*, while at the same time testing the soundness of that doctrine. They should be understood in the context of Telesio's confrontation with a scholarly tradition, both that of Aristotle and that of Galen, of

[19] As a further area of the reception of Telesio's views, one should mention the medical area, not only the well-known instance of Persio but possibly also within wider European circles, including those of radical Italian émigrés such as Agostino Doni of Cosenza. See *infra*, Suitner, Chap. 10.
[20] The most accurate introduction is Bondì, *Introduzione a Telesio*.
[21] See *infra*, Garau, Chap. 12. For a comparative treatment of self-preservation in Telesio and early-modern philosophy, see Mulsow, *Frühneuzeitliche Selbsterhaltung*, 193-200.
[22] Giglioni, "Introduzione".

which he was a fierce adversary. At the same time, they bear witness to Telesio's contribution to the scientific debates of his time.[23]

Telesio's immanent perspective on nature and its implications for the doctrine of the soul worried religious authorities even more than his anti-Aristotelianism – which, in the climate of counter-reformist Italy, could be seen as a threat against Thomistic orthodoxy. His treatment of the soul as a *spiritus* of entirely natural origin in the first editions of *De rerum natura* aroused the attention of ecclesiastical censors. On 28 April 1570, Telesio wrote to the main ecclesiastical authority in Cosenza, Cardinal Flavio Orsini, to defend himself against rumours concerning the impiety of his conceptions. "In truth – he wrote – these two books deal with nothing but the first bodies and the principles, that is, warmth/coldness, humidity and dryness. Very few things are asserted about the soul and only those that pertain to the matter of the principles and the sensitive and motive soul [...]."[24] The difficulty must have been serious and might explain the long time, from 1570 to 1586, that Telesio took to elaborate the last version of his work, in which the distinction between the *spiritus e semine eductus*, i.e. the natural soul, and the *anima a Deo immissa*, i.e. the soul of divine origin, was emphasized.[25] Nevertheless, this caution (or clarification) was not sufficient to avoid censure. The Clementine *Index librorum prohibitorum* of 1596 suspended *De rerum natura* and some of the small natural treatises with the clause *donec expurgetur*. As no expurgation was ever approved, Telesio's 'dangerous' works remained prohibited to orthodox Catholics up to 1900, when they were taken off Leo XIII's *Index*.

Telesio's troubles with censors should be read against the background of a climate of increased religious tensions and attempts at control and censure.[26] In the same year 1570 in which Telesio wrote his self-exculpation to Cardinal Orsini, the polymath Girolamo Cardano was tried by the Inquisition in Bologna for his heterodox views and astrology – sixteen years before this art was officially condemned by Sixtus V. He was subsequently forced to move to Rome, where he could be better controlled. The Neapolitan scientist Giambattista Della Porta was arrested in 1574 and condemned in Rome for necromancy. Many of his works, as for instance the Italian version of *De humana physiognomonia*, could not be printed. Patrizi, who

[23] In this volume, several studies are dedicated to Telesio's treatment of specific natural issues and their cultural context. See *infra*, Hirai (Chap. 3) on issues linked to the generation of life, Borrelli (Chap. 4) and Trabucco (Chap. 5) on heat, moving spirits and winds, Omodeo on sea tides (Chap. 6), Nenci (Chap. 7) and Mulsow (Chap. 8) on optics, light and the rainbow.

[24] De Mirandola, "Una lettera indedita di Telesio", 374: "Et veramente—he wrote—in questi doi libri non si tratta d'altro, che de li primi corpi, et de li principii cioè caldo freddo, humido, e secco. Dell'anima se ne dice pochissime cose. Et quelle sole, ch'appartengono alla materia delli principii, et all'anima sensitiva, et motiva [...]."

[25] See *infra*, Granada, Chap. 2.

[26] Ottaviani discusses early documents relative to the censure of Telesio's ideas. See *infra*, Chap. 9.

cherished Telesio's views and corresponded with him, was hired in Rome as a professor of Platonic philosophy and was immediately tried for the view on natural philosophy that he presented in *Nova de universis philosophia* (1591).[27] Among other allegations, he had to exculpate himself in 1592 from the suspicion of being a follower of Copernicus's system. As the Inquisition's documents read, "In *Pancosmia* [...] he [Patrizi] states 'that the motion of the Earth is by far in better agreement with reason than the motion of the heavens or the uppermost celestial bodies'. And he refers to Nicholas Copernicus' sentence according to which the sidereal heaven is immobile, along with the stars, while the Earth moves."[28] Some of Patrizi's persecutors were later involved in Bruno's trial and condemnation to death, as well as in the Galileo Affaire. After a first imprisonment in 1592, Campanella had a trial in Padua and Rome (1594-1595) leading to his abjuration upon being vehemently suspected of heresy. His subsequent imprisonment in the Inquisition's jails of Naples and Rome lasted thirty years (1597-1634); he was spared the death penalty only because he resisted horrible tortures that deformed him permanently and he pretended to be insane.[29] Galileo and his Padua associate, the natural philosopher Cesare Cremonini, were investigated together by the Padua Inquisition (1604).[30] Telesio's works were publicly burned in front of the cathedral of Naples on St. Peter and Paul's day in 1610, together with other prohibited books. Hence it is no wonder that authors he inspired were reluctant to mention him directly, as was likely the case with Della Porta's views on heat and moving spirits in *De aeris transmutationibus* (Rome, 1610).[31] Campanella's Telesian work *De sensu rerum et magia* was confiscated by his harassers; this forced him later to rewrite it by heart, in Italian, during his imprisonment and then to translate it back into Latin.

Notwithstanding this climate of suspicion and censure, Telesio's ideas subtly entered the scientific culture of the seventeenth century. Bacon is perhaps the most evident instance of such influence, but other examples can be mentioned. The English mathematician Henry Savile became acquainted with Telesio's philosophy during his continental *Bildungsreise*, discussed his ideas with Patrizi and Persio, and sent a copy of the 1570 edition of *De rerum natura* to the humanist Andreas Dudith-Sbardellati.[32] The founder of the *Accademia dei Lincei*, Federico

[27] Cf. Rotondò, "Cultura umanistica".
[28] Baldini and Spruit, *Catholic Church and Modern Science*, vol. I, 3, 51, doc. 1, 2216: "Lib. 17 Pancosmias fol. 103, pag. 1, col. 2.a ait quod Terram revolvi longe videtur esse rationi consonantius, quam Coelum, vel suprema astra moveri. Et refert sententiam Nicolai Copernici dicentis Coelum sydereum stare simul cum stellis, Terram vero moveri."
[29] Among others, see Del Col, *L'Inquisizione in Italia*, 552-565, and Black, *Italian Inquisition*, Chap. 7.
[30] Antonino Poppi, *Cremonini e Galileo inquisiti a Padova nel 1604: Nuovi documenti d'archivio* (Padova: Antenore, 1992).
[31] See *infra*, Borelli, Chap. 4.
[32] Iovine, "Henry Savile lettore di Bernardino Telesio".

Cesi, was profoundly influenced by Telesio's conceptions.[33] The philosophy of *De rerum natura iuxta propria principia* was held in great esteem and critically assessed by the Lynceans. Persio discussed with them Telesio's conceptions on the nature of light in the years following Galileo's astounding telescopic discoveries.[34] Further documentation of the circulation of Telesian views in the scientific debates of the seventeenth century is Galileo's references to his work. In the last part of the *Dialogo sopra i massimi sistemi del mondo* (1632) Galileo deemed it necessary to introduce his own 'proof' of the Copernican theory, a mechanical explanation of the sea tides, by distancing himself not only from astrological interpretations of the phenomenon but also from Telesio's 'thermo-dynamic' account.[35] In spite of his disagreement on specific points, Galileo fiercely reacted in defence of Telesio's memory when he was discredited by his opponents. In the course of their polemics over cometary theory, the Jesuit Orazio Grassi accused Galileo of following Cardano's and Telesio's "sterile and unfortunate philosophy" (*sterilem et infelicem philosophiam*).[36] Galileo's reply in *Il Saggiatore* (1623) in defence of the two natural thinkers was firm: "Does he [Grassi] not notice how impiously he deprives them of all their reputation in order to hide a small blot on that of his master?"[37]

In many ways, Telesio is emblematic of early-modern scientific culture. His attention to detail and experience and, at the same time, his aspiration to universality and all-comprehensiveness is typical of Renaissance science. His natural philosophy constituted a milestone in modern culture as a first systematic attempt at the foundation of the natural sciences, going counter to the Scholastic tradition. He is also representative of the ethical tensions affecting the natural debates of his age. His thought and its reception bear witness to the inseparability of natural sciences and philosophy in a time when the natural disciplines underwent a process of rapid change leading to an understanding of science and its methodology closer to that of our present day. This collection of essays is dedicated to him and the place of his thought at the crossroads of the natural sciences, philosophy, philology and the life sciences. The contributors to the volume focus on the scientific-cultural context of this thinker as well as his scientific roots, and they deal with the question of his influence on the natural sciences of early modernity.

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[33] Galluzzi, *Libertà di filosofare in Naturalibus*, 83-97.
[34] Gómez López, "Telesio y el debate sobre la naturaleza de la luz".
[35] See *infra*, Omodeo, Chap. 6.
[36] Grassi, "Libra astronomica", 118.
[37] Galilei, *Opera*, vol. VI, 236. On the reception of Telesio, also see Selmi, "'Formazione' e 'ricezione'".

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