Explaining Natural Science in Hexameters.
Scientific Didactic Epic in the Early Modern Era

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Didactic epic is one of the most intensely studied genres of Neo-Latin poetry. However, the numerous didactic poems that consider scientific topics as diverse as polar lights and balneology have to date received little attention. Insofar as these poems are considered at all, they are primarily understood as exercises in literary imitatio and demonstrations of poetic virtuosity, largely disregarding their professed objectives of explaining science to their readers. Focusing on a case study of the Iris (1730) by the Jesuit poet Carlo Noceti, the present article suggests that the formal aspects of these texts should not be evaluated in isolation from their contents. Rather, it seems preferable to treat them as serious attempts to familiarise readers with new notions, facts and insights in the age of the Scientific Revolution. The article is complemented by an Appendix listing all pertinent poems known to the author.

Early modern times saw the rapid development, transformation and conceptual unification (under the signs of empiricism, deductive reasoning and mathematics) of numerous disciplines concerned with the natural world. This process, often described as the “Scientific Revolution”, ultimately resulted in present-day natural science. In what follows, I refer to the disciplines affected by this process – not only the direct precursors of modern disciplines (including medicine and mathematics), but also those that were eventually marginalised in the process, such as astrology and alchemy – and to the technologies directly based on them collectively as (natural) science, following established practice in the modern history of science.

* Preliminary versions of this article were given as talks at Oxford, Budapest, Tübingen and Bochum. I would like to thank my listeners at these occasions as well as the anonymous referees for their perceptive comments and criticisms. Special thanks to Yasmin Haskell, who kindly sent me several of her studies on Jesuit didactic poetry.

1 The concept has been much contested over the last decades, but see now D. Wootton, The Invention of Science. A New History of the Scientific Revolution (New York, NY, 2015), for a powerful vindication.

2 Compare the range of disciplines included in the third and fourth volumes of the leading handbook in the field, the Cambridge History of Science: K. Park, L. Daston (ed.), Early Modern Science (Cambridge, 2006); R. Porter (ed.), Eighteenth-Century Science (Cambridge, 2003).

Humanistica Lovaniensia 68.1 (2019), 135-175 https://doi.org/10.30986/2019.135
The fact that the most important language of natural science well into the eighteenth century was Latin is well-known in principle. Its implications are however seldom considered and are often completely ignored. In fact, Neo-Latin literature covered all disciplines of early modern science and deployed a much broader array of genres than present-day scientific writing: monographic treatises, encyclopaedias, dictionaries, commentaries, textbooks, experimental and expedition reports, collections of observations, dissertations, research papers and reviews published in scientific journals, letters, biographies of scientists, academic orations, aphorisms, panegyric poetry and emblems being only some of the most common. In this way, Latin constituted an essential prerequisite to the success of the Scientific Revolution, as the latter depended on the efficient communication of its findings in a language that was understood across the entirety of Europe.

An attempt to verify these rather sweeping assertions as a whole is currently being made in a five-year project funded by the European Research Council and based at Innsbruck. In what follows, I would like to exemplify Neo-Latin’s efficiency as a medium of scientific communication by means of one specific genre, didactic epic.

The recognition of this genre in ancient literary theory has been extremely limited, but this has not deterred poets from writing quite self-consciously in it and modern scholarship from acknowledging its existence, although there is no complete agreement about its boundaries. In the present article, I take “didactic epic” to mean poetry in hexameters that is essentially non-narrative (although it may contain narrative inserts), professes a clearly recognisable didactic intent and treats a more or less complex topic in a coherent way (which presupposes a length of more than just a couple of lines). This excludes didactic verse in other metres such as elegiacs or iambics but includes hexameter poems falling

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3 M.D. Gordin, Scientific Babel. The Language of Science from the Fall of Latin to the Rise of English (London – Chicago, IL, 2015), 23-49. For a first overview of scientific literature in Latin by disciplines, see J. IJsewijn, D. Sacré, Companion to Neo-Latin Studies. Second, Entirely Rewritten Edition. Part 2 (Leuven, 1998), 324-361.

4 See https://www.uibk.ac.at/projects/noscemus.

5 The two major exceptions are the so-called Tractatus Coislianus, an epitome of a Peripatetic treatise from the Hellenistic era, and the late antique grammarian Diomedes. See E. Pöhlmann, “Charakteristika des römischen Lehrgedichts”, in Aufstieg und Niedergang der römischen Welt, vol. 1.3 (Berlin – New York, NY, 1973), 813-901, at 815-835; K. Volk, The Poetics of Latin Didactic. Lucretius, Vergil, Ovid, Manilius (Oxford, 2002), 26-34.
short of the poetic complexity of classics such as Lucretius’ *De rerum natura*.\(^6\)

In spite of its theoretical neglect and occasionally hazy contours, didactic epic is a foundational genre of European literature. The oldest didactic poem extant, Hesiod’s *Theogony*, may even antedate Homer’s *Iliad*, which would render it Europe’s earliest literary text altogether.\(^7\) The genre continued to flourish from archaic times until the end of the Roman era. It was also widely practised through the Middle Ages, albeit in a generally more mundane and unpretentious form aimed at the easy memorisation of dry learning contents. One may think of Alexander of Villedieu’s *Doctrinale* as an example.\(^8\)

Early modern times witnessed a boom in didactic poetry in general, not only in Latin hexameters, but also in a variety of other metres as well as in the vernaculars.\(^9\) Latin didactic epic, whose authors now aspired to the linguistic and compositional standards of their Roman models – Lucretius and Virgil above all others – remained among the most popular forms. Many hundred specimens are extant. The tradition apparently began around 1455 with Basini’s *Astronomica*\(^10\) and extended as far as the early nineteenth century, as well as some occasional latecomers in the twentieth century. Early modern didactic epicists went far beyond their ancient predecessors with regard to their contents: every

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\(^6\) For a more ambitious definition in terms of literary features, which excludes poems such as Hesiod’s *Theogony* and Parmenides’ Περὶ φύσεως, see Volk 2002 (as in n. 5), 34–43.

\(^7\) M.L. West (ed., com.), Hesiod, *Theogony* (Oxford, 1966), 46–48.

\(^8\) For the genre in antiquity, see Pöhlmann 1973 (as in n. 5); B. Effe, *Dichtung und Lehre. Untersuchungen zur Typologie des antiken Lehrgedichts* (München, 1977); Volk 2002 (as in n. 5), 25–68; M. Gale, “Didactic Epic”, in S. Harrison (ed.), *A Companion to Latin Literature* (Malden, MA, 2005), 101–115. For its later development, see R.M. Schuler, J.G. Fitch, “Theory and Context of the Didactic Poem. Some Classical, Medieval, and Later Continuities”, *Florilegium* 5 (1983), 1-43. A thorough overview of medieval didactic poetry is given by T. Haye, *Das lateinische Lehrgedicht im Mittelalter: Analyse einer Gattung* (Leiden, 1997).

\(^9\) W. Kühlmann, *Wissen als Poesie. Ein Grundriss zu Formen und Funktionen der frühneuzeitlichen Lehrdichtung im deutschen Kulturraum des 16. und 17. Jahrhunderts* (Berlin – Boston, MA, 2016), provides an overview of this wide and diverse field for the German-speaking world.

\(^10\) Here and in the following, early modern didactic poems on scientific topics are only cited with last name of author, short title and year of publication. For fuller bibliographical data, see the Appendix.
conceivable topic from coffee to logic and from the art of conversation to the polar lights could be treated in Latin hexameters.\textsuperscript{11}

A considerable part of this ample production was concerned with the natural sciences: the pertinent texts presently known to me number a little over one hundred, whereas 350 early modern didactic poems of indiscriminate content have been collected by an expert in the field.\textsuperscript{12}

Judging by the texts assembled in the Appendix, production started in the fifteenth century with Basini’s aforementioned poem and two others by Buonincontri, increased through the sixteenth century (24 examples written or first published then), decreased a little for unclear reasons in the seventeenth (19 examples) and reached a high peak in the eighteenth century (61), before abating in the nineteenth (4) and twentieth (1) centuries. During the seventeenth and eighteenth centuries, the Society of Jesus played a leading role in the field (41 poems), without eclipsing other traditions. How representative these numbers are is hard to say. They are presumably skewed to some extent in favour of eighteenth-century and Jesuit texts by the more frequent publication and superior preservation of later poems, by preexisting bibliographies focusing on – although not restricted to – the areas just mentioned (see the preliminary

\textsuperscript{11} Overviews: G. Roellenbleck, \textit{Das epische Lehrgedicht Italiens im 15. und 16. Jahrhundert} (München, 1975); H. Hofmann, “Seminar. Das neulateinische Lehrgedicht”, in S.P. Revard, F. Rädle, M.A. Di Cesare (ed.), \textit{Acta conventus Neo-Latini Guelpherbytani. Proceedings of the Sixth International Congress of Neo-Latin Studies} (Binghamton, NY, 1988), 401-436; W. Ludwig, “Neulateinische Lehrgedichte und Vergils Georgica”, in L. Braun (ed.), W. Ludwig, \textit{Litterae neolatinae. Schriften zur neulateinischen Literatur} (München, 1989), 100-127; IJsewijn, Sacré 1998 (as in n. 3), 38-45; Y. Haskell, Ph. Hardie (ed.), \textit{Poets and Teachers. Latin Didactic Poetry and the Didactic Authority of the Latin Poet from the Renaissance to the Present} (Bari, 1999); Y. Haskell, “The Classification of Neo-Latin Didactic Poetry from the Fifteenth to the Nineteenth Centuries”, in Ph. Ford, J. Bloemendal, Ch. Fantazzi (ed.), \textit{Brill’s Encyclopaedia of the Neo-Latin World} (Leiden – Boston, MA, 2014), 437-448; V. Moul, “Didactic Poetry”, in Ead. (ed.), \textit{A Guide to Neo-Latin Literature} (Cambridge, 2017), 180-199. For examples from the twentieth century, see IJsewijn, Sacré 1998 (as in n. 3), 38; Kühllmann 2016 (as in n. 9), 159. Some additional studies on specific aspects that are important in the present context: Haye 1997 (as in n. 8), 374-397 (texts from sixteenth-century Germany); Y. Haskell, “Work or Play? Latin Recreational Georgic Poetry of the Italian Renaissance”, \textit{Humanistica Lovaniensia} 48 (1999), 132-159 (how seriously does the respective type of didactic epic engage its readers?); H. Hofmann, “Aristaeus und seine Nachfolger. Bemerkungen zur Rezeption des Aristaeus-Epyllions in der neulateinischen Lehrdichtung”, \textit{Humanistica Lovaniensia} 52 (2003), 343-398 (narrative inserts; starts with a thorough overview of the genre at 343-349).

\textsuperscript{12} Y. Haskell, \textit{Loyola’s Bees. Ideology and Industry in Jesuit Latin Didactic Poetry} (Oxford, 2003), 4.
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remarks to the Appendix) and by the monumental collection of François Oudin s.j.’s Poemata didascalica (1749), which mainly contains Jesuit poems. However, I do not think that the overall picture is severely biased, as its unevenness is confirmed by my personal findings and can plausibly be explained by the didactic impetus of the Society of Jesus and the Enlightenment (below, sections 1 and 3).

The respective poems covered practically all early modern scientific disciplines. To begin with the apparently most unpoetic, mathematics, at least one prominent example of a poem that is largely dedicated to this discipline can be adduced, namely Bruno’s De minimo (1591). Not only Newtonian physics as a whole, as in Stay’s ten books on Philosophia recentior (1755-1792), but also most physical sub-disciplines from optics (Noceti, Iris, 1730) and acoustics (Zamagna, Echo, 1764) to hydrostatics (Thomas, Barometrum, 1749), electrostatics (Mazzolari, Electrica, 1767) and magnetism (Fellon, Magnes, 1696) received poetical treatment. Cosmology was discussed too, because it played a major role in Lucretius and because the controversy about the different world systems was a burning issue. It was however a dangerous topic: Bruno’s fate, caused in part by his insistence on an infinite and eternal universe (De innumerabilibus, immenso et infigurabili, 1591), is known all too well. Closely tied to this branch was astronomical and astrological epic (there was no clear divide between the two disciplines), which had an influential ancient model in Manilius’ Astronomica and whose most famous specimen today is Pontano’s Urania (1505). The sublunar world was treated, inter alia, in meteorological (Pontano, Meteorum, 1505), hydrological (Lagomarsini, De origine fontium, 1749) and seismological (le Febvre, Terra-motus, 1704) works. Botanical, zoological and mineralogical poems reflected the boom of natural history from the sixteenth century. Molnár’s triptych consisting of a Zoologicon, a Botanicon and a Oryctologicon (all 1780) can be considered a particularly systematic and exhaustive specimen. Medicine, including such

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13 See G. Aquilechcia, “Bruno’s Mathematical Dilemma in his Poem De minimo”, Renaissance Studies 5 (1991), 313-326.
14 See W. Hübner, “Die Rezeption des astrologischen Lehrgedichts des Manilius in der italienischen Renaissance”, in R. Schmitz, F. Krafft (ed.), Humanismus und Naturwissenschaften (Boppard, 1980), 39-67; Y. Haskell, “Latin Didactic Poetry on the Stars. Wonder, Myth, and Science”, Renaissance Studies 12 (1998), 495-522; I. Pantin, “Res contenta doceri? Renaissance Cosmological Poetry, Classical Models and the Poetics of Didascalica”, in Haskell, Hardie 1999 (as in n. 11), 21-34.

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areas as paediatrics (Alessandrini, *Paedotrophia*, 1547), dietetics (Habersack, *Medicina Austro-Viennensis versice exposita*, 1731) and psychosomatics (Flemyng, *Neuropathia*, 1740), was also popular; an influential early example is Fracastoro’s *Syphilis* (1530), which gave the French disease its modern name. Disciplines that were considered scientific in their day but no longer today are well-represented, too. This holds for the aforementioned astrology, for alchemy, explained in didactic verse since Augurello’s *Chrysopoeia* (1515), and for numerology (Bruno, *De monade*, 1591). Finally, technical applications of scientific insights were sung in Latin hexameter poems of the same making as those just mentioned: poets described scientific instruments such as the barometer (Addison, *Barometri descriptio*, 1698) and technologies like gunpowder (Tarillon, *Pulvis pyrius*, 1692) and the steam machine (Giaconeletti, *De lebetis materie et forma*, 1863). In exploring such a diversity of topics, scientific didactic epics can also vary considerably in terms of length (from a few dozen to ca. 20,000 lines), their descriptive or prescriptive stance, their literary inventiveness and polish, the depth of their engagement with the ancient tradition and their typographical presentation and paratextual apparatus.

In spite of its interest in terms of content and (in many cases) its formal virtuosity, the exposition of early modern science in Latin hexameters has to date received little scholarly attention. Historians of science have scarcely noticed the phenomenon at all. Within Neo-Latin studies, didactic poetry in general was among the first genres to kindle strong interest (see above, n. 11). But when it comes to natural science, only a handful of poems are available in modern scholarly editions and translations (see the Appendix), and only one monograph – *Loyola’s Bees* by Yasmin Haskell – devotes noteworthy space to such texts. Another, much older monograph exists on astronomical and astrological poetry in fifteenth-century Italy; poems devoted to these disciplines have generally fared a little better than the rest, perhaps because their ancient pedigree made them appear more respectable. Moreover, even in these

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15 See Y. Haskell, “Medical Didactic Poetry”, in Ford, Bloemendal, Fantazzi 2014 (as in n. 11), 1044-1045.
16 Haskell 2003 (as in n. 12), 118-244. See moreover L. Panizza (ed.), *Philosophical and Scientific Poetry in the Renaissance*, in Renaissance Studies 5 (1991), a thematic issue, most of whose contributions are however dedicated to vernacular texts.
17 See B. Soldati, *La poesia astrologica nel Quattrocento* (Firenze, 1906), and the literature cited above, n. 14.
laudable exceptions, the scientific nature of the respective poems rarely occupies the focus of attention: as a rule, they are approached as creative exercises in literary imitation rather than as documents of the history of science. The relevance of their natural scientific content and the presence of a serious didactic purpose is sometimes even explicitly denied. More often, the devaluation of these aspects manifests itself in a neglect of the exposition of science within the poems in favour of their more overtly literary and poetic features and, on a more general level, in a failure to recognise a body of scientific didactic that could be meaningfully distinguished from poems concerned with other thematic areas.

In the following, I would like to suggest that we should take natural-scientific didactic epic seriously with respect to its professed goal of explaining science. This is of course not to deny the obvious literary virtuosity and playfulness of many of the respective poems or their imitation of ancient models. However, these traits do not imply that the contents are just a pretext for putting up a literary show. Scientific didactic epic was a genuine attempt at familiarising an educated lay readership with the mass of discoveries and inventions that confronted people

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18 See, e.g., L. Bradner, *Musae Anglicanae. A History of Anglo-Latin Poetry* (New York, NY, 1940), 221 on English poems about scientific instruments which “did not have any serious purpose for or against science”; Haskell 1998 (as in n. 14), 504 on Pontano’s *Urania* which was “more decorative than didactic, *stricto sensu*”; Haskell 2003 (as in n. 12), 5: “[W]hat sort of pedagogical purpose will have been served by the contortions of the hexameter around some contemporary scientific theory?”; C. Schindler, “Wissen ist Macht! Niccolò Partenio Giangettasio (1648-1715) und die neulateinische Gelehrtenkultur der Jesuiten in Neapel”, *Scienza poetica* 18 (2014), 28–59, at 45 and 47: “Giangettasio ist also in seinen *Nautila* ebenso wie in seinen anderen Lehrdichtungen eher Dichter als Wissenschaftler, die ästhetische Gestaltung hat – darin den antiken Referenztexten nicht unähnlich – Primat vor dem Lehrstoff”; “Primat der Ästhetik vor der Wissenschaft”. Schindler’s article has reappeared in an abbreviated English version as “Exploring the Distinctiveness of Neo-Latin Jesuit Didactic Poetry in Naples: The Case of Niccolò Partenio Gianettiosio”, in R.A. Maryks (ed.), *Exploring Jesuit Distinctiveness. Interdisciplinary Perspectives on Ways of Proceeding within the Society of Jesus* (Leiden, 2016), 24-40.

19 As far as I can see, Haskell 2003 (as in n. 12), 178 is the only author to explicitly distinguish poems with natural-scientific content from others, even if the “Scientific Poetry” in her respective chapter title sits a little uncomfortably with the “‘Meteorological’ Georgic” in the title of the preceding chapter (118).

20 Cf. the exceptional assertion in Haye 1997 (as in n. 8), 396: “Lediglich in einem engeren Bereich der Wissenschaft, in der auch im 18. Jahrhundert die lateinische Sprache noch eine erhebliche Bedeutung besitzt, scheint die Komposition eines nicht ausschließlich literarischen, sondern ernsthaft belehrenden Gedichts weiterhin möglich.” In the following, he cites Bošković’s *De solis ac lunae defectibus* (1760) as an example.
in early modern times.\textsuperscript{21} In order to substantiate this claim, three kinds of argument will be provided. In the first place, some preconditions shall be called to mind; they concern (a) the premodern relationship between poetry and didactics, (b) the authors of the respective poems, (c) the model of Lucretius and (d) the poems’ language, Latin. Second, and most importantly, a number of poems will be viewed from the inside and their didactic techniques will be analysed. Finally, some aspects of their contemporary reception will be elucidated.

Throughout my discussion, I will try to illustrate my point with examples that are as representative as possible in terms of chronology, provenance and scientific discipline. My frequent recourse to poems from the Society of Jesus and from the eighteenth century not only reflects one focus of current research on early modern didactic poetry in general (the other being Italian humanism),\textsuperscript{22} but also the numerical predominance of poems by members of this order and from the Enlightenment. Moreover, reception phenomena are better documented for the eighteenth than for earlier centuries, not least due to the emergence of the new medium of the learned journal with its reviews. However, the resulting picture of the scientific didactic tradition should not be significantly flawed by these circumstances. In fact, one principal result of what follows is that the tradition, manifold as it presents itself in several other respects, is fairly coherent with regard to its didacticism, not least because of the pervasive influence of Lucretius (see below, section 1c). Eighteenth-century and Jesuit authors appeared on average to be more sophisticated in delivering their didactic message than did poets of previous eras and outside the Society, but the difference is quantitative rather than qualitative. As will become clear in section 2, the didactic techniques in evidence in eighteenth-century Jesuit poems can be paralleled in Protestant and sixteenth-century texts.

\textsuperscript{21} That this was the primary target audience seems to be a plausible a priori assumption. For a case in which educated non-scientists are explicitly identified as the intended readership, see Y. Haskell, “Sleeping with the Enemy. Tommaso Ceva’s Use and Abuse of Lucretius in the Philosopha novo-antiqua (Milan, 1704)”, in J. Feros Ruys (ed.), \textit{What Nature Does Not Teach. Didactic Literature in the Medieval and Early-Modern Periods} (Turnhout, 2008), 497-520, at 519.

\textsuperscript{22} See Moul 2017 (as in n. 11), 184, who invites scholars to go beyond these areas.
1. Preconditions

(a) Regarding the premodern connection between poetry and didactics in general, one can be brief, as it is well-known in principle and does not exclusively concern scientific didactic poetry. However, the fact seems sometimes to be forgotten despite its importance: the separation between didactics and poetry, the notion that poetry should not even try to teach the reader something, is a child of Romanticism. From antiquity to the eighteenth century, the opposite notion prevailed: to instruct the reader was understood as a pivotal function of poetry. The poet had to be a man of universal learning, so that he could speak accurately and authoritatively about all kinds of subjects. In early modern times, these ideas were not only ubiquitous, but new conclusions were also drawn from them regarding the canon of literary genres. While Aristotle had denied Empedocles the status of a poet (not, however, for his didacticism but rather for his lack of μίμησις) and ancient poetics had (for reasons unrelated to Aristotle’s verdict) largely disregarded didactic epic as an autonomous poetic genre, Aristotle’s judgement was now sometimes disregarded or criticised in turn. Authors of dialogues on poetry such as Giovanni Pontano (Actius, 1507) and Girolamo Fracastoro (Naugerius, 1555) and of handbooks of poetics such as Julius Caesar Scaliger or Martin Opitz discussed didactic poetry in one form or another. Opitz, for one, corroborated his thesis that “die Poeterey […] alle anderen künste und wissenschaften in sich helt” (“poetry contains in itself all other arts and fields of knowledge”) precisely with the example of didactic poetry:

Oder wer kan leugnen / das nicht Virgilius ein gutt er Ackersman / Lucretius ein vornemer naturkündiger / Manilius ein Astronomus, Lucanus ein Historienschreiber / Oppianus ein Jägermeister / und einer und der andere der Philosophie obristen sein / da sie doch nichts als Poeten sein.

23 On the fundamental revolution of literary critical thinking in the age of Romanticism, see M.H. Abrams, The Mirror and the Lamp (New York, NY, 1953).
24 See Arist. Poet. 1447b18-20; for two exceptions, see above, n. 5.
25 See F. Akkerman, “Auf der Suche nach dem Lehrgedicht in einigen neulateinischen Poetiken”, in Revard, Rädle, Di Cesare (as in n. 11), 409-417; Kühlmann 2016 (as in n. 9), 2-5.
26 M. Opitz, Buch von der Deutschen Poeterey (Brieg – Breslau, 1624), ch. 3.
Or who could deny that Virgil is a good farmer, Lucretius an excellent naturalist, Manilius an astronomer, Lucan a historian, Oppianus a huntsman, and all of them colonels-in-chief of philosophy, although they are nothing but poets?

(b) Present-day readers will be less prone than Opitz to accept Virgil as an expert in agriculture and rather incline towards sharing the doubts of Seneca (Ep. 86.15) in this regard. However, the expertise claimed by Opitz for the ancient poets definitely holds for most of their early modern successors in the field of science. To cite just a few authors whose technical knowledge is above suspicion: Fracastoro was among the leading physicians of his day. Mizauld was famous as an astronomer and astrologist in sixteenth-century Paris. On Bruno’s merits as a natural philosopher, nothing needs to be said. Bošković counted as one of the greatest scientists of the later eighteenth century; he realised decisive breakthroughs in physics, astronomy and applied mathematics and inspired such luminaries as Carl Friedrich Gauß and Michael Faraday. Other authors were at least deeply interested amateurs. Savastano, for one, read and digested a great deal of technical literature for his Botanicorum libri IV (1712), as evinced by the citations in his auto-commentary to it.

Moreover, most authors of scientific didactic epic could lay claim to professional teaching experience, even if this experience often did not extend to the natural sciences, whose teaching was, with the exception of medicine, institutionalised but slowly. Presumably, most early modern intellectuals had to earn their living by teaching at some point or another. This was especially true of the members of the Society of Jesus, who constituted a large proportion of all scientific didactic poets, as already mentioned. The Jesuits were the early modern teaching order par excellence, and all of their members were obligated to teach in the

27 For the sixteenth century, see already Haye 1997 (as in n. 8), 392.
28 See also Ph. Ford, “Claude Quillet’s Callipaedia (1655). Eugenics Treatise or Pregnancy Manual?”, in Haskell, Hardie 1999 (as in n. 11), 125-139, at 125-126 on Quillet’s doctoral degree in medicine. For more “doctor-poets”, see Haskell 2014 (as in n. 15).
29 On Mizauld’s life and works, see J. Dupège, Médecine, astrologie et religion à Paris. Antoine Mizauld (ca. 1512-1578) (Paris, 1999).
30 An overview of Bošković’s life, works and significance is provided by the contributions to P. Bursill-Hall (ed.), R.J. Bosovich, vita e attività scientifica. His Life and Scientific Work. Atti del convegno Roma, 23-27 maggio 1988 (Roma, 1993).
31 See Haskell 2003 (as in n. 12), 102.
32 See Haskell, Hardie 1999 (as in n. 11), 10.
order’s schools for some period of their career. In many cases, teaching remained their main professional occupation throughout their life. Such was the case, to name but one example, of Carlo Noceti (1694-1759), who taught philosophy (including natural philosophy) and theology at the Collegio Romano from an early age until his death and counted among his disciples a number of younger scientific didactic poets such as Mazzolari and Bošković.\footnote{I. Tautschnig (ed., tr., com.), Carlo Noceti, *Iris* (Innsbruck, 2017), 11-12.}

Thus, both scientific expertise and didactic vocation strongly suggest that the authors in question deemed it important to get the facts right and to inform their readers correctly about their respective subjects. They did not tackle highly technical topics only in order to demonstrate their literary virtuosity, as is often assumed of the Greek didactic poets of the Hellenistic era, although this does not correspond with the way in which authors such as Aratus or Nicander were understood either in antiquity or in early modern times.\footnote{For the commonplace of Hellenistic didactic epic as a game for virtuosi poets, see e.g. D. Kidd (ed., tr., com.), Aratus, *Phaenomena* (Cambridge, 1997), 26: “In deriving much of his subject-matter from technical works written in prose Aratus introduced a new problem into the composition of didactic epic, but it was a challenge that must have appealed to the ingenuity of Hellenistic poets in their general quest for novelty”; Volk 2002 (as in n. 5), 54-55. In contrast, the huge corpus of scholia to the *Phainomena* (J. Martin [ed.], *Scholia in Aratum vetera* [Stuttgart, 1974]) demonstrates that Aratus was primarily read as a teacher of astronomy in antiquity. Five out of six sixteenth-century translators of Nicander of Colophon were physicians, and the poet himself is regularly called *medicus* in the titles of these translations; see M.T. Santamaría Hernández (ed., tr., com.), Pedro Jaime Esteve, *Nicandri Theriaca. Traducción latina en verso (1552)* (Cuenca, 2018), 13-19. For a view that comes close to mine, see Schuler, Fitch 1983 (as in n. 8), 11-12.}

(c) However this may be, the main literary models of early modern scientific poets were not Hellenistic, but Roman works. Alongside Virgil’s *Georgics*, it was Lucretius’ *De rerum natura* that took pride of place. The more difficult and technical a subject, the greater the probability that an author would choose Lucretius as his main point of reference.\footnote{This is well illustrated by the predominance of Virgil and Lucretius in chapters 3 (“Cultivating Science”) and 4 (“Breaking Ground”) of Haskell 2003 (as in n. 12) respectively. See further Ead., “Religion and Enlightenment in the Neo-Latin Reception of Lucretius”, in S. Gillespie, Ph. Hardie (ed.), *The Cambridge Companion to Lucretius* (Cambridge, 2007), 185-201; Ead. 2008 (as in n. 21); Ead., “Poetic Flights or Retreats? Latin Lucretian Poems in Sixteenth-Century Italy”, in D. Norbrook, S. Harrison, Ph. Hardie (ed.), *Lucretius and the Early Modern* (Oxford, 2016), 91-121.} It is no coincidence that the most famous of all Neo-Latin didactic poems, Polignac’s *Anti-Lucretius* (1747), took its cue from the
Roman follower of Epicurus.\footnote{See W.B. Fleischmann, “Zum Anti-Lucretius des Kardinals de Polignac”, Romanische Forschungen 77 (1965), 42-63 (57-59 on Polignac’s Lucretian style); R. Specht, “Über Polignacs Antilucretius”, in H. Barion, E.-W. Böckenförde et al. (ed.), Epirrhosis. Festgabe für Carl Schmitt, vol. 2 (Berlin, 1968), 697-707; E.J. Ament, “The Anti-Lucretius of Cardinal Polignac”, Transactions and Proceedings of the American Philosophical Association 101 (1970), 29-49.} The attractiveness of Lucretius not only reflected the increasing importance of Epicureanism in its physical, religious and moral dimensions within European intellectual history from the early sixteenth century to the age of Enlightenment and the pivotal role of \textit{De rerum natura} in this connection.\footnote{Good starting points for exploring the early modern reception of Lucretius in general are provided by Norbrook, Harrison, Hardie 2016 (as in n. 35) and J. Lezra, L. Blake (ed.), \textit{Lucretius and Modernity. Epicurean Encounters across Times and Disciplines} (New York, NY, 2016).} To a natural-scientific poet, Lucretius’ epic also suggested itself as a dominant model for two more specific reasons: its content – Epicurean atomistic physics arguably being the most intricate ancient representation of the physical universe – and above all its literary grandeur. In many cases, its imitation is already obvious at the level of expression: the archaic flavour of Lucretius’ Latin and many of his characteristic phrases were regularly adopted by his early modern successors.

One of the hallmarks of \textit{De rerum natura} is the fact that its speaker takes his didactic mission extremely seriously.\footnote{For summaries of Lucretius’ didactic stance as described in the following, see Effe 1977 (as in n. 8), 66-79; Schuler, Fitch 1983 (as in n. 8), 16-18; G.B. Conte, \textit{Latin Literature. A History}, translated by J.B. Solodow, revised by D. Fowler and G.W. Most (Baltimore, MD – London, 1994), 160-163.} He declares the acceptance of Epicurean physics (which implies the mortality of the soul and thus annihilates fear of punishment after death) to be a prerequisite for a happy life, and therefore strives to convince his readers of his point of view. In \textit{DRN} 3.417-829, for instance, he enumerates no fewer than 29 proofs in a row against personal survival after death in a vehement attempt to suffocate any possible objection under a heap of arguments. Aside from this \textit{tour de force}, a broad array of sophisticated techniques of persuasion is displayed throughout the poem. Among others, one may highlight the syllogism, the \textit{reductio ad absurdum}, the reasoning from analogy (often conveyed by captivating epic similes) and above all the intense contact with the reader: the latter is constantly advised to pay attention and to reason sharply, but also warned to avoid fallacies and not to succumb to the weight of the tradition. Finally, the Roman poet
programmatically explains the usefulness of poetry as a vehicle of didacticism in his famous simile of the honey with which the rim of the bitter absinth cup of Epicurean philosophy is coated (DRN 1.933-947). In all of these ways, Lucretius provided later authors of scientific didactic epic with an impressive example of committed didacticism to follow.

(d) Today, however, Lucretius is also seen as a notoriously difficult poet, which raises a general objection to the view presented so far: is the honey-sweet language of the apostle of Epicurus, his highly poetical Latin with its free word-order, its archaisms, technicisms and rhetorical figures, not precisely proof that the author did not conceive of his poem as teaching material? Does such a language not provide so many impediments to understanding that it thwarts all didactic intentions? And is the same not even more true of Lucretius’ early modern followers?

In fact, neither Latin nor poetry had this effect on a well-bred audience in the first centuries of the modern era; quite the opposite. Latin was the main subject and was generally also the language of instruction in early modern higher education.\(^{39}\) Every educated person was expected to speak, understand, write and read it fluently. Moreover, it had a significant terminological advantage over the vernaculars due to its long history as the language of learned discourse: a plethora of technical terms had been coined and continued to be coined in Latin and latinised Greek over the centuries and millennia in order to express notions for which the vernaculars simply had no words (and if they had them, they had borrowed them precisely from Latin).\(^{40}\) As mentioned at the outset, these factors rendered Latin the leading language of early modern science, in much the same way in which English fulfils this role today.\(^{41}\) And who would think of English as an impediment to scientific understanding?

The role of poetry in making complex issues palatable is a bit harder to grasp from our modern point of view, because the ways of poetry and

\(^{39}\) See E. Paulsen, *Geschichte des gelehrten Unterrichts auf den deutschen Schulen und Universitäten*, herausgegeben und in einem Anhang fortgesetzt von R. Lehmann (Leipzig – Berlin, 1919-1921) for the German speaking world, and E. Lukács (ed.), *Ratio atque institutio studiorum Societatis Jesu 1586, 1591, 1599* (Roma, 1986) for the catholic part of Europe.

\(^{40}\) The results of this process are gathered in books like O.E. Nybakken, *Greek and Latin in Scientific Terminology* (Ames, IA, 1959); on the process itself, see H. Helander, “On Neologisms in Neo-Latin”, in Ford, Bloemendal, Fantazzi 2014 (as in n. 11), 37-54.

\(^{41}\) For a justification of this commonplace and further literature, see Gordin 2015 (as in n. 3), 25 n. 3.
didacticism have diverged so resolutely since the Romantic period. Yet readers were much better acquainted with poetic forms of expression in early modern times than they are today. A large part of the educational reading programme was actually poetry, and pupils even had to compose poems themselves. In this way, they quickly became familiar with the respective varieties of Latin. Consequently, the notion that poetry per se was more difficult to read than prose seems to have been unknown. In contrast, its perusal was often proclaimed to be especially pleasant: Horace’s assertion of *delectare* as one essential goal of poetry (*Ars 333*) remained commonplace. Most importantly, poetry was not only seen as inherently didactic in theory, but also constituted a recognised and widely used vehicle of instruction in practice, because it furthered memorisation. Until the early sixteenth century, the leonine hexameters of Alexander of Villedieu were the most popular textbook for higher Latin in large parts of Europe, and the heavily moralising *Disticha Catonis* continued to represent popular beginners’ reading through the eighteenth century.42

Keeping these premises in mind, it no longer comes as a surprise that Latin hexameters were widely accepted as a convenient medium for conveying scientific notions. In addition, one further point may also be worthy of consideration, although it is not capable of hard proof. Many aspects of early modern science were shockingly new, and many of its notions – from the motion of the earth to the possibility of a vacuum and the impossibility of spontaneous generation – flew in the face of received wisdom and common sense. It seems reasonable to assume that a literary form with a classical pedigree, written in an age-old language, could go some way towards mitigating these disturbing aspects: it made the new science look like a natural continuation of longstanding trends and integrated it into a time-honoured tradition of thinking about the natural world.43

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42 R.F. Glei, “Alexander de Villa Dei (ca. 1170-1250)”, in W. Ax (ed.), *Lateinische Lehrer Europas. Fünfzehn Portraits von Varro bis Erasmus von Rotterdam* (Köln, 2005), 291-312; K. Sallmann (ed.), *Die Literatur des Umbruchs. Von der römischen zur christlichen Literatur* (München, 1997), 610-611.

43 Cf. already Haskell 2003 (as in n. 12), 13, who speaks of the “reassuring sway of the Virgilian hexameter”, and, with a slightly different emphasis, Moul 2017 (as in n. 11), 183.
2. Didactic techniques

So far, my assertion of a serious didactic intent in scientific didactic epic rests on contextual evidence. Do the poems themselves bear it out? In what follows, I will outline in some detail four didactic traits – clear structure, definition and description of unfamiliar notions and objects, didactic metaphors and similes, and contact with the reader – of one pertinent poem, namely Noceti’s *Iris* (1730). The *Iris* lends itself to my purpose in various respects: it is an exemplar of didacticism, it is short enough to allow for an in-depth analysis and it represents two subgroups – poems from the eighteenth century and from the Society of Jesus – that make up for a large part of the total production, as already mentioned. However, in order to make it plausible that the abovementioned characteristics are not restricted to this single example, but can be found in the tradition at large, and also to provide some hints regarding the ways in which different authors adapted these features to the needs of their respective subjects, the discussion of the *Iris* will in each case be followed by a briefer treatment of three other poems by non-Jesuit authors, which consider different disciplines (astronomy, botany and medicine) and stem not only from the eighteenth, but also from the sixteenth century. These additional examples are Buchanan’s *Sphaera* (1585), an overview of astronomy in five books that defends the Ptolemaic system against Copernicus and Brahe, McEnroe’s *Connubia florum* (1728), one book about the sexuality of plants, then freshly discovered by Sébastien Vaillant, and Flemyng’s *Neuropathia* (1740), three books on the mental disorder called hypocondria (in men) and hysteria (in women), or simply English disease at the time, but explained as an affection of the nerves and renamed accordingly by the author.

First of all, however, Noceti’s *Iris* (1730) shall briefly be presented to provide some context for its subsequent discussion. Since Homer and the Book of Genesis, the rainbow had been explained in mythological and theological terms, and from Aristotle and Seneca to Ibn al-Haytham,
Theoderic of Freiberg and René Descartes, a long tradition of scientific speculation and research had developed around the phenomenon. However, only Newton’s discovery that white light is in fact a blend of various colours and that these can be separated from each other by sending light through a prism as they are refracted under different angles, rendered a scientifically correct understanding of the phenomenon possible.\textsuperscript{46} Iris, a comparatively slender poem of some 500 lines, published just a quarter of a century after Newton’s Opticks (1704, Latin edition as Optice 1706), set out to explain the mechanisms behind the rainbow.

The poem’s contents and structure may be summarised as follows.\textsuperscript{47} Having announced his theme, Noceti begins by contrasting the correct explanation of the rainbow, based on the reflection and refraction of sunlight in raindrops, with older, false explanations having recourse to chthonic exhalations or the concave form of some clouds (1-69). He then sets out the fundamentals of Newtonian optics (reflection, refraction, composite nature of sunlight, different angles of refraction for different colours, 70-172), before turning to the rainbow itself. In meticulous detail, the beam path within a single drop of water is analysed: the beam is refracted when it enters the drop, reflected from the drop’s back side and refracted a second time when it exits the drop (173-242). The resulting angle of refraction varies between $40^\circ$ for blue and $42^\circ$ for red (243-289). This is confirmed by experience that will expand the boundaries of human knowledge further and further in the future, as promised in a digression (290-345). Next, Noceti moves back from the microscopic to the macroscopic level and shows how the mechanisms he has described do indeed lead to the appearance of a rainbow (346-388). To the scientific explanation, a mythological one is added, invented by Noceti himself, tracing the rainbow’s origin back to an unhappy love story between the nymph Iris and a certain Xanthus, who is finally changed into the homonymous river near Troy (389-444). The poem concludes with a shorter discussion of the secondary rainbow, caused by that part of the sunlight that is reflected not once but twice inside the single drops (445-516).

\textsuperscript{46} C.B. Boyer, The Rainbow: From Myth to Mathematics (New York, NY, 1959).
\textsuperscript{47} The text of Iris exists in three different versions. The following considerations are based on the recent edition in Tautschnig 2017 (as in n. 33), which is itself based on the edition in Oudin’s Poemata didascalica (1749). For more on the poem’s publication history, see section 3 and the Appendix.
Beyond the examples mentioned in this summary, Noceti’s poem also contains quite a few other passages that might be defined as “recreational”. To the hymn to Experientia and the epyllion about Iris and Xanthus, one can add an opening invocation to Phoebus Apollo (not only in his capacity as the god of Poetry, but also as the Sun-God, 6-12), addresses to the Muses (149-150, 195-197) and several further personifications of abstract entities such as the ladies Sophia (5), Mathesis (221, 287) and Natura (345). The rainbow itself is constantly addressed as the goddess Iris, daughter of the Sun and the Rain. In a spirited valediction, Iris is moreover hailed as bringer of peace, alluding to the rainbow’s role in the biblical story of the Great Flood (500-516).

However, none of this ornament ever detracts from the poem’s factual argument; quite the opposite. The aforementioned passages remain strictly subservient to Noceti’s teaching. In giving the reader some rest and pleasing him, they keep him fresh and willing to follow Noceti’s more overtly didactic explanations. In the latter, Noceti makes every effort to explain his message and pointedly applies a number of specific techniques to this end. While most can already be found in Lucretius, they appear in even greater density in Iris and are dexterously adapted to the poem’s subject.

(a) To begin with, the poem is not only clearly structured, as has hopefully become evident from the above summary, but it also never allows the reader to forget about its structure and logical development. Its sections are typographically evidenced as paragraphs in the various editions, and every new step in the argument is also verbally signposted throughout. After the optical fundamentals, for example, the transition to the discussion of the beam path in a raindrop is announced as follows (173-175):

Hoc autem posito fundamine percipe porro,  
cur quae plexa simul radii simulacra recondunt,  
ordine ab aëriis videas effulgere guttis.

48 See Bošković’s justification of such passages in the preface to his De solis ac lunae defectibus (1760), ii: “Haec ad argumentum pertinent, quibus episodia immiscui sane multa ad demulendum animum severiorum contemplatione defatigatum” (“What was said so far pertains to the subject proper. To this, I have added a fair number of short stories to relax the mind tired from reflecting on rather demanding topics”). That literary ornament is never just that, but fulfils the rhetorical function of keeping the reader well-disposed, has already been explained by Quint. Inst. 8.3.6.

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But now that we have laid this fundament, learn further why we see the colours, interwoven and hidden in the sunrays, gleam one after the other from the drops in the air.

Another case in point is the transition from the microscopic processes that generate the rainbow to the latter’s appearance (346-347):

Hactenus unde Iris; dissecti protinus orbis
forma tibi in promptu et superest quodcumque patescit.

So far [I have explained] where the rainbow comes from. Soon the shape of the half-circle will be at your hands and all the rest will become clear.

Further strongly marked incisions may be found at 195-197 (question to the Muses), 254-255 (“Forsitan et quantum simulacra valentia flexum / quaeque petant et mira hominum observata requiras”, “Perhaps you also want to know how much the single images change their direction and what wonderful things men have observed [in this respect]”), and 444-445 (“Nunc locus, exterior quo pacto effulget arcus / interdum, quem vulgo Irim dixere secundam”, “Now [we have reached] the place [to explain] how an arch further outside, commonly called ‘second rainbow’, begins to gleam”). Simpler transitional formulae occur at 13 and 198 (“Principio”), 36 (“Non tamen”), 55 and 93 (“Praeterea”).

The concern to clarify the structure of one’s poem is not limited to Noceti. Buchanan opens the third and fourth of his five books with veritable summaries. Book four, dedicated to the risings and settings of the stars begins with the request to the addressee: “Nunc mihi stellarumque ortus obitusque canenti / sis facilis” (“Now be docile, while I sing of the risings and settings of the stars”, 72). Within the books, sections are likewise explicitly announced as such. In book one, the part dedicated to the circumference of the earth opens with the injunction: “Nunc age, telluris quae sit mensura, quis illam / ambitus in gyrum remeans circumdet […] / animo […] percurre sagaci” (“Come on now, think through in your smart mind what is the measure of the earth, which circumference surrounds it, coming back in a circle”, 19).49 When Buchanan enumerates, as he likes to, a string of arguments for or against some opinion, he takes care to present them in good order. Sometimes,

49 See further, e.g., book 2, at 43: “Forsitan et quaeras, quae sit sine fine rotati / materie coeli” (“Perhaps you also ask what substance the endlessly rotating sky consists of”).
for example in book one, at 22, this is underlined by the use of anaphora. There, four arguments for the infinitesimal smallness of the earth as compared to the universe are introduced by “Nam neque [...] nec [...] nec [...] nec”.

McEnroe not only opens some sections of his work in the same way as Noceti and Buchanan, he occasionally also combines the conclusion of one section with the opening of the next: “Hactenus explicitus flos est mihi carmine simplex, / nunc tibi compositos perstringam ex ordine flores” (“So far, my song has explained the simple blossom, now I will, in the order of things, briefly present to you the compound flowers [i.e. the inflorescence]”, 446-447). A digression can be rounded off in particularly emphatic fashion: “Sed mihi digressae redereant ad pensa Camoenae” (“But may the Muses, who have gone astray, now return to their assignment for me”, 395). Moreover, the layout helps the reader, as blank lines are used to separate the single sections.

In Flemyng’s Neuropathia, most of the techniques mentioned so far – announcement of the topic of a new book or section, conclusion of a section, transition from one section to the next – are regularly used. Moreover, the poet can also make use of a Lucretian back reference (“ut supra docu”, “as I have taught before”, 3.74) and promise to treat a content-rich topic such as the drugs against neuropathia orderly but selectively: “Multa quidem hic spectant: quorum primaria tradam /...”

50 E.g., 337: “Nunc florum sexus quae monstrant signa docebo” (“Now I will teach which signs denote the sex of flowers”).

51 Topic of a new book: e.g. 2.14-18 (“Quo magis, incepti quae pars est altera nostri, / multiplicem facie pestim plenamque querelis / depictam vivo ante oculos ostendam / decursumque notasque mali describere certas / conferet”, “The more useful it will now be – which is the second part of my endeavour – to paint the many appearances of the wailful disease with lively colours, to place it before your eyes and to describe the evil’s progress and its unmistakable signs”). Topic of a new section: 1.298-301 (“Qui vero in victu errores [...] / omnia veridico describens carmine tradam”, “But which are the mistakes regarding the way of life, all of this I will describe and impart to you in truthful song”). Conclusion: 3.241-243 (“Sic tibi ventriculus cocturaeque organa primae / curanda, ut chylus venis bonus insinuetur, / pabula nec semper morbo nova suppedimentur”, “In this way, you must look after your stomach and the instruments of the first digestion, so that good nurturing liquid may get into the veins and that the disease may not receive new food all the time”). Transition: 1.209 (“His fundamentis stabilitis, nonne videre est [...]?”), “Having laid this firm foundation, is it not plain to see?”); 3.72-73 (“His ita munitus praeceptis acceper porro, / quae disciplinae ad leges facienda supersunt”, “Now that you are thus girt by these instructions, listen further what else there is to do according to the laws of the art”).

52 For similar phrases in Lucretius, see DRN 1.531, 543, 734, 846; 2.499; 6.271, 1094.
enumerans capita et seriem rerum ordine ponam” (“Many things belong to this part; of these, I will refer and enumerate the principal elements which are most important and put down them one after the other in good order”, 3.97-98).

(b) A scientific poem cannot fail to mention technical terms, uncommon notions and unfamiliar objects, all of which seriously threaten the reader’s understanding. Noceti is keenly aware of this problem, which he identifies explicitly at 74-75 (“Antiquis numquam tentata Latinis / nomine multa carent”, “Many things never attempted by the ancient Latin authors lack a name”), and handles the issue with great care. An expression that was probably unknown to his readers is diligently defined before its first use. In his discussion of the beam path, Noceti needs a term for the direction in which the greatest part of the light of a certain colour is inflected, making that colour appear most saturated. He therefore coins the expression “strong rays” (radii valentes) and defines it as follows (235-237):

Atque uno tramite plures,
quod sequitur, coeunt radii; qui robore iuncto
plus possunt, radiosque ideo dixere valentes.

And in one particular direction, several rays come together, as follows [from the above]. Their strength united, they have greater power, which is why they are called strong rays.

In the further course of the poem, radii valentes and variants (radii fortres, simulacra valentia, validi colores) recur, always marked as at 237 by italics, at 246, 254, 286, 456 and 463.54

In a similar vein, the measurement of an angle by degrees is meticulously explained (256-265) before its application (276-285, 458-461). Moreover, a strange object such as the prism is presented in a carefully crafted ekphrasis when it makes its first appearance (151-160):

Est ternam in faciem, quarum levissima quaeque,
porrectum medium vitrum non amplius ulnam,
nomine quod Graii dixerunt prisma vocantes,
aptum opus et tales fabricatum munus in usus:

53 This of course harks back to Lucretius’ laments about the egestas of the Latin language (DRN 1.136-139; 1.830-832; 3.258-260).
54 The standard expression seems to have been radii efficaces (Tautschnig 2017 [as in n. 33], 65), which is metrically impossible.
hoc ubi ad apricae solem opposuere fenestrae,  
atque ubi multiplexi lux est discreta refractu,  
tectum introgressae diverso tramite partes  
haec violas, haec secum undas, herbam illa virentem,  
ista crocum, tulit illa rosas, propriisque refulget  
pariete in adverso variata coloribus iris.

There is a piece of glass, which extends itself on three sides – each of  
which is perfectly smooth – for no more than half a cubit. The Greeks  
called and named it a “prisma”: a convenient object, an instrument  
designed to be used as follows: when, the windows being sunlit, the  
prism is opposed to the sun and the light is divided by manifold refraction,  
its parts enter the room on different ways. This one brings with  
itself violets, this one water, another one green grass, yet others crocus  
and roses, and on the opposite wall, a rainbow gleams in its character-  
istic different colours.

Buchanan, too, systematically defines and describes new notions and  
objects, beginning with such seemingly self-evident ones as mundus,  
whose name is derived from the homonymous adjective meaning “clean,  
nice” (book 1, at 3):

Hoc quocumque vides circumque infraque supraque  
volvere perpetuo labentia saecula motu  
omnia complexum gremio longaeva vetustas  
admirata decus varium pictique nitorem  
aetheris et puros radiati luminis orbes  
uno appellari consentit nomine mundum.

This here, whatever you see around, below and above you, being  
turned around by the ages that pass in continuous motion and holding  
everything in its bosom: long-lived antiquity, which admires its mani-  
fold adornment, the lustre of the dotted ether and the pure spheres  
emitting rays of light, agrees that it shall be called “the world”.

In a similar vein, notions such as “degree”, “pole”, “circle of longitude /  
latitude”, “polar circle”, “tropic”, “ecliptic”, “horizon”, “rise” and  
“setting” are all explained in turn as Buchanan’s account of the cosmos  
unfolds.55

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55 See book 1, at 20-21; book 3, at 51-52, 60-62, 72-73.

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McEnroe finds another solution to the terminological problem: he explains the technical terms of plant anatomy and procreation in a small lexicon that precedes the poem proper (13-18). Within the poem itself, his explanatory efforts focus on the description of strange plants such as the mythical *Agnus Scythicus* (*Vegetable Lamb of Tartary*, 166-181) or the *Mimosa pudica* (250-263). The poet is keenly aware of the difficulty of this task: “Mimosae labor est naturam aperire latentem” (“It is hard work to reveal the secret nature of the Mimosa”, 250).

Flemyng, in contrast, starts from a short but descriptive sketch of those aspects of the brain that he needs for his argument, namely the connection between the brain and the nervous system, and introduces some of the necessary terminology (*cortex, nivea medulla, nervi*) on this occasion (1.89-94):

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Pars etenim cerebri exterior cinerisque colorem
subfusci referens et cortex nomine dictus
in dura et nivea finitur ubique medulla,
exsuscess mage quae struitur fibrisque coactis.
At nervi exoriuntur ab hac fiuntque medulla,
et sic compositi corpus diduntur in omne.
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For the outer part of the brain, which shows the greyish colour of ash and is called “bark”, is everywhere edged by a hard, snow-white marrow, which consists of dryer and denser fibres. From this marrow, the nerves emanate and come into being, and while they are crowded together there, they divide themselves over the whole body.

Terminological questions also remain a concern later on, for example when Flemyng rejects the traditional terms for the disease he describes, *hypocondria* and *hysteria*, as inadequate (1.265-268). In some cases, he coins his own graphic formulas. *Tortus canalis* (“winding channel”) is introduced in 3.109 for “intestine” by the circumlocution “intestinorum teretem tortumque canalem” and then used in this meaning throughout (3.135, 216, 345, 415).

(c) In addition to straightforward explanations, Noceti is also happy to deploy various metaphors and similes, especially when it comes to visualising abstract notions.\(^56\) The way in which different colours coexist within white light, for example, was certainly as difficult to imagine for

\(^{56}\) On the explanatory simile in ancient didactic epic, see Schuler, Fitch 1983 (as in n. 8), 7.
eighteenth-century readers as it is for us today. Noceti does his best to make things a little easier by devising an ingenuous metaphor from weaving (97-99): the sunbeams (themselves metaphorically described as “arrows”) are said to consist of seven “threads” (“stamina”), and light itself appears as a fabric “woven” (“texta”) from these. The thread metaphor is then used as a kind of leitmotif throughout the whole poem. At one occasion, Noceti even expands it into two impressive similes in order to make the paradox of many colours hidden in a beam of seemingly uniform, colourless sunlight still more acceptable. First, God is said to have “combed” the fabric of light, when He was creating the world (“Ipse pater prima nascentis origine mundi / versicoloratam percurrens pectine telam”, 135-136), so as to ensure that light should be resolved orderly into its various colours when refracted. A few lines later, light is compared to a silk robe woven from threads of different colours: looking at the robe as a whole, the single colours are invisible, but when the fabric is resolved, they reappear (144-148).

Like the techniques discussed before, explanatory metaphors and similes are not peculiar to Noceti. Buchanan is quite creative in this area, and his similes are even indicated by remarks like Simile or Declarat simili in the marginalia. For instance, the fact that the mountains hardly detract from the roundness of the earth is illustrated by a fly crawling over a ball of glass. While the ball is experienced as rough by the fly, it nonetheless appears perfectly smooth to we humans (book 1, at 7). The stars should be imagined as fixed to their sphere and move around together with it like a nail in a turning wheel (book 2, at 29). That the sun looks bigger in the morning and in the evening than at noon is claimed to be due to atmospheric refraction, just as things under water look bigger owing to refraction (book 2, at 36). The superimposition of different movements is illustrated by the case of a person walking around on a ship sailing along at full speed (book 2, at 42).

McEnroe compares the raising of sap in plants to blood circulation in humans in an extended, impressive simile (142-160). This is in line with his tendency to humanise plants as already evident in the title of his poem, Connubia florum (The Wedding of Flowers). Flemyng provides an exception, as he prefers a literal style of exposition and has hardly any use for figurative speech, except for an occasional casual metaphor

57 *Fila*: 121, 133, 171, 191, 195, 241, 270, 469; *stamina*: 182; the hair of the goddess Iris (*comae*, 500) could also be assigned to this field.
such as mentis theatrum (2.186). That this is not his subject’s fault is shown by another poem on physiology and psychology, Thomas Gray’s unfinished De principiis cogitandi, where all nerves lead to the brain as rivers flow to the ocean and the self-conscious mind is likened to a Hamadryad who contemplates her own mirror image in a pure fountain (128, 131).

(d) Perhaps the most striking trait of Noceti’s text is the close contact he maintains with his reader by way of second person singular verbs, imperatives, personal pronouns and combinations of these. In the same way as the other features just discussed, this is anticipated in Lucretius. However, whereas the Roman poet turns to his addressee Memmius once in twenty to thirty lines on average, the reader of Iris is addressed every five lines or so.\(^{58}\) Throughout the poem, he is never left to himself but is continuously counselled on how to behave and how to reason. For example, he is warned not to blindly trust authorities: “Non tamen ista tibi quisquam persuadeat auctor” (“But no writer shall convince you of this”, 36). Instead, he must resort to his own experience, as formulas such as “Aspice!” (“Look!”, 40) or “Nonne vides?” (“Don’t you see?”, 44) inculcate in him. Above all, he must always be alert and play an active role in the reading process. His collaboration with the author is an indispensable prerequisite for the success of the whole enterprise. This, for instance, is how Noceti exhorts the reader to complete an unfinished train of thought for himself (170-172):

\[
\text{Atque ea, quae in viridi contingere cernimus herba, quamlibet ad lucis partem discretionque fila transfer et ad cunctos prudens extende colores.}
\]

And what we see happen in the case of green grass, carry it over to any part of the light and to its different threads; look ahead and generalise it for all colours.

\(^{58}\) The density of apostrophe varies considerably between different parts of the poem. In an easy, narrative section like the Xanthus epyllion (389-444), it can drop to zero. In contrast, one finds 22 instances in 70 lines, i.e. nearly one instance every three lines, in the difficult passage 173-242, where the beam path inside a water drop is analysed: “percipe” (173), “tu” (176), “tibi pinge” (176), “sepone” (181), “perpende” (182), “tu” (191), “te” (192), “videbis” (193), “aspice” (204), “miraberis” (207), “credas” (208), “tibi” (209), “metuas” (210), “tibi finge” (212), “tibi” (218), “te” (220), “te” (221), “arripe” (231), “percipies” (239), “experiere” (239), “tibi” (241), “poteris tute ipse” (242).
At the beginning of a new section, special attention must be paid: “Huc animum tamen advertas” (“But now, hither direct your attention”, 462). When a long, complex argument draws to its close, Noceti encourages the exhausted reader to make a last effort: “Tum vero optatam victoriamiam arripere metam” (“At that point, you have won – now seize the mark you have hoped for!”, 231). And when a particularly difficult point is reached, the poet even prescribes in great detail, step by step, which mental operations must be performed. In order to visualise the fact that a rainbow is always seen at the same angular distance (40-42°) from the antisolar point, the reader should carry out a kind of thought experiment: he should imagine the lines from the eye to the antisolar point and to a point in the rainbow as the two legs of a compass with which the whole rainbow can then be drawn (266-285). Or, to give a final example, this is how Noceti begins his explanation of the origin of the rainbow colours on a microscopic level (176-182):

Harum tu faciem, Solis qui obvertitur axi,
imprimis tibi pinge animo medioque resectam
in partes distingue duas, quarum altera centrum
iridis interior spectet, pars altera centro
exterior superas coeli se avertat ad auras.
Tum mecum reliquos paulum sepone colores
staminaque igniti tantum perpende ruboris.

Paint for yourself in your mind especially that part of the drops which is turned towards the Sun’s chariot, cut it in the middle and separate it into two parts, one of which looks towards the centre of the rainbow, while the other, exterior one is turned away from the centre towards the upper air of the sky. Then put aside with me the other colours for a while and consider only the threads of fiery red.

Although this kind of guidance may sometimes appear a little paternalistic, it undoubtedly fulfils its purpose: the reader is safely escorted through the whole poem and everything he needs in order to grasp its contents is put at his disposal.

Again, a look at Buchanan, McEnroe and Flemyng suggests that Noceti is only one distinctive exponent of a didactic discourse in which most early modern scientific epics participate. Not only the close contact with the reader in general, but also the specific techniques noted above return in their poems. The exhortation to autopsy and precise observation is most noticeable in McEnroe and Flemyng: “Aspice, quos habeant
vultus Boheravia, Malva, / nec petalis idem locus est” (“Look, how different are the faces of Boerhavia and Malva! Also their petals are arranged differently”, McEnroe, *Connubia* 433-434).\(^{59}\) Being attentive to what is said and the importance of mental initiative is most strongly recommended by Buchanan and Flemyng. To visualise the different speed of the planets, Buchanan advises the reader to imagine them all in the same place and then to picture their subsequent changes of position (book 2, at 39-40):

Quo magis hoc animo possis comprehendere, finge esse simul cunctos Tauri sub fronte planetas molirique suos non aequo tramite gressus.

In order to grasp better what I have said, imagine all the planets to be together under the forehead of Taurus and to move their steps with uneven gait.\(^{60}\)

Warnings against the pitfalls of false reasoning can be found in Buchanan, who cautions his addressee against the heliocentric system with the words: “Haec procul a vera quantum ratione recedant, / percipe” (“Understand, how far this is removed from true reasoning”, book 1, at 17), and in McEnroe.\(^{61}\)

Finally, all three authors conjure, to an even higher degree than Noceti, a strong solidarity between teacher and reader. Buchanan talks to a fictitious Timoleon, who is addressed as “dear boy” (“care puer”, book 1, at 13) and invited to reason “together” with his teacher (“me cum”, book 1, at 13, 19; book 2, at 27). McEnroe’s poem is styled as a letter to his own brother, who is apostrophised in the proem (2) and promised further instruction in the form of another letter in the very last line (“altera [sc. epistola] quam meditor, fratrum optimae, plura docebit”, 526). At one point, the poet even refers to his brother’s personal predilections: being a pious person, the brother will be particularly moved by the passion flower (“te, frater, te novi etenim, flos ille..."

\(^{59}\) In Flemyng’s *Neuropathia*, see e.g. 1.119: “Aspice”; 1.122: “Nonne vides [...]?”; 1.320: attention must be paid to “certis signis”.

\(^{60}\) For further examples in Buchanan, see book 1, at 13 and the passages adduced under (a). In Flemyng, see 1.41-43 (“arrectas aures adhibe vacuasque”, “prick up your ears and do not let yourself be diverted”); 1.149-154 (“sollers adverte”, “pay full attention”); 1.306-308.

\(^{61}\) E.g. Buchanan, book 1, at 6; McEnroe, 264.
movebit”, 421). Flemyng minimises the distance between himself and his potentially ailing addressee by intimating that he has himself suffered from neuropathia in the past. Already in the first book, the speaker uses an inclusive plural when he exhorts the reader to remember his words precisely, “so that we can avoid the bitter sorrows of the disease” (“ut morbi aerumnas vitare queamus amaras”, 1.308). In the third book, which basically consists of a long string of instructions to the patient, the poet is even more outspoken regarding his own health history: “Te meliora manent, experto crede” (“Better things lay in store for you – believe me, I have experienced it myself”, 3.49).

3. Contemporary reception

Last but not least, contemporary reception of the poems in question indicates that people understood them not as literary dalliances or recon- dite curiosities, but as texts from which educated people could inform themselves about important developments in the realm of science.

Some poems kindled considerable interest while still in statu nascendi. Drafts could not only be read in Jesuit colleges to add lustre to the yearly instauratio studiorum, as was the case of Noceti’s Iris, for example, but also at even more prestigious occasions. When composing his De solis ac lunae defectibus in the 1740s and 1750s, Bošković recited various parts of the nascent poem to the members of the Roman Accademia dell’Arcadia – Italy’s most important literary society at the time – at their weekly meetings.

Once finished, a substantial portion of the poems appeared in print. The exact ratio of published texts to manuscripts is of course difficult to determine, as manuscripts are less visible and more liable to destruction, but the sheer number of printed poems speaks for itself. This fact is particularly remarkable in the case of the Jesuit authors, because most of their other poetic output, especially their theatre plays, were not printed.

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62 The general reader does not feel neglected either, as many addresses are unspecific; see e.g. 128: “quisquis amas flores”; 96-101; 226; 352-356.
63 See Noceti, De iride et aurora boreali carmina (1747), 19; Bošković, De solis ac lunae defectibus (1760), iii; E. Proverbio, “Boscovich. Scientist and Man of Letters”, Memorie della Società Astronomica Italiana, Supplimenti 22 (2013), 34-54, at 41 and 51.

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Moreover, more than half of the poems went through two or more editions. Leaving bestsellers such as Fracastoro’s *Syphilis* (1530) aside, works that are largely unknown today such as Thorius’ *Hymnus tabaci* (1626) or Quillet’s *Callipædia* (1655) were reissued several times during the decades following their initial publication. Even a quite undistinguished text like Tarillon’s *Pulvis pyrius* (1692) was reprinted in 1704 and subsequently included into Oudin’s massive collection of didactic poetry. When the publication of Stay’s monumental *Philosophia recentior* was finally completed with the appearance of its third and last volume in 1792, this *editio maior* with its ample notes and supplements by Bošković was even complemented by a one-volume edition containing only the text. The preface to the latter explains the rationale behind this procedure (IV):

> Eodem tempore, quo postrema pars editur, visum itidem est decem eos carminum libros ab adnotationibus et supplementis seiungere omnesque simul hoc uno volumine concludere, ut nonnullis geretur mos, et iis scilicet, qui minus moleste ferant in aliquam interdum obscuritatem incurrere quam tam crebro versuum lecti inspiciendi commentariis interrumpere, et iis, qui in philosophicis rationibus multum exercitati nullis indigeant ad quaesum vel difficiliora intelligenda explicationibus.

At the same time as the last part [that is, the third volume of the *editio maior*] now comes out, it was decided also to separate these ten books of poetry from the annotations and supplements and to unite them all in this single volume in order to take account of the wishes of a number of readers, namely of those who find it less annoying to run into some difficulty of understanding now and then than to interrupt the reading of the verses so often to consult the commentary, and of those so well-exercised in scientific reasoning that they do not need any explanations in order to understand everything, even the more difficult parts.

As late as the end of the eighteenth century, publishers could thus specifically cater for different classes of readers in the publication of a very long and, as it appears from a modern perspective, hopelessly difficult poem.\(^{65}\)

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\(^{64}\) The examples of reissues and translations given in the following can easily be multiplied from the Appendix.

\(^{65}\) On the difficulty of Stay’s *Philosophia recentior*, see Haskell 2003 (as in n. 12), 213-220.
Another sign that scientific didactic epic was read not just for its formal qualities but also for its contents were attempts to make the latter accessible to a non-latinate readership in translation, as a rule in bilingual editions. While Sainte-Marthe’s *Paedotrophia* (1584) was provided with a facing French translation in 1698, more than a century after its first publication, McEnroe’s *Connubia florum* (1728) appeared in such a bilingual form from the very beginning. Editions including versions in Italian *versi sciolti* were produced of Savastano’s *Botanica* (1712) in 1749 and of Noceti’s *Iris* and *Aurora borealis* (1747) in 1755.

The same attention to content is evidenced by the addition of explanatory paratexts such as *argumenta*, marginalia, notes and commentaries. Rarely did a poem appear without any of these (as mentioned shortly before, a plain-text edition apparently called for a justification in its preface). In particular, marginalia and notes were very common. *Argumenta* in hexameters introduced the reader to Buchanan’s *Sphaera* (1585), for instance; prose *argumenta* preceded Furichius’ *Chryseis* (1633) and the 1773 edition of Zamagna’s *Echo*. In 1616, the Scotsman Adam King authored an enormous commentary on Buchanan’s astronomical masterpiece, presumably for use in the teaching of astronomy at the University of Edinburgh (a case to which one may compare Bruno’s lectures, given in 1591 at the University of Padua, on books 4 and 5 of his own *De minimo*). While King’s commentary remained in manuscript, the commentaries and supplements by Bošković were printed together with the respective poems, namely Noceti’s *Iris* and *Aurora borealis* (1747) and the first two volumes of Stay’s *Philosophia recensior* (1755, 1760). In addition, the Ragusan Jesuit wrote a lengthy auto-commentary to his *De solis ac lunae defectibus* (1760), justified in the preface by the need to make himself understood to non-mathematicians.

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66 D. McOmish, “A Community of Scholarship. Latin Literature and Scientific Discourse in Early-Modern Scotland”, in Id., S.J. Reid (ed.), *Neo-Latin Literature and Literary Culture in Early Modern Scotland* (Leiden, 2017), 40-73, at 65-72 (an edition of the manuscript containing Buchanan’s *Sphaera* and King’s commentary by McOmish is in preparation); Aquilecchia 1991 (as in n. 13), 323. See also Bossuet’s *De arte medendi libri XII* (1557), which were advertised as *omnibus medicinae studiose admodum utiles* (“very useful to all students of medicine”) on their title page. As Moul 2017 (as in n. 11), 191-192 remarks, Kinloch’s *De hominis procreatione* (1596) was recommended to professional doctors for independent study, while non-scientific didactic poetry was in some cases studied at a lower educational level, namely at school.

67 *Ad lectorem*, ii: “Adnotationes adieci, in quibus soluta oratione exposui dilucidius aliquanto, quae versibus pertractantur, ut ab iis etiam, qui in astronomia et universa mathesi sunt rudes, facilius intelligi possent ipsa carmina.”

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On a smaller scale, Furichius acted similarly much earlier when adding *scholia* to his *Chryseis* (1633). Mizauld’s astronomical tetralogy (1552-1553) is accompanied by an elaborate and efficient paratextual apparatus: the single works are introduced by detailed tables of contents, the poetic treatment is divided into ‘chapters’ by inserted headings such as *Horizontis seu finitoriis circuli descriptio, usus, natura et situs* (“Description, utility, nature and position of the circle called horizon or ‘confiner’”, *De mundi sphaera*, 50), subdivided by marginalia and (in the case of *De mundi sphaera*) accompanied by diagrams with captions.68 Yet another, quite special format was chosen by Bruno in *De monade* and *De innumerabilibus* (1591), where the poetic parts are regularly interrupted by explanations and continuations in prose.

To return briefly to the aforementioned anthology compiled by François Oudin: this collection, first published in two volumes comprising some 750 pages in 1749, strikingly testifies to the high esteem in which scientific didactic epic was held. Of its 29 poems, no fewer than fourteen are dedicated to science and its technical applications such as gunpowder or glassmaking. Moreover, its date of publication offers a reminder of the surprisingly late apogee of scientific didactic epic, a fact already mentioned in the introduction. The genre’s popularity during the Enlightenment, the didactically committed era in European history *par excellence*, when didactic poetry also thrived in the vernacular, provides yet another indication that the respective texts were understood as serious attempts at teaching some science to the average intellectual.69

That a second, greatly expanded edition of Oudin’s *Poemata didascalia*, which also contained six new scientific poems, was published as late as 1813, demonstrates the lasting appeal of scientific didactic epic even in the first decades of the nineteenth century.

Finally, the inferences to be drawn from the circumstances of publication can occasionally be confirmed from explicit testimony, as provided

68 See Pantin 1999 (as in n. 14), 31-33. Similar headings can also be found, e.g., in Pontano’s *Urania* (1506) and in *De homine sano et aegroto* (1753) by Hebenstreit (who subdivides his poem by paragraphs).

69 On German didactic poetry in the Enlightenment, see L.L. Albertsen, *Das Lehrgedicht, eine Geschichte der antikisierenden Sachepik in der neueren deutschen Literatur mit einem unbekannten Gedicht Albrecht von Hallers* (Aarhus, 1967), 132-391; C. Siegrist, *Das Lehrgedicht der Aufklärung* (Stuttgart, 1974). The natural world was a not uncommon subject of vernacular didactic poems, but science strictly speaking seems to have been comparatively rare, the most familiar example being Voltaire’s *Élémens de la philosophie de Neuton* (1738).
by the dedications, prefaces to the reader, laudatory poems and imprimaturs which precedence most poems. One can also draw on reviews in journals such as the *Acta eruditorum*, the *Journal de Trévoux* or the *Gentleman’s Magazine*. In such paratexts and appraisals, it was either taken for granted or expressly stated that a successful poem must not only be elegantly written, but also convey a good understanding of its subject. De Quintiis, for one, excuses his recourse to unclassical vocabulary with the undisputed need for clarity in the letter to the reader introducing his poem on the baths of Ischia, *Inarime* (1726):

> Ignoscendum proinde mihi, quod in iis recolendis duara requirat claritatis necessitate coactus vocibus usus sum, quae barbariæ aliquam redolerent.

> You must therefore pardon me for having used in my treatment of these matters words which smack somewhat of barbary: it was the hard constraint to achieve the required lucidity that forced me to do so.\(^7\)

In the *Nova acta eruditorum*, Bošković’s *De solis ac lunae defectibus* (1760) is praised as follows:

> Verum auctor noster subtili tatem cum poesi coniunxit ita, ut saepe ante oculos picta etiam quae difficillima sint videantur. […] Effecit poeta, ut id, quod demonstrationes mathematicas vocant, vere demonstrationes dici iam possint, ut si digitis, quod aiunt, indicentur, clarius apparere haud queant.

> But our author has combined logical precision and poetry in such a way that even the most difficult things often appear like painted before one’s eyes. The poet has achieved it that the so-called mathematical demonstrations can now rightfully be called demonstrations: even if things were, as the saying goes, pointed at with the finger, they could not appear more clearly.\(^7\)

\(^7\) See also, e.g., the approbation of Noceti’s *De iride et aurora boreali carmina* (1747): “mira […] in obscurissimis reconditisque rebus exponendis lux atque facilitas” (“marvelous lucidity and easiness in the presentation of things extremely hard to see through and abstruse”), and the preface of the translator to the bilingual edition of Bošković’s *De solis ac lunae defectibus* (Paris, 1779), xxix: “Pour donner du Poème sur les Éclipses une idée juste et précise, il suffiroit de dire que cet Ouvrage est exactement Newton dans la bouche de Virgile, ou bien la vraie Physique, et sur-tout l’Astronomie, ornée de tous les charmes de la poésie, et mise à la portée de tout le monde.”

\(^7\) *Nova acta eruditorum* (April 1761), 168-174, at 171. See also the review of the first volume of Stay’s *Philosophia recentior* in the *Journal de Trévoux* (January 1756), 81-108.
Similar opinions are also voiced in a perhaps unique work of literary theory and criticism concerned chiefly with scientific didactic epic, the *De poesi didascalica dialogus* written by Cristoforo Stay and appended to the final volume of the *editio maior* of his brother Benedict’s *Philosophia recentior* (1792). The participants in this dialogue not only concur (perhaps unsurprisingly) that scientific didactic epic is the very noblest form of poetry, but also justify their opinion precisely with the genre’s didactic mission (xxv):

Musarum enim cultus ii demum sunt maximi, qui et doctrinis ipsis lucem ac splendorem afferunt et praestantiora ingenia perficiunt ac illustriore loco statuunt.

Among the sacrifices to the Muses, the greatest are those which bring light and splendor to the teachings they expound, make their readers’ minds more excellent and place them at a more elevated viewpoint.}

*In sum, it should have become clear that Neo-Latin didactic epic on scientific subjects cannot be reduced to a mere literary *jeu d’esprit*. Rather, this variety of didactic poetry constituted a real attempt at conveying early modern science to a broader audience of educated non-scientists. As such, it was taken seriously in its own time and deserves to be taken seriously today. This view is confirmed rather than contradicted by the fact that many of the respective texts also make for pleasant reading: they perfectly implement the Horatian unity of *prodesse* and *delectare*.

In earlier works of literary theory, in which scientific didactic is mentioned more briefly, the genre’s didactic function is nonetheless equally taken for granted. See the *peroratio* of Giovanni Pontano’s *Actius* in his *Opera omnia soluta oratione composita* (Venezia, 1518-1519), part 2, f. 153v: “Aperuit rerum naturam generi hominum carmine suo Empedocles, sideralis discipline Dorotheus Sidonius” (“Empedocles has revealed to humankind the nature of things in his poem, Dorotheus of Sidon the nature of astrology”), and above, section 1 (a).
Appendix

A Preliminary List of Neo-Latin Scientific Didactic Epics

The following list is much indebted to the (considerably overlapping) lists in Michael Paintner’s edition of Bernardo Zamagna’s *Navis aëria* (Wien, 1784), 64-74 and in Haskell 2003 (as in n. 12), 329-332 (56 items together). Half a dozen additional items are derived from Hofmann 2003 (as in n. 11), 345-349. In contrast, the indications given by Michael Denis, *Lesefrüchte. Erster Theil: A bis L* (Wien, 1797), 230-235 mostly proved unverifiable.

The list is meant to define a body of early modern didactic epics that can meaningfully be distinguished from the rest as natural-scientific, even if the boundaries are blurred in a number of cases. Only poems that are (mainly) written in hexameters, that reach a certain length and that devote a substantial part of their text to natural science are included. If the admission of a poem did not seem self-evident, a short explanation has been added. One subgenre that had to be excluded (as far as a poem could be attributed to it without doubt, which was not always the case) are the numerous so-called tripos verses from Oxford, Cambridge and Dublin, mostly short pieces that follow their own generic rules.73

In the case of multiple editions under slightly different titles, only the title of the first edition is given. Titles are shortened if excessive. However, translations are cited with their new title. “Oudin I, II, 2I, 2II, 4III” refers to François Oudin s.j. (ed.), *Poemata didascalica*, 2 vol. (Paris, 1749); second, enlarged edition in 3 vol. (Paris, 1813). The second edition is cited only if a poem is not contained in the first. Modern scholarly editions are always cited. The abbreviation “[s.j.]” refers to ex-Jesuits after the suppression of the order in 1773. An asterisk (*) means *non vidi*.

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73 See J.J. Hall, *Cambridge Act and Tripos Verses 1565-1894* (Cambridge, 2009).
[1] Addison, Joseph, *Barometri descriptio*, in Anonymous (ed.), *Examen poeticum duplex* (London, 1698), 75-78. Modern edition and English translation in E. Haan, *Vergilius redivivus. Studies in Joseph Addison’s Latin Poetry* (Philadelphia, PA, 2005), 148-151.

[2] Alessandrini, Giulio, *Paedotrophia sive De puerorum educatione* (Venezia, 1547 [USTC 807761]; Zürich, 1559 [USTC 668492]; Trento, 1586 [USTC 808603]). Contains a number of paediatric passages: see f. 6v-7r, 10v-14v of the last edition, which is easiest available.

[3] Anonymous, *Ascensus et descensus mercurii in barometro pendent ex gravitate aëris et vi eius elastica*, in E. Popham (ed.), *Selecta poemata Anglorum Latina*, vol. 2 (Bath, 1774), 192-195.

[4] Anonymous, *Febris intermittens*, in Popham (ed.), *Selecta poemata* (see [3]), vol. 3 (Bath, 1774), 5-8.

[5] Augurello, Giovanni Aurelio, *Chrysopoeia* (Roma, 1515); 21 further editions, two French translations, one paraphrase. See T. Reiser, *Mythologie und Alchemie in der Lehrepik des frühen 17. Jahrhunderts. Die Chryseidos Libri IIII des Straßburger Dichterarztes Johannes Nicolaus Furichius (1602-1633)* (Berlin – New York, NY, 2010), 52-53.

[6] Basini, Basinio, *Astronomicon libri II* (ca. 1455); in *Opera praestantiora nunc primum edita, tomus primus* (Rimini, 1794), 290-342.

[7] Bisse, Thomas, *Machina pneumatica*, in Id., *Lusus poetici* (London, 1720*), 27-30.

[8] Id., *Microscopium*, in Anonymous (ed.), *Musae Anglicanae*, vol. 1 (London, 1761), 232-243.

[9] Borgondio s.j., Orazio, *De volatu, De natatu, De incessu, De motu sanguinis, De respiratione, De fluminibus*, in Anonymous (ed.), *Arcadum carmina. Pars prior* (Roma, 1721), 1-7, 7-14, 14-21, 21-28; *Pars altera* (Roma, 1756), 8-15, 15-24.

[10] Id., *De lue bovina. Fragmentum ex carmine longiori de motu animalium*, in *Opere fisico-mediche stampate e manoscritte del Kavalier Antonio Vallisneri raccolte da Antonio suo figliuolo, tomo secondo* (Venezia, 1733), 24-25.

[11] Bošković s.j., Rugjer Josip, *De solis ac lunae defectibus libri V* (London, 1760; Venezia, 1761; Graz, 1765). Amplified edition in six books with facing French translation by Abbé de Barruel: *Les éclipses* (Paris, 1779).
[12] Bossuet, François, *De arte medendi libri XII*, ex veterum et recentiorum medicorum sententiis, omnibus medicinae studiosis admodum utiles (Lyon, 1557) [USTC 152234].

[13] Brumoy s.j., Pierre, *De arte vitraria libri II* (Caen, 1712); in Oudin ²III, 254-311 (in four books).

[14] Id., *De motibus animi libri XII*, in Id., *Recueil de divers ouvrages en prose et en vers* (Paris, 1741), vol. 1, 48-283, vol. 2, 2-193. Psychosomatics play an important role; anonymous facing French translation: *Les passions*.

[15] Bruno, Giordano, *De triplici minimo et mensura [...] libri V* (Frankfurt a. M., 1591 [USTC 669360]).

[16] Id., *De monade numero et figura liber [...] item De innumerabilibus, immenso et infigurabili, seu De universo et mundis libri VIII* (Frankfurt a. M., 1591 [USTC 668230]). Modern edition of these poems and the preceding one in *Opera Latine conscripta*, vol. 1, pars 1-3 (Napoli, 1879-1884; Firenze, 1889); many modern translations.

[17] Buchanan, George, *Sphaera* (Paris, 1585 [USTC 172299]); many further editions.

[18] Buonincontri, Lorenzo, *Rerum naturalium et divinarum libri III* (ca. 1470); on cosmology and natural philosophy in general. Modern edition of this and the following poem in S. Heilen (ed.), Laurentius Bonincontri Miniatensis, *De rebus naturalibus et divinis* (Stuttgart, 1999).

[19] Id., *De rebus coelestibus aureum opusculum* (early 1470s; Venezia, 1520*; Venezia, 1526* [USTC 816237]; Basel, 1540 [USTC 671752]; Basel, 1575 [USTC 698691]). Book 1 is concerned with theology, books 2-3 mainly with astronomy and astrology; the title varies considerably in the later editions.

[20] Caldogno, Francesco Bernardino, *Praeservator sanitatis* (Vicenza, 1529* [USTC 817755]; Speyer, 1539* [USTC 686197]).

[21] Capece, Scipione, *De principiis rerum libri II* (Venezia, 1546 [USTC 818458]); several further editions. Italian translation by Francesco Maria Ricci: *Il poema De principiis rerum […] colla traduzione in verso italiano sciolto* (Venezia, 1754).

[22] Ceva s.j., Tommaso, *Philosophia novo-antiqua, dissertationes VII*, in Id., *Carmina* (Milano, 1704), 1-113. Seven short poems, in spite of the title.

[23] Contucci s.j., Contuccio (†1765), *De plantis*. Unpublished, whereabouts of ms. apparently unknown: see Haskell 2003 [as in n. 12], 193 n. 52.

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[24] Coopman, Gadson, *Varis sive Carmen de variolis* (Franeker, 1783); second edition with Dutch translation by F. Hoffman (Leiden, 1787*). German translation by Georg Samuel Francke in *Die Horen* 3.10 (1797), 56-81.

[25] Courtois s.j., Jean-Louis, *Aqua picata* (Roma, 1747); in Oudin II, 272-296.

[26] de la Sante s.j., Gilles Anne Xavier, *Ferrum* (Nyon, 1707 [second edition; first edition could not be verified]); many further editions.

[27] de Polignac, Melchior, *Anti-Lucretius sive De Deo et natura libri IX* (Paris, 1747); many further editions and translations.

[28] de Quintii s.j., Camillo Eucherio, *Inarime seu De balneis Pithecusarum libri VI* (Napoli, 1726).

[29] de Sainte-Marthe, Scévole, *Paedotrophiae libri III* (Paris, 1580 [USTC 171587]); several further editions; in Oudin 2II, 167-224. Edition with facing French translation by Abel de Sainte-Marthe: *La manière de nourrir les enfants à la mammelle* (Paris, 1698). Modern edition in *Oeuvres complètes*, vol. 4 (Genève, 2015*). Contains a number of medical, dietetic and paediatric passages; see 10-19, 40-56.

[30] du Cerceau s.j., Jean Antoine, *Papiliones* (Rouen, 1696); in Oudin 2III, 389-401.

[31] [Escoulant, Pierre], *Gnomon manualis, Gallice La montre. Carmen a selectis secundanis elaboratum ac publice pronuntiatum in regio Ludovici Magni collegio Societatis Jesu* (Paris, 1736); first part ascribed to Pierre Escoulant s.j.; in Oudin I, 322-326.

[32] Favaro, Giuseppe, *Mors laniata* (Amsterdam, 1936*; Modena, 1937*).

[33] Fellon s.j., Thomas Bernard, *Magnes* (Lyon, 1696); in Oudin I, 190-209.

[34] Flemyng, Malcolm, *Neuropathia sive De morbis hypochondriacis et hysterics libri III* (York, 1740; Amsterdam, 1741); Italian translation by Giambattista Moretti da Gaeta: *Del mal de’ nervi o sia dela ipocondria e del morbo isterico* (Roma, 1755*).

[35] Fracastoro, Girolamo, *Syphilis sive Morbus Gallicus* (Verona, 1530 [USTC 830459]); many further editions. Modern edition by G. Eatough (ed., tr.), Fracastoro’s *Syphilis* (Liverpool, 1984).

[36] Furichius, Johannes Nicolaus, *Aurea catena sive Hermes poeticus de lapide philosophorum* (Padova, 1627).

[37] Id., *Chryseidos libri IIII* (Strasbourg, 1633). Modern edition by Reiser 2010 (as in [5]).

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Garulli [s.j.], Camillo, *Hypothesis Copernicana, Cometae*, in Id., *Hypothesis Copernicana, Cometae et Elegiarum monobiblos* (Roma, 1777), 11-32, 33-86.

Geoffroy, Étienne Louis, *Hygieine sive Ars sanitatem conservandi. Poema* (Paris, 1771).

Giaccoletti, Giuseppe, *De lebetis materie et forma eiusque tutela in machinis vi vaporis agentibus carmen didascalicum* (Amsterdam, 1863).

Giannettasio s.j., Niccolò, *Bellica* (Napoli, 1699; Napoli, 1714). Books 2, 6, 7, 14, 15 are dedicated to aspects of modern war technology such as gunnery, artillery, siege technology, sapping.

Id., *Naumachica seu De bello navali libri V* (Napoli, 1715). For discussions of martial and nautical technology, astronomy and geography, see especially 5, 13-18, 38-40, 49-53.

Gray, Thomas, *De principiis cogitandi*, in *The Poetical Works of Thomas Gray* (London, 1821), 126-134; in G.G.C. (ed.), *Fasciculus carminum stylo Lucretiano scriptorum* (Eton, 1839), 1-12. Unfinished, only first parts of books 1 and 4 extant. The full name of the editor is not ascertainable.

Griffet s.j., Claude, *Cerebrum. Carmen* (Rouen, 1727); in Oudin ²III, 243-253.

Grove, Robert, *Carmen de sanguinis circuitu a Gulielmo Harvaeo Anglo primum invento* (London, 1685; London, 1721*).

Habersack, Franz Adolf, *Medicina Austro-Viennensis versice exposita sive Regulae diaetaetico-propylactico-euporistae* (Wien, 1731; Eger, 1775). Partly in elegiac distichs, partly in hexameters.

Hebenstreit, Johann Baptist, *In astro-poecilo-pyrgium Keplerianum astronomiae ortum progressumque usque ad nostram aetatem […] depictum exhibens*, in Johannes Kepler, *Tabulae Rudolphinae* (Ulm, 1627 [USTC 2133655]), f. [5v-7v]. Partly didactic, partly panegyrical description in hexameters of the frontispiece of Kepler’s work, which allegorically depicts the history and the system of astronomy.

Hebenstreit, Johann Ernst, *Pathologia metrica seu De morbis carmen* (Leipzig, 1740).

Id., *De homine sano et aegroto carmen* (Leipzig, 1753; Leipzig, 1759).

Hérissant, Louis-Antoine-Proper, *Typographia. Carmen* (Paris, 1764); in Oudin ²III, 1-8.

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[51] Honterus, Johannes, *Rudimentorum cosmographicorum libri III* (Zürich, 1548 [USTC 691661]); many further editions.

[52] Ivančič s.j., Ján, *Elementa opticae* (Trnava, 1750*).

[53] Kinloch, David, *De hominis procreatione, anatome et morbis internis* (Paris, 1596* [USTC 158436]); in A. Johnston (ed.), *Delitiae poetarum Scotorum* (Amsterdam, 1637 [USTC 1511235]), vol. 2, 3-66.

[54] Lagomarsini s.j., Girolamo, *De anatome*, in Francesco Savastano, *I quattro libri delle cose botaniche*, tr. by Giampietro Bergantini (Venezia, 1749), 1-34 (unfinished; includes facing Italian translation and notes); in *Opera edita et inedita* (Genova, 1842), 317-324.

[55] Landi Vittori s.j., Gregorio, *Institutiones philosophicae, libri XII* (Roma, 1767*).

[56] Latomus, Barthélemy, *Bombarda* (Köln, 1523 [USTC 657187]); second, massively enlarged edition (Paris, 1536 [USTC 146999]; Paris, 1545* [USTC 195648]). Modern edition with translation and commentary in M. Melchior, C. Loutsch (ed.), *Humanistica Luxemburgensia* (Bruxelles, 2009), 32-87.

[57] le Coëdic s.j., Pierre, *Mundus Cartesii*, in Oudin I, 43-72.

[58] le Febvre s.j., François Antoine, *Aurum* (Paris, 1703); in Oudin I, 210-223.

[59] Id., *Terraie-motus* (Paris, 1704); in Oudin I, 224-236.

[60] Id., *Musica* (Paris, 1704); in Oudin I, 237-251. Opens with a description of the anatomical and physiological foundations of the human voice and the sense of hearing.

[61] Lopez de Ayala, Pedro, *Poesis philosophica in sex digesta libros de totidem rebus, quas physici nonnaturales vocant* (Coimbra, 1618).

[62] Lucini, Paolo, *Opticae iuxta Newtonianas leges [...] Latinis versibus expositae libri IV* (Parma, 1793).

[63] Mazzolari s.j., Giuseppe Maria, *Electricorum libri VI* (Roma, 1767).

[64] Id., *De origine ventorum [...] carmen philosophicum*, Archivio Romano della Compagnia di Gesù, Opp. NN, ms. 163*.

[65] McEnroe [alias De la Croix], Demetrius, *Connubia florum Latino carmine demonstrata* (Paris, 1728 [with French translation by Patrice Trante]; Bath, 1791; Lisboa, 1801 [with Portuguese translation by Manoel

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Maria de Barbosa du Bocage); in Oudin I, 327-346, erroneously ascribed to the French translator).

[66] Miziauld, Antoine, *De mundi sphaera seu Cosmographia, libri III* (Paris, 1551* [USTC 203995]; Paris, 1552 [USTC 151073]; Paris, 1553* [USTC 196623]).

[67] Id., *Zodiacus sive Duodecim signorum coeli hortulus libellis III concinnatus* (Paris, 1553 [USTC 140101]).

[68] Id., *Planetae sive Planetarum collegium* (Paris, 1553 [USTC 151367]).

[69] Id., *Asterismi sive Stellatarum octavi coeli imaginum officina* (Paris, 1553 [USTC 158712]).

[70] Molnár, János, *Zoologicon, Botanicon, Oryctologicon* (Buda, 1780). The three works form a triptych comprising the whole realm of Nature.

[71] Noceti s.j., Carlo, *Iris* (Venezia, 1730*; Venezia, 1731*); in Id., *De iride et aurora boreali carmina* (Roma, 1747), 1-17; in Oudin II, 204-223; Italian translation by Antonio Ambrogi s.j. in *L’iride e l’aurora boreale* (Firenze, 1755). Modern edition: Tautchnig 2017 (as in n. 33).

[72] Id., *Aurora borealis*, in *De iride* (see [70]), 49-87; in Oudin II, 224-271; Italian translation by Antonio Ambrogi s.j. in *L’iride* (see [70]).

[73] Oudin s.j., François, *Somnia* (Dijon, ?1697*; Dijon, 1698; Langres, 1698); in Oudin I, 5-23. Begins with physiological foundations of sleep and dreams.

[74] Id., *Ignis*, in Oudin I, 252-271.

[75] Petit, Pierre, *Thia Sinensis* (Paris, 1635); in Oudin I, 24-42. Includes a description of the shrub and a discussion of its medical properties.

[76] Plinius, Basilius, *De colorum natura* (Wittenberg, 1599*).

[77] Id., *De voluptate et dolore* (Wittenberg, 1600 [USTC 615277]).

[78] Id., *De ventis* (Wittenberg, 1600*; Riga, 1603*).

[79] Id., *De venenis et venenatis et de morbi Gallici investigatione carmen* (Wittenberg, 1603; Nürnberg, 1603* [USTC 2039587]).

[80] Id., *Carmen de magnete* (Augsburg, 1603 [USTC 2104865]).

[81] Pontano, Giovanni Gioviano, *Urania sive De stellis libri V*, in *Opera* (Venezia, 1505 [USTC 850308]), f. a ii r o iii v; many further editions. Modern edition of book 1 by D. Weh (ed., tr.), *Giovanni Pontanos Urania, Buch 1* (Wiesbaden, 2017).
[82] Id., Meteororum liber unus, in Opera (Venezia, 1505 [USTC 850308]), f. [o v r-s i v]; many further editions. Modern edition in M. de Nichilo (ed.), I poemi astrologici di Giovanni Pontano (Bari, 1975), 93-137.

[83] Pulcharelli s.j., Costanzo, Paeoniae seu De valetudine tuenda libri II, in Id., Carminum libri V (Napoli, 1618, 184-282; La Flèche, 1619* [USTC 6804580]; Firenze, 1650, 129-195; Bologna, 1651, 144-212).

[84] Quillet, Claude, Callipaedia seu De pulchrae prolis habendae ratione (Paris, 1655); many further editions. English translation “by several hands”: Callipaedia, or The Art of Getting Pretty Children (London, 1710); several further editions.

[85] [Sándor, Carolus, and eleven other students of Trnava University], De vi electrica carmen didacticum (Trnava, 1746).

[86] Savastano s.j., Francesco, Botanicorum seu Institutionum rei herbariae libri IV (Napoli, 1712); Italian translation by Giampietro Bergantini: I quattro libri delle cose botaniche (Venezia, 1749).

[87] Scherrffer s.j., Karl, De ascensu mercurii in barometro carmen (Graz, 1749*).

[88] Sonnenburg, Johann Christoph Anton, Carmen macrobioticum (Helmstadt, 1803).

[89] Souciet s.j., Auguste Étienne, Cometae (Caen, 1710*); in Oudin II, 184-203.

[90] Speyert van der Eyk, Simone, De galvanismo, unpublished, 1823*. Universiteitsbibliotheek Leiden, ms. LTK 557.

[91] Stay, Benedict, Philosophiae versibus traditae libri VI (Venezia, 1744); enlarged and revised edition (Venezia, 1747).

[92] Id., Philosophiae recentioris versibus traditae libri X [...] cum adnotationibus et supplementis P. Rogerii Josephi Boscovich, 3 vol. (Roma, 1755; Roma, 1760; Roma, 1792); edition in one volume without notes and supplements (Roma, 1792).

[93] Strozzi s.j., Tommaso, De mentis potu sive De cocolatis opificio libri III, in Id., Poemata varia (Napoli, 1689), 1-89. Contains a notable amount of botanical and medical passages; see especially 17-19, 59-71, 77-89.

[94] Tarillon s.j., François, Pulvis pyrius (Paris, 1692*; s.l., 1704); in Oudin I, 128-140.

[95] Thomas s.j., Loup, Barometrum, in Oudin ²II, 341-356.

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[96] Thorius, Raphael, *Hymnus tabaci* (Leiden, 1625 [USTC 1028165]); several further editions. Three different translations, by Peter Hausted (London, 1651), Henry Player (London, 1716), and William Bewick [first book of two books only] (London, 1725). Modern hypertext edition by M. Riley at http://www.philological.bham.ac.uk/thorius. The title is misleading, since the poem is largely didactic.

[97] van Mander, Carel, *Poema de pulvere tabaci* (København, 1661; København, 1666).

[98] Vigo, Giovanni Bernardo, *Cortex Peruvianus* (Torino, 1773).

[99] Id., *Tubera terrae* (Torino, 1776); translation by the author: *I tartufi* (Torino, 1776). Contains a substantial amount of mycological discussion: see 3-7, 16-38.

[100] von Nettesheim, Johannes, *Vellus aureum*, unpublished, ca. 1560. Biblioteca Apostolica Vaticana, ms. Barb. lat. 1832*. See Z. von Martels, “Augurello’s *Chrysopoeia* (1515). A Turning Point in the Literary Tradition of Alchemical Texts”, *Early Science and Medicine* 5.2 (2000), 178-195, at 191-194.

[101] Wilczek [s.j.], Ignatius, *De coloribus carmen* (Frankfurt a. M. – Leipzig, 1776).

[102] Winter, Krzystof, *Fabrilium Silesiae officinarum fodinarumque descriptio et denotatio brevis* (Frankfurt a. d. Oder, 1556; Lüben, 1582).

[103] Zamagna s.j., Bernardo, *Echo, libri II* (Roma, 1764; Dillingen, 1773).

[104] Id., *Navis æüria, libri II* (Roma, 1768; Wien, 1784). Modern editions by M.B. McElwain (ed., tr.), *Navis æüria of B. Zamagna* (Northampton, MA, 1939*); D. Bitzel, *Navis æüria. Eine Metamorphose des Lehrgedichts im Zeitalter des technischen Fortschritts* (Frankfurt a. M., 1997).

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