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Michał Kokowski

ORCID 0000-0002-5389-9051
Institute for the History of Science,
Polish Academy of Sciences (Warsaw-Kraków, Poland)
michal.kokowski@ihnpan.pl

An Introduction to the Topic "Copernicus and Astrology". A Commentary on the Theses of Robert S. Westman

Abstract

This article is an introduction to the subject of Copernicus and astrology. It presents an overview of a set of facts and positions of researchers exploring the relevant ideas of Copernicus, as well as the author's own perspective. A key role is played by a critique of R.S. Westman's theses.

Keywords: *Copernicus*, *science of stars*, *astrology*, *astronomy*, *terms and their different meanings*, *R.S. Westman*

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Wprowadzenie do tematyki „Kopernik a astrologia". Komentarz do tez Roberta S. Westmana

Abstrakt

Artykuł stanowi wprowadzenie do tematyki „Kopernik a astrologia". Przedstawiono przegląd zbioru faktów i stanowisk badaczy myśli Kopernika, które łączą się z tą tematyką, a także stanowisko autora. Kluczową rolę pełni krytyka tez R.S. Westmana.

Słowa kluczowe: *Kopernik*, *nauka o gwiazdach*, *astrologia*, *astronomia*, *terminy i ich różne znaczenia*, *R.S. Westman*

1. Astrology – Mesopotamia and the Ancient World[1]

Etymologically speaking, astrology is the science of stars (from Greek ἀστρον (*ástron*) + λὀγος (*lógos*)), which deals with the prediction of: a) natural phenomena (occurring in the celestial sphere and the terrestial sphere) based on the configuration of the positions of the Sun and the Moon, the planets / wandering stars, the fixed stars and b) the fate of a specific person, nation, land, enterprise, etc. based on the configuration of the positions of the Sun and the Moon and the planets /

[1] The origin of the article: in Kokowski's 2009 monograph, the topic of Copernicus and astrology played a marginal role. I recalled there (pp. 51, 52, 104, 286, 405) that in none of his works did Copernicus, unlike Rheticus, promulgate ideas that could be interpreted as acceptance of the principles of astrology. This was also claimed by many earlier researchers of this subject.

The situation changed when Robert S. Westman, in his 2011 monograph and later works, presented a radicalized view of Copernicus and astrology. However, the beginnings of this interpretation date back to 1993.

To test Westman's theses, an online conference "Copernicus and Astrology" was organized on May 29, 2024, as part of the work of the Commission on the History of Science (Polish Academy of Arts and Sciences) and the Science Studies Research Unit (Institute for the History of Science, Polish Academy of Sciences).

The conference speakers included dr hab. Sylwia Konarska-Zimnicka, Associate Professor at the Jan Kochanowski University in Kielce, George Borski, a young researcher associated with Stichting 'De Rebus', Foundation for the History and Philosophy of Science (Amsterdam – Almere, The Netherlands), and the author of this article.

The article at hand is an extension of the paper that was an introduction to the subject of the conference. The topic will be continued in the next two articles – see Borski, Kolkov 2024; Konarska-Zimnicka 2024.

wandering stars[2] in relation to the fixed stars, in particular some part of the zodiac. The foundation of astrology is a basic ontological axiom: *the assumption of the existence of an influence of celestial bodies on the whole of nature* (both the Earth and the rest of the cosmos), *including the human organism, with the impact not only on its physical, but also intellectual and mental spheres*.[3]

According to many researchers of the topic (e.g. Dobrzycki 1971, pp. 15–19; Doktór 1987, p. 7; Koch-Westenholz 1995, pp. 32–73; Saunders 1998; Lewis 2003, p. 144), the science understood in this way originated probably in Mesopotamia in the 4th–3rd millennia BC,[4] then spread and gained recognition throughout the ancient world.[5]

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[2] Originally, it concerned five planets: Mercury, Venus, Mars, Jupiter, and Saturn. After the discovery of additional planets in the 18th and 19th centuries, i.e. Pluto (1781) and Neptune (1846), advocates of astrology included these celestial bodies in the set of planets taken into account in the construction of astrological horoscopes.

[3] According to A.A. Long (1982), this axiom was developed by the Stoics and has a universal meaning of the sympathy of celestial and terrestrial phenomena. The term 'sympathy' in this meaning was used, for example, by Sextus Empiricus (1949, p. 325). However, I think that this axiom (though not the term 'sympathy' itself) is much older – it was born in the ancient culture of Mesopotamia, and perhaps even earlier in the megalithic culture.

In discussing this issue, A.A. Long introduced a useful distinction between *hard astrology* and *soft astrology*: "I will distinguish, during this paper, between 'hard' astrology, which claims that heavenly bodies are both signs and causes of human affairs, and 'soft' astrology which regards heavenly bodies only as signs of human affairs without also attributing a causal role to the heavenly bodies… (Long 1982, p. 170, fn. 19).

How this ontological axiom was interpreted, see below.

[4] In my opinion, however, it cannot be ruled out – but this is just a guess not supported by written sources – that the beginnings of astrology date back to the megalithic culture, i.e. the 5th millennium BC. This is also the opinion of Nicholas Campion (2008, vol. I, pp. 15–49).

[5] However, according to some researchers *basing on a solid analysis of source texts*, only the foundations of astrological knowledge were created in Mesopotamia, and astrological research was fully developed only in Hellenistic times – see e.g. Pingree 1997; Rochberg-Halton 1984; 1992; Rochberg 1988; 1992; 2004; 2010; Tanzella-Nitti 2002; Taylor 2006; Cooper 2018; Ulanowski 1992; 2022.

The aforementioned foundations of astrological knowledge are related to the study of cosmic omens – fortune-telling from celestial phenomena (from the Latin *omen*, *omina* – 'fortune-telling'), distinguished from astrological research proper: "(1) Omina, which studied celestial phenomena as signs or indicators of future terrestrial events, and which originated in ancient Mesopotamia, and (2) astrology proper, which studied the influence of the heavenly bodies on the course of

From ancient times to the 17th century astrology was the pinnacle of astronomy (etymologically, the science describing stars/heavenly bodies; Latin 'astronomia' comes from Greek ἄστρον + νὸμος (*astron* + *nómos*), i.e. star + law), because astrology used the tools of astronomy as an auxiliary science providing predictions of the positions of Sun, Moon, planets and fixed stars).

It is common knowledge that the greatest contribution to astronomy and astrology in antiquity was made by Claudius Ptolemy, the author of *Almagest* (on mathematical and observational astronomy), *Planetary Hypotheses* (on physical astronomy) and *Tetrabiblos* (on astrology).[6]

The interpretation of the above-mentioned basic ontological axiom of astrology has been a controversial issue since the ancient times. It was connected with a critical discussion on the determinism and indeterminism of natural phenomena and human fates, in which participated the Stoics (including Zeno, Manilius, Chrysippus, Carneades, Diogenes of Babylon, Posidonius and Panaetius, who rejected astrology), the Neoplatonists (including Geminus of Rhodes, Plotinus, and Proclus) and the Skeptics (including Favorinus, Sextus Empiricus and Cicero, who rejected astrology), as well as the supporters of astrology: Ptolemy and Julius Firmicus Maternus, and the opponents of astrology: St. Bishop Augustine and St. Isidore of Seville.[7]

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events on earth, and which originated in the Hellenistic Greek sphere" (Rochberg-Halton 1992, p. 504).

[6] "Ptolemy's *Tetrabiblos* is without doubt the single most influential book in all of Western Astrology. Its effect upon astrology is as great as Isaac Newton's *Principia* on Physics" (Hand 1994, p. i).

From the first half of the 12th century, when the first translation of *Tetrabiblos* (*Quadripartitum*) into Latin was made, Ptolemy was called the prince of astrologers in Latin Europe (Broecke 2003, p. 59). For example, John of Głogów thus defined Ptolemy in his *Tractatus preclarissimus iudiciis astrorum de mutatione aëris* (Cracoviae: Florian Unglern et Wolfgang Lern, 1514, Boss., XVI. Qu. 1671, pp. 9vb, 10rb): "omnium sapientium in scientia stellarum princeps".

Let us add that in the 15th and 16th centuries, some European researchers criticized medieval Arabic astrology, which deformed Ptolemy's views on this matter; this is the so-called back to Ptolemy – see Faracovi 2014.

[7] The ancient thinkers mentioned here knew a great deal about astrology, its advantages, limitations and disadvantages. I think that their level of knowledge far exceeds that of many contemporary experts in this field (which is a very strong argument for the need to develop the history of thought and the history of science). I find the

The legacy of Hellenic and Hellenistic astronomy and astrology was creatively taken up:

a) in the Middle Ages in Arab culture by Abū Ma'šar (Albumasar), the author of *De magnis coniunctionibus* (*On the Great Conjunctions*) [Augsburg 1489, Venice 1515]; Mashallah ibn Athari (Mashallah); Alcabitius; al-Kindi; Albohazen Hali, the author of *Praeclarissimus liber completus in judiciis astrorum* (Venice, 1485: Erhard Ratdolt),

b) in Christian Europe, on the one hand, in the 12th–16th centuries, works combining philosophy, astrology and theology were created by St. Bishop Albert the Great (*rational astrology*), the Wittenberg School (among others, Philip Melanchthon, Caspar Peucer, Erasmus Reinhold, Hieronymus Wolf, Jakob Milich, Martin Chemnitz, Paul Eber), and St. Cardinal Robert Bellarmin (*Thomasian astrology*) – see Brosseder 2005; Rutkin 2018; on the other hand, in the 12th–17th centuries, in reference to the Stoic Panaetius and the Neoplatonists: Geminus of Rhodes, Plotinus and Proclus, the Skeptics: Favorinus, Sextus Empiricus and Cicero, and the Christian philosophers and theologians: St. Bishop Augustine and St. Isidore of Seville, there was an ongoing debate on the incompatibility of prophetic astrology with the dogmas of the Christian faith (including the Christian concept of free will) and empirical knowledge, among others by St. Thomas Aquinas, Bishop Étienne Tempier (d. 1279) – the condemnation of the theses of the radical Aristotelians (1270, 1277), Bishop Nicholas of Oresme, Cardinal Archbishop Peter of Ailly, John Gerson, Marsilio Ficino, Giovanni Pico della Mirandola, Girolamo Fracastoro, Martin Luther, and the bull *Coelli et terrae* (1586) – see Lanuza-Navarro, Ávalos-Flores 2008; Vescovini 2014; Hendrix 2007; 2010; 2018;

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critique of astrology particularly interesting. I was greatly impressed by the critical commentaries of Sextus Empiricus (floruit mid-late 2nd century AD in Athens and Alexandria) – see Sextus Empiricus 1949.

2020; 2023; Tarrant 2020; in the case of Giovani Pico della Mirandola, author of *Disputationes adversus astrologiam divinatricem* (Bologna 1496), it was about distinguishing true natural effects of the action of the celestial spheres on the Earth from false astrological speculations.

Let us quote Pico della Mirandola here:

> Astrologiam vero cum dico, non eam intelligo quae siderum moles et motus mathematica ratione metitur, artem certam et nobilem et suis meritis honestissimam auctoritateque hominum doctissimorum maxime comprobatam; sed quae de sideribus eventura pronunciat, fraudem mercenariae mendacitatis, legibus interdictam et civilibus et pontificiis, humana curiositate retentam, irrisam a philosophis, cultam a circulatoribus, optimo cuique prudentissimoque suspectam, cuius olim professores gentilicio vocabulo Chaldaei, vel ab ipsa professione genethliaci dicebantur (40, 1–11) (cited form Rutkin 2010, p. 146).
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> But when I say astrologia, I do not understand that which measures the sizes and motions of the stars with mathematical argument, a certain and noble art, most honest in its benefits, and approved especially by the authority of the most learned men; but that which announces what will happen from the stars, a fraud of mercenary mendacity, prohibited by laws both civil and papal, retained by human curiosity, ridiculed by philosophers, worshipped by quacks, suspected by the best and most pruden, whose professors were formerly called by the gentile term of Chaldaeans, or by their very profession, genethlics] (cited from Rutkin 2010, p. 136).

2. The science of the stars, astronomy, astrology and mathematics

Since the dawn of time, people have been interested in stars. With the development of ancient culture, a research discipline dedicated to this emerged – the science of stars.

Plato used the term 'astronomy' in his writings to designate this science, *developed using geometry and arithmetic*. In turn, Aristotle understood the science of the stars to be the study of these stars using the Aristotelian principles of metaphysics and physics, and he called such science 'astrology'. The Chaldeans, on the other hand, understood the science of the stars as a science used to predict people's fate, based on the previously adopted fundamental assumption about the existence of specific influences of heavenly bodies on man and nature.

These three different meanings of the science of the stars are manifested in the works of Ptolemy in the *Almagest*, *Tetrabiblos* and *Planetary Hypotheses*, in which their author combined three traditions: Platonic astronomy (presented in the *Timaeus*, which preaches probabilism and hypothetism of the postulated entities of the theory), Aristotelian metaphysics and physics, and the Chaldean idea of the possibility of predicting human fate based on the configuration of heavenly bodies (cf. Hübner 1989; Losev 2012; Feke 2018).

However, in the *Almagest* Ptolemy himself did not use the term 'astronomy' at all and in the *Tetrabiblos* he used it only six times, always in the phrase "di' astronomias" [using astronomy], and he did not use the term 'astrology', but the term 'apostelematography' or 'apostelesmatika' (cf. Hübner 1989; Feke 2009; 2018; Losev 2012; Muszyński 2012), which included both astronomy and astrology in meaning. Nevertheless:

> [T]he two sciences remain distinct. According to Ptolemy, astrology and astronomy use astronomia [or, better said, *tools of astronomy* – M.K.] to different ends. Astrology employs astronomia [*tools of astronomy* – M.K.] to predict the qualitative changes produced in the sublunary realm from the stars' configurations, which result from their movements. Astronomy, on the other hand, uses astronomia [*tools of astronomy* – M.K.] to predict the stars' movements and configurations themselves (Feke 2018, p. 169).

This idea was expressed more accurately by Oswald Schreckenfuchs (1569), quoted by Westman:

> Astrorum Scientiam in duas diuidi partes. Haec scientia despescitur in Astronomiam et Astrologiam. Astronomia est doctrina, que mediantibus Geometrria, et Arithmetica, inquirit, ac demonstrat motus uarios, magnitudines, et

> distantias corporum coelestium, ut paucis multa dicam, ipsa omnes diuersitates, et mutations apparentiarum, tam in planetis quam in reliqius stellis, saluat.
>
> Astrologia autem est doctrina, que ex stallarum motu ac uirtute, natura atque situ diuesos qualitatum et quantitatum motus in corporibus, praedicit (Westman 2011a, p. 519, fn. 56).

> The science of stars is divided into two parts. This science encompasses Astronomy and Astrology. Astronomy is a doctrine which by means of Geometry and Arithmetic investigates, and shows the various motions, magnitudes, and distances of the heavenly bodies, to name a few [of] many things; it itself saves all the diversities and changes of appearances, both in the planets and in the rest of the stars.
>
> But astrology is a doctrine which predicts the various qualities and quantities of movement in bodies from the movement and virtue of the stars, their nature and situation.

Nevertheless, from antiquity to the 16th and 17th centuries, the names 'the science of the stars', 'astronomy', 'astrology' and 'mathematics' were often treated interchangeably.[8] It was clear from the specific context what astronomical or astrological, or mathematical aspect was meant by the authors discussing the science of the stars.[9]

3. Subdisciplines of the science of the stars / astronomy / astrology / mathematics

From ancient to modern times, the science of the stars has undergone multi-faceted development. Taking this development synthetically, we

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[8] One example comes from Giorgio Valla and his encyclopedia *De expetendis ac fugiendis rebus* (Venice, 1501), according to which "Astrologia astrorum scientia est…" (Book 1). We know that Copernicus used this encyclopedia – see L. Birkenmajer 1924, pp. 152–168.

[9] Moreover, according to Robert Schmidt, the translator of *Tetrabiblos*, the belief widespread among some researchers that the contents of astronomy and astrology are identical is erroneous. In Ptolemy, astronomy and Aristotle's physics are two preliminary disciplines on which astrology is based (see Ptolemy 1994, note 1, pp. 1–2). I share this view.

can distinguish many subdisciplines – trends that emerged, developed, lasted or disappeared.

The basic division is as follows: the study of the stars is divided into mathematical astronomy and physical astronomy, which together describe and explain the movements, sizes and distances of celestial bodies, and practical astronomy, which describes the effects of celestial bodies on Earth.[10] Practical astronomy includes many subdisciplines, such as: astronavigation (navigational astronomy), astrogeography (astronomical geography), natural or physical astrology (choreography: terrestrial astrology, astrometeorology / astrological meteorology, astrobotany / astrological botany, astrozoology / astrological zoology, astromineralogy / astrological mineralogy, iatromathematics / medical astrology / astrological medicine) and prophetic astrology (*astrologia divinatrix*; *astrologia iudicaria*) or superstitious astrology (*astrologia superstitiosa*).[11]

Divinatory astrology includes: mundane or political astrology, which concerns the creation of horoscopes of rulers, territories and countries; natal astrology, which concerns the creation of horoscopes of people (two variants determined by the starting date: birth or conception); horary (hourly) astrology, which concerns the search for an answer to a specific question asked at a specific date; elective astrology, the opposite of horary astrology, when the answer to the question we are interested in is known and we want to know when we should make such a decision.[12]

Natural, medical and prophetic/superstitious astrology was based on mathematical and physical astronomy as well as astrological physics (describing the mechanisms of astrological interactions).[13]

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[10] This type of division was used, for example, by Claudius Ptolemy, Albohazen Hali, and Albert of Brudzewo. The latter used it in his work *Commentariolum super Theoricas novas planetarum*, first published in 1495 in Milan, and reprinted in Kraków in 1900 (see Albertus de Brudzewo 1900, pp. 16–17). During his studies in Kraków, Copernicus most likely already analyzed copies of this work used by Cracovian lecturers – see Sylla 2017, p. 47.

[11] In turn, astrology can be divided into subdisciplines or trends. Jim Lewis's *Astrology Encyclopedia* (2003) distinguishes 25 disciplines (astrological trends) from ancient times to the present day, and also provides several geographical descriptions, including Chaldean/Mesopotamian, Chinese, and Egyptian astrology.

[12] Cooper 2018, pp. 382–383.

[13] See L. Birkenmajer 1900, pp. 94–95; Cornell 1933/ (3rd rev. ed.) 1992; Allen (1941) 1966, p. 13; Pines 1964; Casirer 1942b, p. 343; Pingree 1968; Barton, Tamsyn

Then, in the 18th and 19th centuries, prophetic/superstitious astrology was considered a pseudoscience,[14] but still had numerous supporters, astrogeography got rid of astrological overtones, astrometeorology

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1994, pp. 179–191; Broecke 2003, pp. 7–27; Poggi 2003; Taub 2003; 2012; Rutkin 2002; 2006; 2018; Cooper 2011, pp. 123–124; 2018; Hübner 2012; Losev 2012; Rożek 2016, p. 253; Sylla 2017, pp. 46–48; Konarska-Zimnicka 2018, p. 137, fn. 1; Pfeffer 2023.

This division is conventional in nature, and although it refers to historical terminology, it serves to organize the discussion on various types of research carried out by the adepts of the "science of the stars" from ancient to modern times, in particular to isolate components related to the activity of divining the fate of people, societies, and the development of events etc., based on the configuration of celestial bodies / stars (wandering stars, i.e. planets, and fixed stars). I believe that it is worth undertaking systematic, detailed historical research of various disciplines included in the "science of stars". I recommend this topic to the attention of researchers.

[14] For example, *Encyclopaedia Britannica* from 1768 puts it this way (in the first volume of the first edition of this encyclopedia): "ASTROLOGY, a conjectural science, which teaches to judge of the effects and influences of the stars, and to foretel future events by the situation and different aspects of the heavenly bodies. *This science has long ago become a just subject of contempt and ridicule* (Colin Macfarquhar (ed.), *Encyclopaedia Britannica*, 3 vols. (Edinburgh, 1768–1771), vol. 1, p. 433 – cited from Rutkin 2018, pp. 241–242; italics added by M.K.).

The recognition of astrology as a pseudoscience was preceded by, on the one hand, the emergence of a philosophical, astrological and theological synthesis in the 12th–16th centuries (e.g. St. Bp. Albert the Great, Melanchthon; see Rutkin 2018) and, on the other hand, the ongoing debate in the 12th–17th centuries on the incompatibility of divinatory astrology with the dogmas of the Christian faith and empirical knowledge (discussed, among others, by St. Bp. Augustine, St. Isidore of Seville, St. Thomas Aquinas, Bp. Étienne Tempier (d. 1279)) and the condemnation of theses of the radical Aristotelians (1270, 1277) by Bp. Nicholas of Oresme, Cardinal Archbp. Peter of Ailly, John Gerson, Marsilio Ficino, Giovanni Pico della Mirandola, Girolamo Fracastoro, Martin Luther, and the papal bull *Coelli et terrae* (1586) – see Lanuza-Navarro, Ávalos-Flores 2008; Vescovini 2014; Tarrant 2020.

Regarding pseudoscience, see e.g. Thagard 1978. I will add one more remark omitted by Thagard. Although I am not a supporter of prophetic astrology for empirical reasons (lack of compliance of astrology's predictions with empirical facts; extremely unrealistic mechanism of influence on humans and the sublunar sphere of distant planets – extremely weak sources of radiation compared to the Sun) and theological reasons (inconsistency of the astrological ontological axiom with the human free will according to Christian theology), I do not agree with the thesis of Eugeniusz Rybka (1971, p. 23) that prophetic astrology can only be implemented in the geocentric system and cannot be implemented in the heliocentric system.

Professor Rybka's thesis is not new at all, because it had been preached before by, for example, W.W. Tarn (1952, p. 348) and David Pingree (1968, p. 118). It was already

changed into meteoreology, iatromathematics into physiology, and mathematical and physical astronomy entered into a close dialogue with modern physics, which led to the emergence of, among others, astrophysics and relativistic cosmology in the 19th and 20th centuries.

4. Two Chairs in Alma Mater Cracoviensis

At the beginning of the 15th century, two Chairs were founded in the Alma Mater Cracoviensis: the Chair of Mathematics and Astronomy, established in 1405 by Master Jan Stobner or the Kraków burgher Stobner (therefore also called the Stobner Chair) and functioning perhaps already since 1410, or at the latest 1415, and the Chair of Astrology, probably established at the beginning of the second half of the 15th century by Marcin Król of Żurawica, as can be proven by the astrological forecast for 1451 prepared by this author.

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denied by George Sarton (1959, p. 60) and Eugenio Garin (1976a, p. xi). I will add that Tarn-Rybka's thesis is contradicted by, for example, the astrological forecaster for 1541 determined on the basis of the *Copernican Tables* by Andreas Aurifaber in the work entitled *Practica auff das Jar M.D.XLI…* (Danzig, 1540) (Green 2010; Włodarczyk 2015, pp. 20–23) or Kepler's activity as an astrologer (Garin 1976a, pp. xi, xii, 12, 125; Gingerich 1981, p. 289; North 1994, pp. 312–314; Rabin 1997; Konarska-Zimnicka 2018, pp. 360–361, fn. 237). Tarn-Rybka's mistake is repeated by Marcin Karas (2018, p. 72, fn. 263).

Incidentally, the content of the monograph by M. Karas (2018) is very interesting from the perspective of my research interests. I only regret, as a historian and philosopher of science and a scientist living in Kraków, that its author, working at the Jagiellonian University in Kraków, only occasionally refers to my habilitation thesis (Kokowski 2004), although he includes it in his basic studies in the introduction to his monograph (Karas 2018, p. 11: "A comprehensive analysis of Copernicus's originality in the light of the latest literature is the English-language publication by the Polish scientist Michał Kokowski entitled "Copernicus's originality (page 314)" […]. The author's research is characterized by an interdisciplinary approach and clarity of the conclusions, a synthetic approach and knowledge of the sciences and their methodology. The monograph presents a very broad background against which heliocentrism is considered") and does not quote my other basic publications (Kokowski 1996; 2001; 2009), the content of which is closely related to his arguments, e.g. on Copernicus's nationality, his methodology, the problem of Earth's movements, the views of T.S. Kuhn on Copernicus, etc. *I assess such a strategy as a manifestation of a very serious crisis in scientific discourse and a waste of an opportunity to engage in a valuable, critical scientific discussion.*

The Chair of Astrology operated until 1780. It was closed by the decision of Hugo Kołłątaj as a result of criticism of the compliance of forecasters with empirical facts, by, among others, Jan Poszakowski and Antoni Wiśniewski (Kowalewska 2009, p. 282; Rok 2023).

5. Copernicus's studies in Kraków and astrology

From the fall of 1491 or the winter of 1492 until the summer of 1495 at the latest,[15] Copernicus studied at Alma Mater Cracoviensis, which was the European center of astronomy and astrology.

During his studies, *he had the opportunity to listen to* many lectures on mathematical and physical astronomy, as well as several on divinatory astrology, including a lecture on Ptolemy's *Quadripartitum* / *Tetrabiblos*, an author considered the prince of astrologers,[16] as lectures of this type were held in Kraków at that time, as evidenced by university lists of lecturers' activities.[17]

I would like to emphasize that we must speak in this context about the probability and not the certainty of Copernicus's participation in specific university classes, as lists of attendance are not known.

As for Copernicus's participation in the lectures on Ptolemy's *Quadripartitum* / *Tetrabiblos*, it is probable that he attended the lectures on this subject given in 1494 by Wojciech Krypa of Szamotuły. This is supported by the fact that a series of such lectures was organized only once in the years 1491–1495 (L. Birkenmajer 1924, pp. 55–60).

Copernicus also learned astrology from the 10th-century work entitled *Praeclarissimus liber completus in judiciis astrorum* / *The Most Famous Complete Book of Fortune-telling from the Stars* (Venice, 1485) by Haly Abenragel, the most frequently quoted author in European astrological literature. Copernicus acquired the book during his studies in Kraków; it was bound together with *Preclarissimus liber elementorum Euclidis perspicacissimi in artem geometrie incipit qu afoelicissime* (Euclid's *Elements*, Venice: Ratdolt, 1482).[18]

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[15] These are approximate dates, quoted from: Chachaj 2023, pp. 38, 93.

[16] See fn. 6, above.

[17] See Karliński 1873; Polkowski 1873, pp. 118–120; Wisłocki 1886; L. Birkenmajer 1900, pp. 191–193; 1924, pp. 50–134; Markowski 1993; Goddu 2010, pp. 25–33; Chachaj 2023, pp. 60–88.

[18] According to M. Curtze, L. Birkenmajer and J. Wasiutyński, G. Rosińska, M. Folkerts, S. Kirschner and A. Kühne, D. Juste, and S. Konarska-Zimnicka, in this

It is also likely that Copernicus learned astrology from three other works (in Latin translations) by Arab authors: an introduction to the art of astrology entitled *Liber introductorius ad magisterium judiciorum astrorum*, by al-Qabisi, known in Latin Europe as Alcabitius (d. ca. 967), and the treatise *De causis orbis et motus eius…* (*On the Causes of the Spheres and Their Motions…*) by Mashallah (ca. 740–815), as well as the famous work *Centiloquium* (*One Hundred Aphorisms*), attributed to Ptolemy,[19] because lectures in Kraków were based on these textbooks (Polkowski 1873, pp. 118–120).

Furthermore, Copernicus also acquired in Kraków the co-bound *Tabulae Astronomice Alfonsi Regis* (Venice, 1492) and the work of the astronomer and astrologer Regiomontanus: *Tabule directionum profectionum*; *famosissimi viri magistri Joannis Germani de Regiomonte in natiuitatibus multum vtiles* (*Tables of Directions and Profections of the Famous Master John the German from Königsberg, Very Useful for Horoscopes*) (Augsburg: Ratdolt, 1490). Importantly in this context, the above-mentioned tables were used as basic tools for creating horoscopes (determining astrological houses) (L. Birkenmajer 1893, pp. 29–30; 1900, pp. 26–69; Włodarczyk 2015, p. 45; Konarska-Zimnicka 2018, pp. 19–80; Piotrowski 2023).[20]

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book, Copernicus included his notes in which, among other things, he quoted the *Tetrabiblos*. These notes concern e.g., the father's lifespan and mother's parents – see Curtze 1875, pp. 57–59; L. Birkenmajer 1900, pp. 191–193; 1924, pp. 50–60, 337–338; Wasiutyński 1938, pp. 68–70; 1963; Rosińska 2002, pp. 119–120; Copernicus 2019, pp. 564–570; Piotrowski 2023; Juste 2024; Konarska-Zimnicka 2024.

However, P. Czartoryski (1978, pp. 359, 366) questions the authorship of at least some of these notes, though without providing the necessary details or a list of such notes; this position is shared by E. Rosen (1984, pp. 111–112); A. Goddu (2004, p. 221, 1. SPS 145); G. Blumenthal (2014, p. 4, fn. 3).

After a scrutiny of the notes included in the digital version of Hali's work and Euclid's *Elements* (made available by the University Library in Uppsala), I have very serious doubts as to the validity of Czartoryski-Goddu's verdict based on an analysis of Copernicus's writing alone, and that is why I support G. Rosińska's opinion (2002, pp. 119–120) that these are Copernicus's notes, written "in his youthful hand" (from the Kraków period). Additionally, due to the fact that the content of these notes correlates very well with Copernicus's family situation, I believe that professors P. Czartoryski (implicitly) and A. Goddu (explicitly) are wrong in denying Copernicus's authorship of these marginalia.

[19] This work was the basic textbook on astrology for medical students in Bologna – see Rutkin 2006, p. 546.

[20] I believe that Copernicus also knew another work by Regiomontanus entitled *Disputationes inter Viennensem et Cracoviensem super Cremonensia in planetarum theoriae*

6. Copernicus's studies in Bologna and Padua and astrology, Joachim Rheticus, Domenico Maria da Novara and Robert S. Westman

Information obtained from Georg Joachim Rheticus:

a) Copernicus was an assistant and helper in the observations of Domenico Maria [da Novara], not his student: ("Cum D.Doctor meus Bononiae, non tam discipulus, quam adiutor, & testis obseruationum doctissimi Viri Dominici Marie" (*Narratio prima* 1540, p. 4);
b) Copernicus lived with Domenico Maria [da Novara] while studying in Bologna ("Vixerat cum Dominico Maria Bononiensi") (*Ephemerides novae* 1550, p. A3; see also Ashworth 2024).

From later studies, including by Westman himself (e.g. 1993; 2011a), it is known that Novara was both an astronomer and an astrologer – he created horoscopes and prognostics.[21]

Addition by Robert S. Westman

R.S. Westman (1993; 1994; 2011a; 2011b; 2014; 2016; 2019; 2024) added to the information from Rheticus that:

a) Copernicus lived in the same house as Domenico Maria da Novara: 1) *it is not known how long* (2011a/2011b, p. 87); 2) *as many as four years: 1496–1500* (2016, p. 35; 2019, p. 297) (sic!); 3) *for some time* (1993, p. 1; 2024);
b) from Novara, Copernicus learned about the debate on astrology and the works: *Tetrabiblos* (Venice, 1493); *Epitome in Almagestum* by Georg von Peurbach and Regiomontanus (Venice, 1496), and *Disputationes adversus astrologiam divinatricem* (*Disputations Against Divinatory Astrology*) by Giovanni Pico della Mirandola (Bologna,

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deliramenta (*Dialogue Between a Viennese and a Cracovian About the Ravings of Gerard of Cremona on Planetary Theories*) (1474). The Viennese was Regiomontanus himself, and the Cracovian was Martin Bylica of Olkusz, Kraków university professor and later the court astrologer of Matthias Corvinus, king of Hungary.

[21] See e.g. Polkowski 1873, p. 142, fn. 2; L. Birkenmajer 1900, pp. 424–448; Wasiutyński 1938, p. 570, n. 30; Biliński 1975; Truffa 2007; Westman 1993, pp. 2–3; 2011a, pp. 87–99 (he does not refer to earlier studies that signaled that Novara dealt with astrology); Bònoli, De Meis (eds.) 2012.

1495 or 1496) (2011a/2011b, pp. 87, 93, 96, 97, 99; 2016, pp. 29, 35; 2019, p. 299; 2024) (sic!);

c) thanks to Novara, during his law studies in Bologna, Copernicus was associated with the culture of creating astrological forecasts (1993, pp. 2–3; 2011a, pp. 76–105/2011b; 2016, pp. 28–35; 2019, p. 299; 2024) (sic!);

d) Novara, however, was not a close collaborator of the Florentine Neoplatonists, which was previously stated e.g. by Thomas S. Kuhn (1957, p. 130) without providing a source, but this does not mean that Neoplatonic thought did not influence Copernicus [*this is a valid point* – M.K.] (1994, p. 87, fn. 19; 2019, p. 297: R.S. Westman knew this back in 1991);

e) during his law studies in Bologna (1496–1500), Copernicus improved his knowledge of astrology, which was necessary in the practice of medicine at that time and which Copernicus studied in Padua in the years 1501–1503 (2024[22]);

f) the reason for Copernicus's development of the heliocentric system was the crisis of astrology, related to, among others, the inconsistency of the order of the planets, which was clearly pointed out *only* by Giovanni Pico della Mirandola (1495 or 1496) and Copernicus's theory was a response to the work of this author (1993; 2001, pp. 3–4 (1495); 2011a/2011b; 2013, pp. 50–51; 2019; 2024) (sic!);

g) *only* Edward Rosen (1978, pp. 356–357) showed that Copernicus could not have obtained knowledge about the quotation from Averroes's *The Paraphrase of Ptolemy* without reading Pico's work (1993, p. 4; 2011a, p. 104) (sic!);

h) Copernicus wrote *De revolutionibus* following the example of Ptolemy's *Almagest* (a work on mathematical astronomy) and he also intended (sic!) to write an astrological treatise following the example of Ptolemy's *Tetrabiblos* (2011a/2011b, pp. 104–105; 2019, p. 300);

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[22] "In 1501 he stayed briefly in Frauenburg but soon returned to Italy to continue his studies, this time at the University of Padua, where he pursued medical studies between 1501 and 1503. At this time medicine was closely allied with astrology, as the stars were thought to influence the body's dispositions. *Thus, Copernicus's astrological experience at Bologna* (sic!) was better training for medicine than one might imagine today" (Westman 2024).

i) Copernicus painted his self-portrait (sic!), having probably (sic!) acquired the skill of painting during his studies in Padua, because there was a flourishing community of painters in Padua and nearby Venice at that time (sic!) (2024).

7. Criticism of R.S. Westman's theses

For historians of philosophy, science, medicine and ideas, it is an indisputable fact that during Copernicus's studies in Kraków (from the fall of 1491 or the winter of 1492 to the summer of 1495 at the latest), Bologna (from the fall of 1496 to March 4, 1500), Rome (after March 4, 1500 to the spring of 1501), Padua (from September 1501 to 1503) and Ferrara (May 1503),[23] he became acquainted with natural, medical and divinatory astrology. At that time, it was the pinnacle of astronomy/mathematics and was valued by rulers. It was a fundamental cultural framework: a mathematized cosmology that was *thoroughly astrological in nature*.[24] This was said by, among others, St. Bp. Albert the Great, Pietro d'Abano and Johannes Regiomontanus (all connected with the University of Padua).[25]

It is also known from many sources and studies that from antiquity to the 16th–17th centuries, medicine had very strong connections with divinatory astrology; a discipline called medical astrology / astrological medicine or iatromathematics was developed, and it could not be practiced without the ability to prepare horoscopes.[26]

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[23] These are approximate dates, quoted from: Chachaj 2023, pp. 38, 93, 98, 112, 136, 164, 165, 168, 213.

[24] These issues are aptly expressed by, for example, Thorndike 1955; Dooley (ed.) 2014a; Dooley 2014b.

[25] About Regiomontanus as an astrologer – see Swerdlow 1990; 1993.

[26] See Cornell 1933/(3rd rev. ed.) 1992; Thorndike 1955; Cooper 2011; 2013; Swieżawski 1980, vol. 5, pp. 312–314; Sellar 2008. When assessing the importance of medical astrology in the Middle Ages, Thorndike (1955, p. 277) compared it to the medieval "unified field theory", as noted by Cooper 2013, p. 537.

In assessing the importance of horoscopic astrology from antiquity to the sixteenth century, Otto Neugebauer compared it to the importance of modern mechanical theory and pure science: "Its actual development [i.e. horoscopic astrology] must be considered as an important component of Hellenistic science … To Greek philosophers and astronomers, the universe was a well defined structure of directly related bodies. The concept of predictable influence between these

This discipline was practiced in ancient times by, among others, Hippocrates (ca. 460 BC–ca. 375 BC) and Galen (died ca. 216), and in the Arab Middle Ages, e.g. by Avicenna (980–1037). Their works formed the basis of the medical canon of European medieval and Renaissance universities. Medical students of the University of Padua also studied them, also at the time when Copernicus was a student there; in particular, this concerns Galen's astrological interpretation of the Hippocratic doctrine of critical days, described in *De diebus decretoriis* (see Galen 2011; Cooper 2011; 2013). Many other thinkers valued this discipline, including St. Bp. Albert the Great, author of the *Speculum astronomiae* (*The Mirror of Astronomy*, c. 1260),[27] Pietro d'Abano (1257–c. 1316), author of the *Conciliator differentiarum philosophorum et praecipue medicorum* (*Conciliator of the Differences Between Philosophers and Especially Physicians*; Mantua, 1472)[28] and Marsilio Ficino (1433–1499), author of the *De vita libri tres* (1489) and translator of the works of Plato and the Platonists.[29] His books were in Copernicus's library.

There were also loud critics of astrology, mainly prophecy, including St. Bp. Augustine (354–430), St. Isidore of Seville (d. 636), St. Thomas Aquinas (1224 or 1225–1274), Bp. Étienne Tempier (d. 1279), Bp. Nicholas d'Oresme (ca. 1320–1384), Henry Langenstein of Hesse (ca. 1325–1397), Card. Archb. Peter of Ailly (1350–1420), John Gerson (1363–1429), Giovanni Pico della Mirandola (1463–1494) and Girolamo Fracastoro (1478–1553).[30]

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bodies is in principle not at all different from any modern mechanistic theory […] Compared with the background of religion, magic, and mysticism, the fundamental doctrines of astrology are pure science" (Neugebauer 1962, p. 171; cited in: Long 1982, p. 165).

[27] According to some researchers, however, such an attribution is not certain. Paola Zambelli and Scott E. Hendrix attribute this work to St. Bp. Albert the Great. I personally do not question this attribution.

[28] He stated the following: "qui deligenter inspiciunt concedunt hanc scientiam astronomiae non solum utilem sed et necessariam maxime medicinae" (Pietro d'Abano 1477, f. 22r.). See also Vescovini 1987.

[29] Allen 1941 and 1966, pp. 3–19; Swieżawski 1980, vol. 5, pp. 307–314; Voss 2000; Małłek 2001; Beecher 2002; Cooper 2011; 2013; Greenbaum 2015; Heidari 2022; Philips 2023.

[30] See e.g. Thorndike 1934a; 1934b; 1941a; 1941b (see the tables of contents); 1955; Pines 1964; Swieżawski 1980, volumes 1–6 (see the index of names and the index of subjects); Granada, Tessicini 2005; Cooper 2011; 2013 and Vescovini 2014.

Therefore, *in the theoretical and empirical layers*, the crisis of astrology in the Middle Ages and the Renaissance (I mean the incompatibility of astrological axioms with, among others, the Christian idea of freedom of will, the purely fictional nature of some terms (zodiac,[31] houses, etc.) and problems with empirical predictions) was permanent. The discovery was made definitely not by Pico.[32]

On the other hand, although Pico denied the occult and kabbalistic interpretations of Aristotelian-Ptolemaic astrology developed by medieval Hebrew and Arab thinkers, he did not fundamentally reject its Aristotelian-Ptolemaic core, and despite such criticism, the astrological vision of the world developed from antiquity to the Renaissance (e.g. by St. Bp. Albert the Great and Petro d'Abano) was still appreciated and developed in the 16th and 17th centuries at European universities.[33] It was appreciated by, among others, Melanchthon,[34] Tycho Brahe and Kepler. From this perspective, the crisis of astrology, manifesting itself in the reduction of its general cultural importance, appeared later, in the second half of the 17th century and in the 18th century.[35]

In such a historical context, it is highly probable and even certain that Copernicus knew natural, medical and divinatory astrology. Nevertheless, we do not know of any document that would justify the thesis that Copernicus used astrological knowledge in his medical activities in Warmia, because both the preserved prescriptions and marginalia attributed to Copernicus are silent about it.

The other theses – interpretations of R.S. Westman, with the exception of Kuhn's criticism (indicated in point d) above)[36] – have no

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[31] On the history of the term 'zodiac' – see Van der Waerden 1952–1953.

[32] See below fn. 47, with the remarks by Marie Boas-Hall 1962, pp. 42–43.

[33] Rutkin 2006, p. 548 mentions in this context the universities of Bologna, Pisa, Padua, Louvain and German Lutheran universities. The university in Kraków is not on the list, but I think it is just an oversight.

[34] See Brosseder 2005.

[35] Rutkin 2002; 2006; 2018. This was combined with the abandonment of the so-called astrologizing Aristotelianism in favor of Newtonianism. See below fn. 55 with Thorndike's (1934b) critique of Pico's argument.

[36] Nevertheless, R.S. Westman (1994; 2011a; … 2024) repeatedly refers with approval to T.S. Kuhn's (1957; 1962) interpretations of the Copernican revolution. Unfortunately, it is hagiographic in nature. The author does not take into account the results of my dissertations: Kokowski 1996; 2001 (the only monograph in world literature on the criticism of Kuhn's interpretations of the Copernican revolution);

factual basis, because in the works of Copernicus there are no traces that he was a supporter of divinatory astrology or that he created horoscopes and astrological forecasts, because the sources are silent about it (also R.S. Westman knows about this, e.g. Westman 2011a, pp. 104–105). Nowhere in his writings did Copernicus mention that it was from Novara that he learned about the debate on astrology and about the *Tetrabiblos* (Venice, 1493), *Epitome in Almagestum* by Georg von Peurbach and Regiomontano (Venice, 1496), and *Disputationes adversus astrologiam divinatricem* by Giovanni Pico della Mirandola (Bologna, 1496). Copernicus's friends and his biographers did not comment on this matter either. Nevertheless, I think it is possible that Copernicus heard about these works from Novara. However, it is (almost) certain to me that Copernicus heard about the 1493 edition of the *Tetrabiblos* while studying in Kraków, because this Alma Mater was the European center of astrology at that time and it would not surprise me if this edition was in his own library, although there is no information about this so far.

On the other hand, it is known that, unlike Copernicus, Joachim Rheticus appreciated divinatory astrology, as clearly evidenced by the subsection of *Narratio prima* (1540) with the telling title "Ad motum eccentrici monarchias mundi mutari" ("The Kingdoms of the World Change with the Motion of the Eccentric"), in which Rheticus makes an astrological interpretation of Copernicus's theory presented in the *De revolutionibus*:

> I shall add a prediction. We see that all kingdoms have had their beginnings when the center of the eccentric was at some special point on the small circle. Thus, when the eccentricity of the sun was at its maximum, the Roman government became a monarchy; as the eccentricity decreased, Rome too declined, as though aging, and then fell. When the eccentricity reached the boundary and quadrant of mean value, the Mohammedan faith was established; another great empire came into being and increased very rapidly, like the change in the eccentricity. A hundred years hence, when the eccentricity will be at its minimum,

2004; 2009, in which I demonstrated the multiple weaknesses of Kuhn's vision of the genesis and reception of Copernicus's theory.

> this empire too will complete its period. In our time it is at its pinnacle from which equally swiftly, God willing, it will fall with a mighty crash. We look forward to the coming of our Lord Jesus Christ when the center of the eccentric reaches the other boundary of mean value, for it was in that position at the creation of the world. This calculation does not differ much from the saying of Elijah, who prophesied under divine inspiration that the world would endure only 6,000 years, during which time nearly two revolutions are completed. Thus it appears that this small circle is in very truth the Wheel of Fortune, by whose turning the kingdoms of the world have their beginnings and vicissitudes. For in this manner are the most significant changes in the entire history of the world revealed, as though inscribed upon this circle (Copernicus / Rosen 1959, pp. 121–122).

Earlier Copernicologists,[37] as well as Westman himself and the author of this article,[38] knew about these views of Copernicus and Rheticus on prophetic astrology.

I limit myself here to presenting the views of authors from the English-speaking world: Edward Rosen categorically denied the possibility that Copernicus valued and practiced astrology, and Lynn Thorndike, Alexandre Koyré, J.L.E. Dreyer and Owen Gingerich approached this issue somewhat differently than Rosen:

> It is a historic fact that the Copernican system was first publicly announced, if not precisely under astrological auspices at least to an astrological accompaniment and that such signifying the future was for long after associated with it in many men's minds. […] Indeed, this astrological accompaniment was somewhat of a new idea itself, since

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[37] Among others, Ignacy Polkowski ((ed.) 1873–1875, vol. I, p. 105), Ludwik Antoni Birkenmajer (1900; 1924); Jeremi Wasiutyński (1938, pp. 430–431); Edward Rosen (1939 [1st ed.], 1959 [2nd rev. ed.], 1971 [3rd ed.], fn. 57, pp. 122–123; 1941; 1978, p. 344, note to page 7:15; 1984, p. 111), Lynn Thorndike (1941a, pp. 414, 417, 419), Thomas S. Kuhn (1957, p. 93), Owen Gingerich (2004a, p. 201 / 2004b, pp. 182–184, 193).

[38] Westman 2011a, pp. 28–29; 2016, pp. 2–3; Kokowski 2009, p. 51–52, 286 fn. 48.

it represented the movement of the earth rather than the motion of the stars as influencing the course of human destiny. The *Narratio prima* of Rheticus […] contained a discussion of the dependence of earthly monarchies and their vicissitudes through the ages upon the movement of the earth in its eccentric orbit (Thorndike 1941a, p. 414).

It is not improbable that Copernicus agreed with the astrological interpretation of the earth's eccentric set forth by Rheticus. His interest in astrology is shown by his possession of the work of Albohazen Haly on that subject […] and by his adding to his copy notes from the *Quadripartitum* of Ptolemy. […] But the most noteworthy fact is that he kept this interest out of *De revolutionibus* and confined the latter exclusively to astronomical argument. Ptolemy, it is true, had set the example in this respect by: devoting the *Almagest* to astronomy and considering astrology separately, though favorably, in the *Quadripartitum*. But Copernicus, who had slowly and reluctantly published *De revolutionibus* at the very close of his life, so far as we know published nothing in the field of astrology. This abstention may have been in part accidental, but it, as well as the new Copernican astronomical hypotheses, was not without significance for the future (Thorndike 1941a, p. 419).

Dr. E. Rosen points out that, in contradistinction with Rheticus, Copernicus nowhere in his books asserts a belief in astrology. Dr. Rosen is perfectly right. And yet it seems to me, at least–difficult to admit that Rheticus, who wrote his *Narratio* with the knowledge and probably under the supervision of Copernicus, would have dared to express these views if they were opposed to those of his master (Koyré 1943, p. 718, fn. 34).

Nothing of this theory of monarchies [viz. Rheticus's astrological speculations] is mentioned by Copernicus himself, but we cannot doubt that Rheticus would not have inserted it in his account if he had not had it from his 'D. Doctor Praeceptor,' as he always called him" (Dreyer 1953, p. 333; cited from Rosen 1984, p. 110; noted by Blumenthal 2014, p. 5).

> All the available biographical information on Rheticus reveals his passion for astrology. Curiously, there is not a shred of evidence that Copernicus had any interest in the subject, even though he could hardly have avoided learning the standard rules of its practice. Given the ethos of the times, Rheticus and Copernicus must certainly have discussed the topic. Copernicus was surely not naive; he must have realized that astrologers would constitute a good fraction of the market for his treatise (Gingerich 2004a, pp. 188–189).

My Institute colleague Jarosław Włodarczyk commented on this subject in a similar style:

> […] whose was the idea of putting Copernicus' theory about the motions of the Earth at the service of historical astrology? On the one hand, while referring to this "prediction" (vaticinium), Rheticus does not associate it directly with Copernicus. On the other hand, Rheticus placed it in the *First Account* of «The Revolutions» by Nicolaus Copernicus when Copernicus was still alive and his decision clearly did not ruin their relations as Rheticus remained in Varmia long after the publication of his book (Włodarczyk 2015, pp. 45–46).

Regarding the above-quoted opinions of Thorndike, Koyré, Dreyer, Gingerich and Włodarczyk, one can repeat Michel-Pierre Lerner's remark that Luther and Melanchthon cooperated closely despite their different views on astrology, so it could have been similar in the case of Copernicus and Rheticus.[39]

Regardless of this, let us recall here four historical facts proving that Copernicus could have had some astrological competence (*however, this does not mean that he shared the belief in the effectiveness of natural, medical or divinatory astrology*).

On April 8, 1535, Dr. Johannes Apelt sent a letter from Nuremberg to Albert, Prince of Prussia (and a senator of the Kingdom of Poland) with his horoscope prepared by Joachim Cameriarus (1500–1574),

[39] Lerner 2012, p. 237; noted by Blumenthal 2014, p. 5.

adding that if the prince did not find anyone who could explain the horoscope to him, he should then seek help from an old canon in Frombork. This old canon was undoubtedly Nicolaus Copernicus himself (Biskup 1973, reg. 344). *This is not, however, a strong argument*, because Apelt did not mention Copernicus's name.

On October 15, 1535, Bernard Wapowski, a friend of Copernicus and then secretary of King Sigismund the Old, sent a letter from Kraków to Sigismund Herberstein of Vienna with Copernicus's astronomical almanac for the year 1536, calculated on the basis of Copernicus's new tables, in order to have it printed in Vienna and disseminated among "specialists in celestial matters in Germany" to protect the almanacs they were compiling from empirical errors (unfortunately, the almanac *was lost*). Almanacs of this type were useful tools for practicing astrologers.[40] *This is not, however, a strong argument*, because we do not know the content of this almanac.[41]

In the 1530s and/or on 4 June 1539, Martin Luther referred to Copernicus as an astrologer:[42] *in this case Luther identified astrology with*

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[40] Biskup 1973, reg. 345; Włodarczyk 2015, p. 45; Piotrowski 2023.

[41] There are stronger arguments: see Borski, Kolkov 2024, ch. 3.1.5.

[42] There are two statements by Luther on this subject:

1) *from the 1530s* (edited by Johann Goldschmidt Aurifaber): "Es ward gedacht eines neuen Astrologi, der wollte beweisen, dass die Erde bewegt wurde und umginge, nicht der Himmel oder das Firmament, Sonne und Monde; Gleich als wenn einer auf einem Wagen oder in einem Schiffe sitz und bewegt wird, meinete, er sasse still und ruhete, das Erdreich aber und die Baume gingen um und bewegten sich. Aber es gehet jetzt also: wer da will klug sehn, der soll ihm nichts lassen gefallen, was Andere machen, er muss ihm etwas Eigens machen, das muss das Allerbeste sehn, wie ers machet. Der Narr will die ganze Kunst Astronomiae umkehren. Aber wie die heilige Schrift anzeiget, so hiess Josua die Sonne still stehen, und nicht das Erdreich" (Luther 1568, p. 433; cited from: Wardęska 1975, p. 39, fn. 19; however, this quote is not in: *Luthers Werke, Kritische Gesamtausgabe. Tischreden*, Weimar, 1912, vol. I, no. 885, pp. 412–413 as I originally claimed following Wardęska (entry no. 885 is placed on p. 442 and concerns an entirely different matter); the proper quote is in: *Colloquia oder Tischreden*, in the series *Dr. Martin Luthers Saemmtliche Schriften*, vol. 22. St. Louis: Lutherischer Concordia Verlag, ed. Johannes Georg Walch, 1887, cap. 70, p. 1546);

2) *from June 4, 1539* (edited by Anton Lauterbach): "De novo quodam astrologo fiebat mentio, qui probaret terram moveri et non caelum, solem et lunam, ac si quis in curru aut navi moveretur, putaret se quiescere et terram, arbores moveri. Aber es gehet itzunder also: Wer da will klug sein, der soll ihme nichts lassen gefallen, was andere achten. Er muss ihme etwas eigenes machen, sicut ille facit, qui totam astrologiam

astronomy, but he was an opponent of prophetic astrology, which he distinguished from astronomy as a reliable science of the movements of the stars.[43]

In 1581, Marcin Kromer, bishop of Warmia, called Copernicus "Praestanti astrologo" (outstanding astrologer), in the first epitaph of Copernicus in the Frombork cathedral.[44] *In this case, however, we are not certain whether bishop Kromer did not identify astrology with astronomy*.

However, what is particularly interesting in the context of this article, contemporary Polish supporters of astrology: – Dr. Małgorzata Korpikiewicz and Dr. Piotr Piotrowski, the current president of the Polish Astrological Society – have not found evidence in Copernicus's works to attribute to him the title of a supporter of astrology (natural, medical or divinatory). Moreover, agreeing with the remarks of historians of science, they claim that Copernicus did not cast horoscopes, but was able to interpret them, because he acquired such knowledge during his studies in Kraków[45] and not – as Westman claimed – only during his studies in Bologna and thanks to his acquaintance with Domenico da Novara.

It should be added here that the astrological genesis of the Copernican theory propagated by R.S. Westman was severely criticized by a historian of mathematical astronomy, Noel M. Swerdlow, who accused Westman of intellectual dishonesty: ignorance of Pico della Mirandola's work *Disputationes adversus astrologiam divinatricem* (1st ed. 1496), arbitrariness and selectivity of translations, and omission of key information from the history of astrology and astronomy. Unfortunately, I share Swerdlow's view.

To the above-mentioned insightful remarks of N.M. Swerdlow, I will add six more.

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invertere vult. Etiam illa confusa tamen ego credo sacrae scripturae, nam Josua iussit solem stare non terram" (*Luthers Werke, Kritische Gesamtausgabe. Tischreden*, Weimar 1916, vol. IV, no. 4638, pp. 412–413); cited from: Wardęska 1975, p. 39, fn. 19.

As a side note: it should be emphasized that it is doubtful whether Luther actually called Copernicus a fool (der Narr) and denied Copernicus's achievements in astronomy. Because it is hard to imagine a situation in which Joachim Rheticus – who, after all, came from the circle of Melanchthon and Luther – could have gone to see such an alleged "fool". See Kleinert 2003; Kokowski 2009, p. 347, note 270; pp. 48–49.

[43] See Luther 1568, pp. 433–435.

[44] Sikorski 1989, p. 144, fn. 16.

[45] Korpikiewicz 1985; Piotrowski 2012; 2023. This is also claimed by the historian of astrology, Sylwia Konarska-Zimnicka (2024).

1) The thesis that Copernicus's reading of Giovanni Pico della Mirandola's *Disputationes adversus astrologiam divinatricem* (1st ed. July 1496[46]) was important for the genesis of Copernican theory is not Westman's original achievement. It was advanced in one form or another before Westman by: Ludwik Birkenmajer (1900, p. 95); Marie Boas-Hall (1962, pp. 42–43, 168–169);[47] Jerzy Dobrzycki (1971, p. 19); Stefan Swieżawski (1973, p. 257; 1980, pp. 126–127; 1983b), Henri de Lubac (1974, pp. 123, 331–334),[48] and especially Nicholas Campion (2008, vol. I, pp. 99–112, particularly pp. 106–112).

What distinguishes Westman from the aforementioned researchers is his conviction that Copernicus formulated his theory in response to the crisis of astrology described *only* in the work *Disputationes adversus astrologiam divinatricem* (1st ed. 1496). This is *an incorrect thesis*, because otherwise Copernicus's works would have included numerous references

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[46] Contrary to the opinion of L.A. Birkenmajer (1900, p. 95, fn. 1) and the original view of R.S. Westman (1993, p. 3), the edition of Pico's work was published in July 1496, not in 1495. Westman (2011a, p. 96) also knows this.

[47] "[…] Even more serious, the current tables of planetary positions drawn up at the command of Alphonso the Wise in Spain at the end of the thirteenth century, were so grossly inaccurate as to inconvenience astrologers. For these and other reasons, astronomers were uneasy; it is almost fair to say that the Copernican revolution was predicted a century before Copernicus published his great work. Even laymen knew that astronomy needed reform: thus, the humanist Pico della Mirandola (1463–1494), arguing against astrology on religious, philosophical and scientific grounds (it denied the omnipotence of God, it denied man's free will and it was strikingly inaccurate) pointed out that the astronomers altered their system, as he believed they would.

Because they were thoroughly imbued with the humanist point of view, the astronomers of the fifteenth century naturally turned to the ancients for a clue to the way out of the astronomical labyrinth in which they found themselves, just as Copernicus was to do in the next century […]" (Boas-Hall 1962, pp. 42–43).

[48] This was noted by Sheila J. Rabin (1997 p. 765, note 41): "No one has followed up this suggestion [of Lubac 1974, s. 333] regarding either Copernicus or Kepler ["that Pico influenced both Copernicus and Kepler to abandon the Aristotelian dualism between the heavens and the earth and further pushed Kepler toward establishing his celestial physics"]; however, Westman, 1993, [p.] 4, has shown that Pico's deriding the inability of astrologers to decide the true order of the planets appears to have helped spur Copernicus's reform […]". The author of these words, however, made a mistake in thinking that it was only Henri de Lubac (1974) who noticed the influence of Pico della Miradola's thought on Copernicus. (I used a copy of Lubac's work, belonging to the collection of the late Prof. Stefan Swieżawski, kept in the Jagiellonian Library. I would like to thank the staff of the BUJ Manuscript Reading Room for providing me with this copy.)

to the central issues discussed in *Disputationes* …, e.g. the distinction between astronomy and divinatory astrology; a list of various very serious reservations about divinatory astrology; astrological philosophy of nature: mechanisms explaining the influence of Sun, Moon, wandering stars or planets, fixed stars and comets on man, and geographical regions; and the idea of personal dignity, free will, and the opposition of material and spiritual factors influencing human development. *But Copernicus did not address such issues in his writings*.

Moreover, contrary to the thought of Giovanni Pico della Mirandola, Copernicus thus identifies astronomy, astrology, and mathematics in book I, 'Introduction' of his *De revolutionibus*:

> Proinde, si artium dignitates penes suam de qua tractant materiam aestimantur, erit haec longe praestantissima: quam alii quidem astronomiam, alii astrologiam, multi vero priscorum mathematices consumationem vocant (Kopernik 1953, p. 21).
>
> If then the value of the arts is judged by the subject matter which they treat, that art will be by far the foremost which is labeled astronomy by some, astrology by others, but by many of the ancients, the consummation of mathematics (Copernicus / Rosen 1978a, p. 7).[49]

Copernicus did this in agreement with many other authors (see above), who since antiquity often treated the terms 'science of the stars', 'astronomy' and 'astrology' interchangeably. One of them was Giorgio Valla, mentioned in this article, who included in the encyclopedia *De expetendis ac fugiendis rebus* (Venice 1501) a treatise entitled *De tota astrologia libri iiii*, devoted to the entire body of astronomical and astrological knowledge. We know that Copernicus was familiar with this encyclopedia (see L. Birkenmajer 1924, pp. 152–167).

According to R.S. Westman, the central problem for Copernicus was the problem of the cosmological structure of the world: the choice of

[49] Such interchangeable use of names originates from antiquity. However, from antiquity to the Enlightenment, there was an evolution of terminology, manifested in the distinction between, among others, natural astrology, which included medical astrology/iatromathematics, and divinatory astrology. Pico's work concerned the critique of divinatory astrology.

an appropriate cosmological system and its arrangement, including the order of the planets. Copernicus allegedly encountered this problem in Bologna while studying the work of Giovanni Pico della Mirandola. The problem with this interpretation is that we have long known that in the *De revolutionibus* (Book I, Introduction, Ch. VI, Ch. X) Copernicus mentioned other authors who touched on this topic, such as Cicero, Plutarch, Plato, Pliny, Ptolemy, Alpetragius, Albategnius Aratensis, Averroes, Martianus Capella, Vitrivius and Aristotle.[50]

The issue of the cosmological structure of the world – the choice of the appropriate cosmological system and its arrangement, including the order of the planets – was also discussed in Valla's encyclopedia (1501) mentioned above. Moreover, Copernicus mentioned other important problems that concerned him, e.g. the length of the tropical year, models of the motion of the Sun and Moon, imperfections of models of homocentric spheres and models of eccentrics and epicycles (*De revolutionibus*, Book I, Introduction) and the problem of the equant (*De revolutionibus*, Letter dedicatory, Books IV and V).[51]

However, from the research so far, we know about the only probable reference of Copernicus to Pico's work.

In his *De revolutionibus* (Book I, Ch. X), Copernicus supposedly obtained information about the sunspot and the conjunction of Mercury and the Sun from Pico's work, which information, due to accepting the idea of the perfection of the supralunar spheres, was interpreted as the transit/passage of Mercury through the disk of the Sun:

> Quamuis et Auerroes in Ptolemaica *Parafrasi* nigricans quiddam se vidisse meminit, quando Solis et Mercurij copulam numeris inueniebat expositam (Kopernik 1953, p. 36).
>
> Yet in his *Paraphrase* of Ptolemy, Ibn Rushd reports having seen something blackish when he found a conjunction of the [S]un and Mercury indicated in the tables (Copernicus/Rosen 1978, p. 19).
>
> However, in his *Paraphrase* of Ptolemy, Averroes mentions that he noticed something dark on the Sun when

[50] A list of these works is provided by, for example, A. Birkenmajer 1953b.

[51] However, Ptolemy himself did not use the term 'equant', but Peurbach and Regiomontanus did. See a short history of the terms: Benjamin, Toomer 1971, p. 405, n. 3; Copernicus / Rosen 1978a, p. 429, note on p. 278:39.

> his calculation showed the complete conjunction of the Sun and Mercury (trans. by M.K.).

According to L. Birkenmajer (1900, pp. 94–95), C.A. Nallino (1944, p. 82), A. Birkenmajer (1953b, note p. 68,6, pp. 106–108), B.R. Goldstein (1969, pp. 53–55); E. Rosen (1978a, note p. 19:24, pp. 356–357), R.S. Westman (2013, pp. 31–32; 2019, p. 299) and O.L. Akopyan (2015, pp. 631–632), this statement is a result of reading the work of Pico della Mirandola (Bologna 1496 / Venice 1498):

nō ꝓcipiſ . Auerrois ī paraphraſi magnæ compōnis Ptolemæi dicit ſe quōdā ī ſole duas quaſi maculas nigricātes ānotaſſe/cūq; nūeros digeſſiſſet p id tp̄s inuentum mercuriū ſolis radus oppoſitū. Recte igitur Moſes ægyptius ex Abubacheſis quoq;

Fig. 1. Pico della Mirandola 1496, p. Hii v

> Auerrois in paraphrasi magnae composicionis Ptolomaei dicit se quondam in sole duas quasi maculas nigricantes annotasse, cumque numeros digessisset per id tempus inuentum mercurium solis radus oppositum.[52]

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[52] English translation: "Averroes, in a paraphrase of Ptolemy's great work, says that he once noticed what seemed to be two blackened spots on the Sun, and when he made calculations for that time, he found Mercury [he found that Mercury was] opposite (sic!) to the Sun" (translated by M.K.).

In other words, Averroes found that Mercury was in opposition (sic!) to the Sun, which, however, does not happen due to the limited elongation (angular distance) of Mercury from the Sun: a maximum of 29 degrees (in the case of Venus: a maximum of 48 degrees). Consequently, it is an error either of Averroes himself, or rather of the translator of Averroes's work, repeated by Pico. It should rather read: "he found Mercury in the rays of the Sun" / "in conjunction with the Sun" / "conjoined with the Sun".

L. Birkenmajer 1900, p. 94 claims that this is a quote from the 1495 edition: Bononiae 1495 (fol. Incunab. Bibl. Jag. Nr. 2281), lib. X, cap. 4, fol. H'$_2$ lin. 2–5. "Auerrois in paraphrasi magnae composicionis Ptolomaei dicit se quondam in sole duas quasi maculas nigricantes annotasse, cumque numeros digessisset per id tempus inuentum Mercurium solis radiis oppositum." / "Auerrois, in a paraphrase of Ptolemy's great composition, says that once upon a time he noted two black spots on the Sun, when he had calculated the numbers during that time Mercury had been found to be opposite to the rays of the Sun" (translated by M.K.).

He makes a mistake: Pico's work was first published in 1496. Moreover, in the first edition the quotation does not have a capital letter in the word 'Mercurium' and instead of 'radiis' there is actually the word 'radus', which changes the meaning of Averroes's statement to some extent (see below fn. 53 and 54).

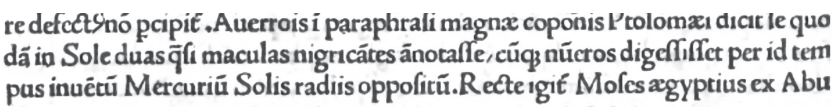

re defect9nō pcipiť .Auerrois ī paraphrali magnæ coponis Ptolomæi dicit ſe quo dā in Sole duas q̄ſi maculas nigricātes ānotaſſe, cūq; nūeros digeſſiſſet per id tem pus inuētū Mercuriū Solis radiis oppoſitū. Recte igiť Moſes ægyptius ex Abu

Fig. 2. Pico della Mirandola 1498, p. 478

> Auerrois in paraphrasi magnae composicionis Ptolomaei dicit se quondam in Sole duas quasi maculas nigricantes annotasse, cumque numeros digessisset per id tempus inuentum Mercurium Solis radiis oppositum (…) (Pico della Mirandola 1498, p. 478).[53]

However, contrary to Westman's assurances, it was not Rosen who authored the thesis that Copernicus's borrowing of information from Averroes's *Paraphrase of Ptolemy* must have come from Pico's work, because Pico was referring to Averroes's work, preserved only in a Hebrew translation, which Pico read because he knew the language. This was already claimed by L. Birkenmajer (1900, pp. 89–95), based on the findings of Moritz Steinschneider (1892, p. 54; 1893, p. 36 §10; p. 547, §340) that there was no Latin translation of Averroes's work, of the Jesuit Josephus Blancanus (1415, p. 57, lines 28–29) and of Johannes Kepler (1617).

Let us now note two issues:

a) a large discrepancy between the text of Pico della Mirandola (two dark spots on the Sun *and the "opposition" of Mercury*) and the text of Copernicus (one dark spot *and the conjunction of Mercury*, identified with the passage/transit of Mercury through the disk of the Sun);[54]

[53] "Auerrois, in a paraphrase of Ptolemy's great composition, says that he once noticed two blackish spots on the Sun, when he had calculated the numbers during that time and found Mercury opposite (sic!) the Sun's rays" [it should be: in conjuction with the Sun / conjoined with the Sun] (translated by M.K.). See also fn. 52 and 54.

Swerdlow's translation, from the 1557 Basel edition: "Auerrois in paraphrasi Magnae compositionis Ptolemaei dicit sequondam in Sole duas quasi maculas nigricantes annotasse, cumque numeros digessisset perid tempus, inuentum Mercurium Solis radijs oppositum" (Liber X, caput IIII, s. 685): "Averroës, (however,) in the paraphrase of the *Great Treatise* of Ptolemy, said that he himself had once observed in the sun two spots, more or less verging on black, and when he carried out computations for that time, found Mercury interposed to the rays of the sun" (Swerdlow 2012b, pp. 5–6).

[54] As an aside, as already noted by A. Birkenmajer (1953b, pp. 103, 108), according to J.J. Lalande, *Astronomie*, 3rd ed., II Paris 1792, pp. 448–452, 462, Averroes's observations could not have been of the passages of Mercury and Venus across the disk of the Sun, because these planets are invisible to the naked eye against the background

b) the text quoted from *Disputationes adversus astrologiam divinatricem* (1496) / *Disputationes adversus astrologiae* (1498) can be found in Book X, Ch. IIII (p. H_2):

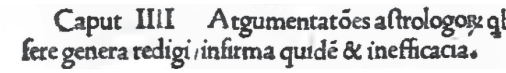
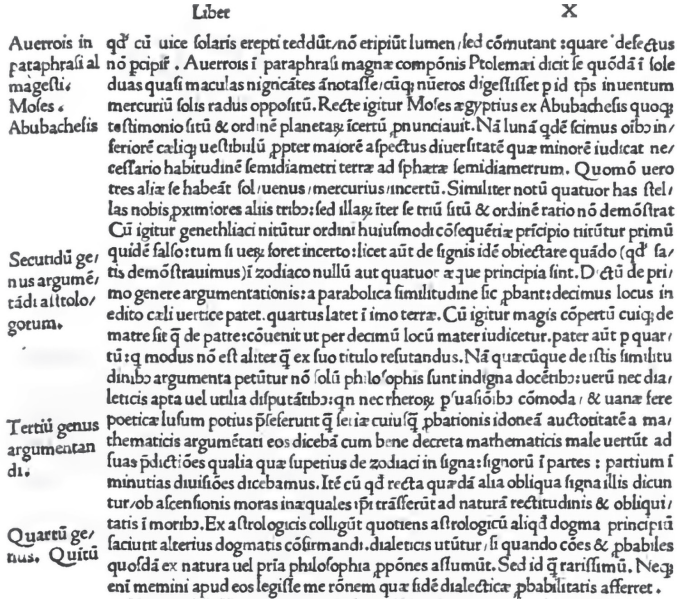

Caput IIII Argumentatões astrologoꝝ qbꝫ ſua roborãt dogmata ad qnq; fere genera redigi / infirma quidẽ & inefficacia.

Fig. 3. The title of Ch. IV of Book X (p. H_2)

("Argumentationes astrologorum quibus sua roborant dogmata ad quinque fere genere redigi, infirma quidem & inefficacia" (Book X, Ch. IIII: "The arguments astrologers use to reinforce their dogma have been reduced to about five types, really weak and ineffective") – see these arguments:


Liber X

Auerrois in pataphraſi al mageſti. Moſes. Abubachelis

Secundũ genus argumẽtãdi altologorum.

Tertiũ genus argumentandi.

Quartũ genus. Quitũ

qđ cũ uice ſolaris erepti reddũt / nõ eripiũt lumen / ſed cõmutant : quare defectus nõ poſſit. Auerrois ĩ paraphraſi magnæ compõnis Ptolemæi dicit ſe quõdã ĩ ſole duas quaſi maculas nigricãtes ãnotaſſe / cũq; nũeros digeſſiſſet p id tps inuentum mercuriũ ſolis radius oppoſitũ. Recte igitur Moſes ægyptius ex Abubachelis quoq; teſtimonio ſitũ & ordinẽ planetaꝝ ĩcertũ pnunciauit. Nã lunã qdẽ ſcimus oĩbꝫ inferioré cæliq; ueſtibulũ ppter maiorẽ aſpectus diuerſitatẽ quæ minorẽ iudicat neceſſario habitudinẽ ſemidiametri terræ ad ſphæræ ſemidiametrum. Quomõ uero tres aliæ ſe habeãt ſol / uenus / mercurius / incertũ. Similiter notũ quatuor has ſtellas nobis pximiores aliis tribꝫ : ſed illaꝝ iter ſe triũ ſitũ & ordinẽ ratio nõ demõſtrat Cũ igitur genethliaci nitũtur ordini huiuſmodi cõſequẽtiæ prĩcipio tritũtur primũ quidẽ falſo : tum ſi ueꝝ foret incerto : licet aũt de ſignis idẽ obiectare quãdo (qđ ſatis demõſtrauimus) ĩ zodiaco nullũ aut quatuor æque principia ſint. Dẽ ctũ de primo genere argumentationis : a parabolica ſimilitudine ſic pbant : decimus locus in edito cæli uertice patet. quartus latet ĩ imo terræ. Cũ igitur magis cõpertũ cuiq; de matre ſit q̃ de patre : cõuenit ut per decimũ locũ mater iudicetur. pater aũt p quartũ : q modus nõ eſt aliter q̃ ex ſuo titulo refutandus. Nã quæcũque de iſtis ſimilitudinibꝫ argumenta petũtur nõ ſolũ philoſophis ſunt indigna docẽtibꝫ : uerũ nec diæleticis apta uel utilia diſputãtibꝫ : qn nec theroꝝ p'uaſiõibꝫ cõmoda / & uanæ fere poeticæ luſum potius pferunt q̃ ſeriæ cuiuſq; pbationis idoneã auctoritatẽ a mathematicis argumẽtati eos dicebã cum bene decreta mathematicis male uertũt ad ſuas pdictiões qualia quæ ſuperius de zodiaci in ſigna : ſignorũ ĩ partes : partium ĩ minutias diuiſiões dicebamus. Itẽ cũ qđ recta quædã alia obliqua ſigna illis dicuntur / ob aſcenſionis moras inæquales : pi trãſſerũt ad naturã rectitudinis & obliquitatis ĩ moribꝫ. Ex aſtrologicis colligũt quotiens aſtrologicũ aliqđ dogma principiũ faciunt alterius dogmatis cõfirmandi. dialeticis utũtur / ſi quando cões & pbabiles quoſdã ex natura uel prĩa philoſophia ppones aſſumũt. Sed id q̃ rariſſimũ. Neq; enĩ memini apud eos legiſſe me rõnem quæ fidẽ dialecticæ pbabilitatis afferret.

Fig. 4. Pico della Mirandola, *Disputationes adversus astrologiam divinatricem* (Bologna 1496, Book X, Ch. IIII, p. H ii_2)

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of the Sun's disk. See also Goldstein 1969. I will add that the simultaneous transit of Mercury and Venus is an extremely rare phenomenon – the next one will happen on June 26, 69163 (Meeus, Vitagliano 2004), and the last one happened in 373173 BC (*Wikipedia* 2024) (which, however, is disputed by McFleppers, Ghosh 2021 as empirically implausible). It follows that Averroes must have actually observed two sunspots on the Sun, which, however, could not have existed there due to the paradigm/axiom of perfection of heavenly bodies applicable in the intellectual culture of the time.

That is, they concern criticism of divinatory astrology and *not issues in the field of mathematical astronomy and physical astronomy* (on which Copernicus focused).[55]

Therefore, the above-mentioned fragments from Copernicus's work and Pico's work *are not at all irrefutable evidence* of Copernicus's dependence on Pico. Copernicus may have learned about the quote from Averroes from another, now unknown study.

It turns out that such a work was already indicated by Moritz Steinschneider in 1903: it is a Latin or Castilian translation of Averroes's *Paraphrase of the Almagest*, made before the mid-14th century for Alfonso X. Copies of this work were available in Bologna and Spain. This information was provided by Alphonsus, son of Dionysius of Lisbon (d. 1352), translator of Averroes's works, in the preface to his translation of Averroes's writing *De separatione primi principii* (codex Digby 256, fol. 190r–194v).[56] This fact was noted by Aleksander Birkenmajer in 1922 and 1953,[57] and was overlooked, among others, by R.S. Westman. Therefore, Copernicus may have come across this translation of Averroes's *Paraphrase of the Almagest* or another writing referring to this work while studying in Bologna.[58]

2) Contrary to the opinion of R.S. Westman, there are no rational premises that would make it more or less probable that Copernicus

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[55] An English translation of the entire chapter 4 (including the fragment with five types of astrologers' arguments) – see Swerdlow 2012b, pp. 3–7. See also a discussion of the entire Pico's treatise in: Shumaker 1972, pp. 18–27; Thorndike 1934b, pp. 485, 532, 529–530.

Note that Thorndike criticizes Pico: "This effort to give the impression that most of the great minds of the past have condemned astrology is weak and unconvincing to anyone at all acquainted with the past history of the subject. Pico selects only those persons and data that support his contention, suppressing the evidence to the contrary, or misrepresents the attitude of other personages. On the whole, his citations are about as unconvincing as those of the astrologers in favor of their art. He had a wide, if not exhaustive, acquaintance with the past literature germane to his theme, but the use he makes of it is that of the advocate and dialectical disputant, almost at times that of invective, rather than that of the impartial historian of ideas" (cited from: Fischer 2006, p. 89, ch. 37).

[56] Steinschneider 1903, p. 59.

[57] A. Birkenmajer 1922, p. 30, fn. 2; 1953b, fn. p. 68,8, p. 108.

[58] This was done critically by, for example, Levi ben Gerson (14th century, southern France) in an astronomical treatise written in Hebrew – see Goldstein 1969, p. 54.

intended to write an astrological treatise following the example of Ptolemy's *Tetrabiblos*. This is just pure literary speculation without any basis in sources.

3) With a view to the tradition of the science of the stars and *its various branches*, we know that from ancient times to the Renaissance, astrology was the consummation of the science of the stars. That is why R.S. Westman cannot be right in claiming that it was the astrological and prognostic problems (i.e. the crisis and criticism of astrology) that made Copernicus reform the foundations of astronomy, because the crisis affected the very foundations of astronomy, without the astrological component.[59]

4) It is *highly paradoxical* that Robert S. Westman, in his astrological interpretation of the development of Copernicus's thought, only marginally treats the astrological thread related to Kraków, the center of European astrology in the 15th century,[60] although his research topic entitled "The Copernican Question: Prognostication, Skepticism and Celestial Order" concerned the period from Copernicus's student years in Kraków and Bologna in the 1490s to 1713, the date of the second edition of Newton's *Philosophiae Naturalis Principia Mathematica*, and originally to about 1610, the date of publication of Kepler's *Astronomia nova* (1609) and Galileo's presentation of the discoveries made using the telescope – see Westman 2001, p. 233, note 1; 2011a.

5) It cannot be rationally denied that the cult of the Sun, solar symbolism and the heliocentric metaphysics of Neoplatonism – *paradoxically omitted* by Westman – were an intellectual challenge for Copernicus, which he had to face when creating his system, usually referred to as heliocentric.[61]

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[59] Cf. ch. 2 and 3 above.

[60] Westman discusses Albert of Brudzewo's division of the science of stars as it relates to astrological topics. The achievements of the Kraków astrological center are described, among others, by A. Birkenmajer 1937; Markowski 1971; 1975; Konarska-Zimnicka 2018.

[61] This issue was drawn by, among others, Ernst Goldbeck (1919, pp. 224–226); Edwin Arthur Burtt (1925, pp. 42–44); Jeremi Wasiutyński (1938, pp. 57–60; 2003); Thomas S. Kuhn (1957, p. 130); Alexandre Koyré (1961, p. 61 / 1973, p. 66); Frances A. Yates (1964, pp. 154–155); S.K. Heninger Jr (1963, ed.) 1965; 1974; Zdeněk Horský (1966); Eugenio Garin (1967; especially 1973a, pp. 680–681; 1973b, pp. 87– 88; 1975;

And so in *De revolutionibus* (Book I, Ch. X), Copernicus explicitly referred to the cult of the Sun and solar symbolism.

> In medio vero omnium residet Sol. Quis enim in hoc pulcherrimo templo lampadem hanc in alio vel meliori loco poneret, quam unde totum simul possit illuminare? Siquidem non inepte quidam lucernam mundi, alii mentem, alii rectorem vocant. Trimegistus visibilem Deum, Sophoclis Electra intuentem omnia. Ita profecto tanquam in solio regali Sol residens circum agentem gubernat Astrorum familiam. Tellus quoque minime fraudatur lunari ministerio, sed ut Aristoteles de animalibus ait, maximam Luna cum terra cognationem habet. Concipit interea a Sole terra, et impregnatur annuo partu (Kopernik 1953, p. 38).

> At rest, however, in the middle of everything is the sun. For in this most beautiful temple, who would place this lamp in another or better position than that from which it can light up the whole thing at the same time ? For, the sun is not inappropriately called by some people the lantern of the universe, its mind by others, and its ruler by still others. [Hermes] the Thrice Greatest labels it a visible god, and Sophocles' Electra, the all-seeing. Thus indeed, as though seated on a royal throne, the sun governs the family of planets revolving around it. Moreover, the earth is not deprived of the moon's attendance. On the contrary, as Aristotle says in a work on animals, the moon has the closest kinship with the earth. Meanwhile the earth has intercourse with the sun, and is impregnated for its yearly parturition (Copernicus / Rosen 1978, p. 22).

1976a; 1988, p. 184); Stanisław Mossakowski (1973/1974, 2008); Bogdan Suchodolski (1973, pp. 117–121); Stefan Swieżawski (1973, p. 257; 1980, pp. 126–127; 1983b, p. 220); Bronisław Biliński (1975; 1977); Michał Kokowski (2001, see the entry under 'neoplatonism'); Dilwyn Knox (2002) and Piotr Piotrowski (2012; 2023).

To be precise, however, it should be noted that it was not in fact a heliocentric system, because its center was a fictitious entity, the so-called average Sun, not the physical Sun. See Thorndike 1941a, pp. 422–423; Swerdlow 1973, pp. 471–476; Shank 2017, pp. 102–106.

The reference to *Trimegistus* (and not *Trismegistus*, as it should be)[62] is perhaps related to Copernicus's knowledge of the work of John of Głogów entitled *Introductio in primam philosophiam Aristotelis* from the end of the 15th century, in which the following statement appears:

> […] et ille Hermes antiquus Trimegistus scribens de Deo ad Asclepium collegam suum, inquit, quod homo est nexus Dei et mundi […] (fol. 2; cited from: L. Birkenmajer 1924, p. 122).[63]

Moreover, in Copernicus's letters written in his own name – described in the literature imprecisely as 'private' (Drewnowski's term), the oldest from February 29, 1524 (?),[64] and the most recent from September 28,

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[62] It was a legendary figure. A synthetic description of research on this issue is provided by Kuczyńska 1992, pp. 138–144. On the Hermetic tradition, see James 1993/1996, pp. 121–162.

[63] "And that the ancient Hermes Trimegistus, writing about God to his colleague Asclepius, says that man is God's link with the world". However, the other theses of the Birkenmajers – that Copernicus took this view either from a) Marsilio Ficino's *De sole et lumine*, *De triplici vita* (Florence, 1489), several copies of which were sent to Kraków's Callimachus and his disciples (L. Birkenmajer 1924, p. 122) or b) the treatise of Hermes Trismegistus entitled *Poimandres*, translated into Latin in 1468 by Ficino, entitled *Liber de potestate et sapientia Dei* (A. Birkenmajer 1953b, notes to p. 71,18 (pp. 113–114); 1963, p. 47) – are not true, because there is no incorrect spelling of the nickname 'Trimegistos', nor the term 'visibilem deum' ('visible god'). See also Rosen 1970 (which explains many ambiguities related to Copernicus's poor knowledge of Hermes's thought); Campa 2016 (reviews discussions on this topic).

I will add that the theme of 'homo est nexus Dei et mundi', referring to *The Asclepius* of Hermes Trismegistus, was later taken up by, among others, St. Bp. Albert the Great, Berthold of Moosburg, cardinal Nicholas of Cusa and Marsilio Ficino – see Jeck 1999; Anzulewicz 2010; Gersh 2021. Therefore, Copernicus could have encountered this thread not only in the work of Hermes Trismegistus himself.

[64] In my opinion, Copernicus also used this seal in his letter of October 22, 1518 to the Warmian Chapter. Poor quality photocopies of this letter are available – see Wasiutyński 1938, illustration on p. 280; Schmauch 1942 (photo on the title page) and Schmauch 1943, p. 216, tab. XXVIII – which should be compared with a scan of the recto page of the original kept in the Archives of the Archdiocese of Warmia in Olsztyn (AAW Olsztyn, Rep. 128; *I would like to thank Rev. Prof. Andrzej Kopiczka, head of AAW, for providing me with this scan*) and other originals of Copernicus's letters, and their scans or photocopies, especially with a letter to bishop Ferber of February 29, 1524 (scan: Alvin-Letter-29-02-1524 (Uppsala) – *I would like to thank Dr. Ina-Maria Jansson, archivist from the Special Collections Department of the University Library in Uppsala, for sending*

1541 – there is an imprint of a signet ring depicting *Apollo (Phoebus) with a lyre*, symbolizing the Sun god.[65]

Fig. 5. Imprint of Nicolaus Copernicus's signet ring on the letter of June 21, 1541 (Staatliches Archivlager in Göttingen). Public domain. URL: http://pauart.pl/app/artwork?id=564b3b0b0cf2a0f6ce2e7391 (digitalisation: PAU, PAUart project)

There is no doubt that this type of solar symbolism was associated with Pythagorean, Platonic and Neoplatonic thought (Tatarkiewicz 1972),[66] the above-mentioned Hermeticism (Yates 1964; 1973/1997)

me the link to this scan); Wasiutyński 1938, illustration after p. 328 recto/verso) and a letter to bishop Dantyszek of June 5, 1536 (Wasiutyński 1938, illustration after p. 408 verso). Unfortunately, Copernicus's earlier 'private' letters (earlier than those from October 22, 1518) have not survived, so we cannot determine with certainty whether Copernicus had already used his seal. However, I assume that he did from the moment of the discovery of 'heliocentric Neoplatonic metaphysics', i.e. in the years around 1500.

[65] Wasiutyński 1938, p. 386; but the paragraph is not available in the 2nd edition: 2007, p. 371; Kuczyński 1970; 1971; Mossakowski 1973/1974, 2008; Drewnowski 1978, pp. 22–23.

[66] Dilwyn Knox (2002, p. 411; 2007, p. 210), adopting a different hermeneutics/research perspective, denies the important meaning of Neoplatonic symbolism of the Sun and treats it as purely literary.

"Even if we were to grant that Ficino's Latin translation of the *Pimander* was Copernicus's source, it would prove very little. It hardly corroborates on its own the assertion that Copernicus was steeped in contemporary Neoplatonism or Hermeticism, Ficino's version of it or not. It is much simpler to assume that Copernicus's invocation to the sun is just a rag-bag of classical tags – from Pliny, Cicero, Sophocles, Hermes Trismegistus […] – rather than a bold declaration of Neoplatonic or Hermetic allegiance. […] Nor, it should be added, does Rheticus relate Copernicus's sun symbolism to Platonic sources. He speaks of his master's wish to re-establish the sun as emperor of the universe, administering its dominions without hurrying from one city to the next. Or, using another common analogy, found in Platonic and non-Platonic sources alike both before and after Copernicus, the sun was like a heart sustaining the body from its

and Renaissance syncretic thought, which tried to reconcile all religious and philosophical trends.

The Renaissance philosopher and astrologer Marsilio Ficino, author of *Liber de Sole* (Florence, 1493), was a vocal follower of Renaissance syncretism and solar symbolism who propounded the thesis that the Sun governs the sky and the Earth (see Ficino 2017, ch. VI). His works were in the library of Copernicus.

Let us note here that Copernicus (unlike Giordano Bruno later) was not a supporter of the Neoplatonic idea of the infinity of the world, because in Book I, Ch. VIII he stated:

> Let us therefore leave the question whether the universe is finite or infinite to be discussed by the natural philosophers. We regard it as a certainty that the earth, enclosed between poles, is bounded by a spherical Surface (Copernicus / Rosen 1978, p. 16).

Copernicus proclaimed this because, among other things, he knew from observations that the deviation from the bisection of the celestial sphere by the plane of the observer's horizon was unmeasurable using available measuring instruments, which had limited measurement accuracy (see Book I, Ch. VI). Therefore, Copernicus's world / universe is similar to infinite (due to the limited accuracy of measuring such a lack of deviation from bisection), and it would be infinite if the measurement error of observing the horizon bisection was exactly 0 degrees, minutes,

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middle. […] Platonic or Neoplatonic sun symbolism is, to put the matter bluntly, a red herring anyway. What preoccupied Copernicus philosophically was the earth's motion, not the sun's location at the centre of the universe. This is evident from several passing comments that Copernicus makes in the opening chapters of *De revolutionibus*" (Knox 2002, p. 411). I do not share the opinion of Prof. Knox that the position of the Sun in the Copernican system was not an important issue for Copernicus.

Knox (2002, pp. 399–400) also pointed out that there is no basis for the widespread claim made by, among others, Dorothy Stimson (1917, p. 25), Edwin A. Burtt (1925, pp. 42–44), Angus Armitage (1938, p. 47), Thomas S. Kuhn (1957, p. 128), Alistair C. Crombie (1952, vol. II, p. 167; 1959/1960, vol. II, p. 209), Cesare Vasoli 1973, pp. 87–89) and Bronisław Biliński (1975, pp. 34–35; 1977), that Domenico Maria de Novara was a Platonist or a supporter of Florentine Platonism and Pythagoreanism, and thus refuted the idea that Novara's interests were shared with Copernicus during the latter's stay in Bologna in the years 1496–1500.

seconds, etc., and the instruments were error-free (i.e. their measurement sensitivity was not limited by any effects).[67]

6) There is no doubt that the genesis of Copernicus's cosmological system (i.e. the heliostatic theory) is also closely related to: a) the issue of calendar reform and the issue of (long-term) movements of the eighth sphere (medieval Arab astronomers, Renaissance Christian astronomers);[68] b) the issue of the so-called removal of the equant from Ptolemy's theory in the name of Plato's principle of perfect circular motions (medieval Arab astronomers and Renaissance Christian astronomers);[69] c) the issue of the measure of distance and order in Aristotelian systems of homocentric spheres and in Ptolemaic systems (the idea of nesting spheres)[70]; d) the discussion of medieval scholastics on the possibilities of the Earth's movements and its three movements: daily, annual and declination / inclination (Buridan, Oresme, Albert of Saxony)[71] and e) the medieval and Renaissance discussion on various physics of astronomical phenomena: Aristotelian, Pythagorean, Platonic, Stoic, Albertine, Buridanian and Neoplatonic, because Copernicus's physical astronomy was a kind of synthesis of different theoretical concepts developed by various philosophical schools.[72]

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[67] Cf. Kokowski 1997, pp. 301–306; 2001, pp. 177, 213, fn. 37; 2023, p. 98, fn. 20. Copernicus also shows no traces of interest in other Neoplatonic concepts, e.g. emanations.

[68] Ravetz 1965a/1965b; Dobrzycki 1965; Swerdlow 1973; Neugebauer, Swerdlow 1984; Kokowski 1996; 2004; 2009.

[69] Swerdlow 1973; Neugebauer, Swerdlow 1984; Kokowski 1996; 2004; 2009.

[70] Van Helden 1985, pp. 4, 22–37, 42.

[71] Duhem 1909; 1913–1959; Crombie 1952, vol. II, pp. 167–178; Grant 1962; 1994; Markowski 1968; 1971; 1972; 1973; 1993; Markowski et al. 1973; Drewnowski 1979; Kokowski 1996; 2001; 2004; 2009.

Let us note that J.M.M.H. Thijssen (2004), who questions the existence of the Buridan school in the sociological sense, i.e. the existence of a master / teacher / lecturer surrounded by listeners (his students), does not deny, however, the substantive connection between the content of Buridan's works and the 'pupils' of this so-called 'school'.

[72] See Kokowski 1996; 2004; 2009; Knox 1999; 2002; 2007. Therefore, calling Copernicus an Aristotelian, Platonist, Pythagorean, Stoic, Neoplatonist, etc. is justified only in relation to selected fragments of the ideas proclaimed by Copernicus. His physical astronomy was a kind of *minimalist syncretism*. Copernicus emphasized that the final answers to some questions require decisions based on the philosophy of nature, e.g. the problem of the finite or infinite size of the world/universe or the choice of equivalent geometric models as representations of astronomical phenomena. He tried to avoid unambiguous answers (which is an expression of the minimalism mentioned above).

We have seen above that R.S. Westman, in creating his interpretation of Copernicus's views on astrology, used the strategy of *literary fiction*, claiming that Copernicus was a supporter of astrology – *understood as the science of the influence of celestial bodies on man* – despite the silence of the sources on this matter. This is not an isolated case in R.S. Westman's work. In an article published in the *Encyclopædia Britannica* (last update: 8 August 2024), R.S. Westman stated that Copernicus was a painter and the creator of the self-portrait (*these are old ideas*) who additionally learned to paint while studying in Padua (*this is a new idea by Westman*)[73] – this is another example of literary fiction. The reason is very elementary: had Copernicus been the author of self-portrait, he would not have limited himself to painting his own figure only, he would have painted also his relatives, bishops and canons of Warmia, etc., because he was not a selfish and antisocial person, as evidenced by his lively activity in the Warmian chapter.[74]

8. Conclusions

Based on currently available sources and historical studies, in opposition to R.S. Westman (1993; 2011a; 2011b; 2013; 2016; 2019; 2024), I think that there are no scientific grounds to claim that:

a) Copernicus accepted divinatory astrology, in particular the ontological astrological axiom;
b) the genesis of Copernicus's two astronomical theories, presented in the *Commentariolus* and *De revolutionibus*, was closely related to divinatory astrology and the activities of Domenico Maria da Novara (supporter of astrology and prognosticator) and Giovanni

[73] Attributing painting skills to Copernicus has a rich history, e.g. Tobiasz Stimmer (1571–1574), Tycho Brahe (*Epistolarvm astronomicarvm libri*, 1589) and Pierre Gassendi (*Nicolai Copernici vita*, 1654, according to which Copernicus studied visual perspective already during his university years in Kraków), and the reception of these ideas by later authors, to the authors of the alleged discovery of Copernicus's grave, because, contrary to popular belief, which prevails even among researchers specializing in Copernicus research, no solid scientific evidence of this discovery has been presented so far. See Kokowski 2005a/2007a; 2005b/2007b; 2009; (ed.) 2012a; 2012b; 2012c; 2014; 2020.

[74] Cf. e.g. Biskup 1973. The moral of the story is that in the scientific activity of a historian of science, one should avoid fascination by popular science, use at least a bit of common sense, and develop richer research hermeneutics (i.e. improve the tools of interpretation).

Pico della Mirandola (opponent of divinatory and occult astrology) in this field.

In the context of contemporary knowledge, theses a) and b) are scientific myths, the result of R.S. Westman's abandonment of the principles of the methodology of historical sciences in favor of historical fictionalism straight out of literary fiction.

On the other hand, it cannot be ruled out that Neoplatonic solar symbolism / heliocentric Neoplatonic metaphysics, *but in combination with Pythagorean, Platonic and Stoic thought* (ideas of mathematical order and harmony)*, Aristotelian, Albertine and Burdanian thought, as well as certain "solar coincidences" of Ptolemy's system*[75] may have caused Copernicus to recognize the immobility of the Sun and the (*almost*) central place of the Sun in his cosmological system, along with giving the Earth an annual motion around the Sun.

Let me remind here the theses I have previously presented regarding the genesis of Copernicus's theory, which are still valid.

Based on the knowledge of the content of Copernicus's works and studies in the field of history and methodology of exact sciences and philosophy, I believe that when he was developing his astronomical theories (described in the *Commentariolus* and *De revolutionibus*), Copernicus creatively referred to three traditions: mathematical astronomy, physical astronomy and natural philosophy. However, the specific solutions that he adopted in his theories – the combination of three movements of the Earth: daily, annual and declination (more complex in the *De revolutionibus* than in the *Commentariolus*) and the measure of order (relating the average distance of *each* planet from the center of the Solar system to its period around the Sun) – were his original achievements.

Copernicus did this using four complementary strategies:

1) *a demarcation strategy* which consisted in distinguishing between a) mathematical astronomy, hence the phrase "mathematical works are written for mathematicians" (*De revolutionibus*, Book I, Preface:

[75] The "solar coincidences" of the Ptolemaic system are the annual period of the Sun's revolution around the ecliptic and the annual period of the so-called epicycle. 'Lower planets' (Mercury and Venus) and the deferent circulation of each of the 'upper planets' (Mars, Jupiter, and Saturn) with the period of the synodic year, i.e. the time between two successive oppositions of the Sun. J.L.E. Dreyer (1953, p. 312) aptly pointed out such properties of Ptolemy's system, which was also noticed, although not so precisely, by Marcin Karas (2018, pp. 118–119, fn. 474).

Dedicatory Letter), b) physical astronomy and natural philosophy (physics), hence the phrase: "[…] let us leave the question whether the world is finite or infinite for discussion to natural philosophers" (*De revolutionibus*, Book I, Ch. VIII) and c) astrological explanations; there is not the slightest trace in the *Commentariolus* or *De revolutionibus* of the use of this type of explanations;[76]

2) *a strategy of critical research on the history of astronomy*, consisting in analyzing the history of various models of astronomical phenomena and the cosmological structures of these models; hence Copernicus's statement (*De revolutionibus*, Book I) about the lack of agreement between various adepts of stellar science / astronomy / mathematics as to the basic parameters of astronomical models and cosmological assumptions called, from Greek, *hypotheses*;

3) *a syncretic strategy in the field of physical astronomy and natural philosophy (physics)*, consisting in an attempt to reconcile various physics of astronomical phenomena: Aristotelian, Platonic, Stoic, Albertine, Burdanian and Neoplatonic; its fruit was Copernicus's celestial proto-physics;[77]

4) *a strategy of hypothetical and correspondence thinking*, consisting in using the tools of the method of mathematical and physical sciences, which I call the hypothetico-deductive method of correspondence thinking.[78]

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[76] It is worth emphasizing that a clear articulation of these demarcation criteria solves the real Gordian knot of the interpretation of Copernicus's thought, i.e. distinguishing between the thread of mathematical astronomy, the thread of physical astronomy/celestial physics and the astrological thread (natural, medical and divinatory astrology), and preparing answers to the questions: "Was Copernicus an astrologer (in the sense that he practiced astrology and was a supporter of natural, medical and divinatory astrology)?" and "Was astrology (natural, medical and divinatory) a source of Copernicus's inspiration in reforming astronomy?"

[77] I introduce this term to denote the fact that Copernicus: a) made a *sketchy* syncretic synthesis of various physics of astronomical phenomena: Aristotelian, Platonic, Stoic, Albertine, Burdanian and Neoplatonic, and b) at the same time emphasized that his physical astronomy/celestial physics was not a philosophy of nature. On this point, I disagree with Copernicus to some respect, because his physical astronomy was a form of natural philosophy, though different from Aristotelian one, as well as with A. Goddu (2010; 2013), who minimizes non-Aristotelian threads in Copernicus's thought and develops in his publications a distorted, exaggerated pro-Aristotelian interpretation of Copernicus's achievements.

[78] Kokowski 1996; 1997; 2001; 2004; 2009; 2012. The hypothetico-deductive method of correspondence thinking consists of two interconnected parts: the hypo-

Therefore, in opposition to well-known researchers, I believe that the following theses have no scientific justification: a) Copernicus was only an imitator of the Pythagoreans, in particular Aristarchus of Samos,[79] b) he was only an imitator of the Buridanists,[80] c) the thought of the Buridanists did not have a significant influence on Copernicus, because in the times of Copernicus it no longer had supporters in Kraków,[81] d) Copernicus was a slavish follower of Arab astronomers

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thetico-deductive method, whose roots go back to Plato (including *Timaeus*) and the Buridanists, and the method of correspondence thinking, whose roots go back to Hellenic and Hellenistic astronomy (including, among others, Ptolemy). Note: This is not an anachronism. Two orders are manifest here: the historical (temporal) context and the metahistorical-methodological (atemporal) context.

[79] Heath 1913; Stahl 1945; Africa 1961; 1962; Rosen 1962; 1978b and other authors from the 16th to the 20th century – see a review of their positions in: Kokowski 2009, pp. 65–68, 310–315. According to the current knowledge, Copernicus did not know Archimedes's treatise *On the Counting of Sand* (published in 1544), which laid the foundations of the cosmological structure of Aristarchus's theory: the stationary Sun in the center of the system, the daily and annual motion of the Earth around the Sun, etc. Even if he had known it, it was only a proto-idea of the heliocentric theory. Copernicus's theories (described in the *Commentariolus* and *De revolutionibus*) are much more developed.

[80] Duhem 1909; 1913–1959.

[81] Goddu 2010, pp. 338. Some researchers, including the above-mentioned André Goddu, authors of the commentary to the French edition of *De revolutionibus* (Copernicus 2015, pp. 103–104, note 4) and Marian Chachaj (2023, p. 90, note 255; using the findings of A. Goddu 2010 and D. Knox 2005), apart from Buridan's idea of probable explanations, the idea of hypothetical three movements of the Earth and the principle of relativity of motion [*to which Copernicus undoubtedly referred* – see Markowski 1968; 1971; 1972; 1973; 1993; Markowski et al. 1973; Drewnowski 1979; Kokowski 1996; 2004; 2009], reduce the Buridanian thought only to the theory of impetus, which cannot be found in Copernicus's works using an elementary linguistic analysis of the texts of the *Commentariolus* or *De revolutionibus*.

In fact, on the basis of purely linguistic analyses, we can only point to fragments of Copernicus's texts in which he used the term 'impetus' – Kokowski 2009, pp. 218–231; Goddu 2010, pp. 338–345. But this does not lead directly to the conclusion that Copernicus knew the theory of impetus (this was overlooked by the critics of my thesis about Copernicus's knowledge of Buridan thought, including the idea of impetus – Goddu 2010, pp. 338–339, 348, fn. 57; the authors of the commentary to the French edition of *De revolutionibus* – see Copernicus 2015, pp. 103–104, fn. 4). In order to find the theory of momentum in Copernicus, it is necessary to a) conduct a content analysis – see e.g. Knox 2005, pp. 171–177 (the term 'impetus' used in the sense of force or gravity) and also b) reconstruct Copernicus's astronomical models using mathematical analysis and then reinterpret them from the perspective of the

from the Maragha school[82] and e) it is astrology – according to R.S. Westman – that was the source of the reform of astronomy carried out by Copernicus. These claims are modern scientific myths and the result of the use of poor research hermeneutics.[83]

In other words, I argue that: a) although the thought of the Pythagoreans and Buridanists had a significant influence on Copernicus, he was not merely a slavish imitator of them, b) although there are numerous similarities between the models of Copernicus and the Arab astronomers, he was not a slavish imitator of the Arab astronomers of the Maragha school, the achievements of which, *paradoxically, according to current knowledge*, he was not familiar with,[84] c) despite his knowledge of astrology (natural, medical and divinatory), Copernicus did not deal with it beyond the period of his university studies and it was not a source of inspiration for his reform of astronomy; and d) the source of inspiration

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theory of impetus; I demonstrated this using the example of the analysis of Copernicus's precession model – see Kokowski 1996, pp. 33–42, 51–62. With this in mind, I argued: "(…) Copernicus's astronomical-physical system, based on Buridanian physics of impetus, determined the further development of modern astronomy and physics, including the Keplerian heliocentric system, Galileo's kinematics and astronomical views, and Newtonian mechanics with its theory of gravity" (Kokowski 2012d, p. 65). However, it is worth correcting this statement by replacing "based on Buridanian physics of impetus" with "which stemmed from Pythagorean, Platonic, Stoic, Albertian, Buridanian and Neoplatonic hypothetical and probabilistic natural philosophy" (which much better reflects the idea presented in Kokowski 1996; 2004; 2009).

[82] Cf. Roberts 1957; Kennedy, Roberts 1959; Abbud 1962; Roberts 1966; Kennedy 1966; Neugebauer 1968; Swerdlow 1973; King, Saliba (eds.) 1987; Saliba 1984; 1987; 1991; 1994; 1997/2000; Neugebauer, Swerdlow 1984; Barker, Ariew 1991b; Barker, Heidarzadeh 2016; Ragep 2017 (an excellent overview of the discussion); Goddu 2018, pp. 198–203. This view was opposed by Blåsjö 2014; 2018; see also footnote below.

[83] Cf. Kokowski 1996; 2001; 2004; 2009, pp. 76–79, 330; 2012d.

[84] There is no doubt, however, that medieval Arab astronomy had a great influence on the development of medieval and Renaissance European astronomy, including the astronomy developed by Copernicus himself. On the one hand, like Noel M. Swerdlow and F. Jamil Ragep, I am amazed by the numerous striking similarities and coincidences of Copernicus's models and the models of Arab astronomers, and on the other hand, like Otto Neugebauer, Mario Di Bono and Viktor Blåsjö, I am intrigued by the internal logic development of astronomical models and the topic of multiple discoveries – see e.g. Neugebauer 1968, p. 90; Di Bono 1995, p. 149; Hugonnard-Roche 1997/2000; Rashed, Morelon (eds.) 1997/ (red.) 2000; Kokowski 2012d; Blåsjö 2014; 2018; Ragep 2017.

for Copernicus's reform of astronomy was the poor state of astronomy itself (*without the astrological component*) in Copernicus's times, which he was able to notice in a dialogue with the centuries-old tradition of astronomical research.[85]

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Bibliography

Abbud, Fuad 1962: The Planetary Theory of Ibn al-Shatir Reduction of the Geometric Models to Numerical Tables. *Isis* 53(4), pp. 492–499. Stable URL: https://www.jstor.org/stable/227723.

Africa, Thomas W. 1961: Copernicus' Relation to Aristarchus and Pythagoras. *Isis* 52(3), pp. 403–409. Stable URL: https://www.jstor.org/stable/228080.

Africa, Thomas W. 1962: A Reply to Professor Rosen. *Isis* 53(4), p. 509. Stable URL: https://www.jstor.org/stable/227725?seq=8.

d'Ailly, Pierre 1414: *Tractatus de concordantia theologie et astronomie*. URL: http://warburg.sas.ac.uk/pdf/fah1620p.pdf (accessed on 18 August 2024).

Akopyan, Ovanes L'vovich 2015: Ot cporov ob astrologii k novoj actronomii? K voprosu ob odnoj istoriogrsficheskij probleme (From Debates about Astrology to the new Astronomy? A Historiographic Problem). *Voprosy istorii estestvoznaniia i tekhniki* 36(4), pp. 625–641.

[85] The reception of this reform was a complex cultural process. During it, both the reform and Copernicus himself were referred to by many, even extremely contradictory, names – see Kokowski 2001 (the only monograph in world literature so far on the interpretation of Copernicus's achievements by Thomas S. Kuhn); 2004 (the monograph in which I defended the originality of Copernicus's achievements, contrary to the then accepted opposing view held by American historians of science); 2009 (the first monograph in world literature on the reception of Copernicus's achievements written from the perspective of the history of ideas).

Akopyan, Ovanes 2021: *Debating the Stars in the Italian Renaissance: Giovanni Pico Della Mirandola's Disputationes Adversus Astrologiam Divinatricem and Its Reception.* ("Brill's Studies in Intellectual History", vol. 325). Leiden, The Netherlands; Boston, USA: Brill.

Albertus de Brudzewo (1495) 1900: *Commentariolum super Theoricas novas planetarum*. ("Munera Saecularia Universitatis Cracoviensis", vol. 4). Editit: Ludovicus Antonius Birkenmajer. Cracoviae: Typis et sumptibus Universitatis Jagellonicae.

Allen, Don Cameron 1941, 1966: *The Star-crossed Renaissance*. The quarrel about astrology and its influence in England. Durham: Duke University Press; II ed. 1966: New York: Octagon Book.

al-Ṭūsī, Naṣīr al-dīn 1993: *Memoir on Astronomy (al-Tadhkhira fi ʿilm al-hay'a)*, 2 vols. Ed. and transl. F. Jamil Ragep ("Sources in the History of Mathematics and Physical Sciences", vol. 12). New York, Berlin, Heidelberg, London, Paris, Tokyo, Hong Kong, Barcelona, Budapest: Springer-Verlag.

Anzulewicz, Henryk 2010: "Solus homo est nexus Dei et mundi": Albertus Magnus über den Menschen. [In:] S. Fernández, J. Noemi, R. Polanco (Hg.), *Multifariam. Homenaje a los profesores Anneliese Meis, Antonio Bentué y Sergio Silva* ("Anales de la Facultad de Teología. Supplementos a Teología y Vida", vol. 1). Santiago: Pontificia Universidad Católica de Chile, pp. 321–335.

Anzulewicz, Henryk 2011: Magie im Verständnis Alberts des Grossen. [In:] I. Atucha, D. Calma, C. König-Pralong and I. Zavattero (eds.), *Mots Médiévaux offerts à Ruedi Imbach* ("Textes Et Études Du Moyen Âge", vol. 57). Porto: Fédération Internationale des Instituts d'Études Médiévales, pp. 419–431.

Armitage, Angus 1938: *Copernicus, the Founder of Modem Astronomy*. New York, London: Thomas Yoseloff.

Ashworth, William B., Jr. 2024: *Domenico Maria Novara.* URL: https://www.lindahall.org/about/news/scientist-of-the-day/domenico-maria-novara/ (accessed on 18 August 2024).

Aurifaber, Andreas 1540: *Practica auff das Jar M.D.XLI*... Danzig: Rhode.

Bagliani, Agostino Paravicini 2001: *Le "Speculum astronomiae", une énigme? Enquête sur les manuscripts*. "Micrologus Library" 6. Florence: SISMEL Edizioni del Galluzzo.

Barker, Peter; Ariew, Roger (eds.) 1991a: *Revolution and Continuity: Essays in the History and Philosophy of Early Modern Science*. "Studies in Philosophy and the History of Philosophy" vol. 24. Washington, DC: The Catholic University of America Press.

Barker, Peter; Ariew, Roger 1991b: Introduction. [In:] P. Barker and R. Ariew (eds.), *Revolution and Continuity*. Washington, DC: The Catholic University of America Press, pp. 1–19.

Barker, Peter; Heidarzadeh, Tofigh 2016: Copernicus, the Tusi Couple, and East–West Exchange in the Fifteenth Century. [In:] *Unifying Heaven and Earth: Essays in the History of Early Modern Cosmology*, ed. Miguel A. Granada, Patrick J. Boner, and Dario Tessicini. Barcelona: Publicacions i Edicions Univ. Barcelona, pp. 19–57.

Barker, Peter; Vesel, Matjaz 2012: Goddu's Copernicus. An Essay Review of Andre Goddu *Copernicus and Aristotelian Tradition*. *Aestimatio* 9, pp. 304–336. URL: https://jps.library.utoronto.ca/index.php/aestimatio/article/view/26007/19144.

Barton, Tamsyn 1994: *Ancient Astrology*. London, New York: Routledge.

Barwiński, Eugeniusz; Birkenmajer, Ludwik Antoni; Łoś, Jan 1914: *Sprawozdanie z poszukiwań w Szwecji dokonanych z ramienia Akademii Umiejętności*. Kraków: Akademia Umiejętności.

Beecher, D. 2002: Ficino, Theriaca and the Stars. [In:] *Marsilio Ficino: His Theology, His Philosophy, His Legacy*, eds. M.J.B. Allen, V. Rees & M. Davies, Leiden, Cologne, Boston & Cologne), pp. 243–256.

Benjamin, Francis S.; Toomer, G.J. 1971: *Campanus of Novara and medieval planetary theory. Theorica planetarum*. Madison, Wisconsin: University of Wisconsin Press.

Bessarion, Basilios 1503: *In Calumniatorem Platonis. Correctio librorum Platonis „De legibus" Georgio Trapezuntio interprete. De natura et arte adversus eundem Trapezuntium traetatus*. Venice: Aldus Manutius.

Biliński, Bronisław 1975: *Alcune consideration su Niccolo Copernico e Domenico Maria Novara (Bologna 1497–1500)*. Wrocław etc.: Zakład Narodowy im. Ossolińskich Wydawnictwo Polskiej Akademii Nauk.

Biliński, Bronisław 1977: *Il pitagorismo di Niccolo Copernico*. Wrocław etc.: Zakład Narodowy im. Ossolińskich Wydawnictwo Polskiej Akademii Nauk.

Birkenmajer, Aleksander 1922: Biblioteka Ryszarda de Fournival poety i uczonego francuskiego z początku XIII wieku i jej późniejsze losy. *Rozprawy i Sprawozdania z Posiedzeń Wydziału Filologicznego Polskiej Akademii Umiejętności* 60(4). URL: https://www.wbc.poznan.pl/dlibra/publication/571702/edition/485513?language=pl.

Birkenmajer, Aleksander 1933/1972a: Le Premier Système Héliocentrique Imaginé par Nicolas Copernic. *La Pologné au VII^e Congrès international des sciences historques*, Varsovie, pp. 91–97 / reprinted 1972: Aleksander Birkenmajer, *Études d'Histoire des Sciences en Pologne*. ("Studia Copernicana", vol. 4), pp. 583–588. Wrocław etc.: Zakład Narodowy im. Ossolińskich Wydawnictwo Polskiej Akademii Nauk.

Birkenmajer, Aleksander 1936a/1972b: Początki astrologicznej szkoły krakowskiej. *Kalendarz Ilustrowanego Kuriera Codziennego* 9, pp. 54–56 / French translation 1972a: Les Débuts de l'École Astrologique de Cracovie. [In:] Aleksander

Birkenmajer, *Études d'Histoire des Sciences en Pologne*. ("Studia Copernicana", vol. 4), pp. 469–473. Wrocław etc.: Zakład Narodowy im. Ossolińskich Wydawnictwo Polskiej Akademii Nauk.

Birkenmajer, Aleksander 1936b/1972c: Comment Copernic a-t-il Conçu et Réalisé son Oeuvre? Organon I, pp. 111–134; reprinted: Aleksander Birkenmajer, *Études d'Histoire des Sciences en Pologne*. ("Studia Copernicana", vol. 4), pp. 589–611. Wrocław etc.: Zakład Narodowy im. Ossolińskich Wydawnictwo Polskiej Akademii Nauk.

Birkenmajer, Aleksander 1937/1972d: Astrologia krakowska u szczytu swego rozgłosu. *Kalendarz Ilustrowanego Kuriera Codziennego* 10, pp. 58–61 / French translation 1972a: L'Astrologie Cracovienne a son apogee. [In:] Aleksander Birkenmajer, *Études d'Histoire des Sciences en Pologne*. ("Studia Copernicana", vol. 4), pp. 474–482. Wrocław etc.: Zakład Narodowy im. Ossolińskich Wydawnictwo Polskiej Akademii Nauk.

Birkenmajer, Aleksander 1953a/1972e: Mikołaj Kopernik. *Wszechświat* 52, pp. 1–11 / French translation 1972d: Nicolas Copernic. [In:] Aleksander Birkenmajer, *Études d'Histoire des Sciences en Pologne*. ("Studia Copernicana", vol. 4), pp. 563–578. Wrocław etc.: Zakład Narodowy im. Ossolińskich Wydawnictwo Polskiej Akademii Nauk.

Birkenmajer, Aleksander 1953b: Objaśnienia do polskiego przekładu I ks. *De revolutionibus*, przyp. str. 68,8, pp. 106–108.

Birkenmajer, Aleksander 1956/1972f: *Uniwersytet Krakowski jako międzynarodowy ośrodek studiów astronomicznych na przełomie XV i XVI stulecia. Odrodzenie w Polsce*, vol. 2, part 2, Odrodzenie w Polsce. Warszawa, pp. 363–373/French translation 1972f: L'Université de Cracovie: Centre International d'Enseignement Astronomique a la fin du Moyen age. [In:] Aleksander Birkenmajer, *Études d'Histoire des Sciences en Pologne*. ("Studia Copernicana", vol. 4), pp. 483–495. Wrocław etc.: Zakład Narodowy im. Ossolińskich Wydawnictwo Polskiej Akademii Nauk.

Birkenmajer, Aleksander 1963: Kopernik jako filozof. *Studia i Materiały z Dziejów Nauki Polskiej*, seria C, nr 7, pp. 31–63. URL: https://kpbc.umk.pl/dlibra/doccontent?id=49930 (accessed on 20 May 2024).

Birkenmajer, Ludwik 1893: Marcin Bylica z Olkusza oraz narzędzia astronomiczne, które zapisał Uniwersytetowi Jagiellońskiemu w roku 1493. *Rozprawy Akademii Umiejętności. Wydział Matematyczno-Przyrodniczy* 25(5), pp. 1–164. URL: https://rcin.org.pl/Content/108149/WA35_131653_cz311-r1893-t5_Rozprawy-MarcinBylica.pdf (accessed on 20 May 2024).

Birkenmajer, Ludwik Antoni 1900: *Mikołaj Kopernik. Część pierwsza. Studya nad pracami Kopernika oraz materyały biograficzne*. Kraków: Akademia Umiejętności.

Birkenmajer, Ludwik Antoni 1914: Bibliotheca Copernicana. [In:] E. Barwiński, L. A. Birkenmajer, J. Łoś 1914, pp. 94–119.

Birkenmajer, Ludwik Antoni 1924: *Stromata Copernicana. Studia, poszukiwania i materiały biograficzne*. Kraków: Polska Akademia Umiejętności.

Biskup, Marian 1973: Regesta Copernicana. "Studia Copernicana" vol. 7. Wrocław etc.: Zakład Narodowy im. Ossolińskich Wydawnictwo Polskiej Akademii Nauk. Stable URL: https://kpbc.umk.pl/dlibra/publication/31531/edition/40241?language=pl.

Blancanus, Josephus 1415: *De Mathematicarum Natvra Dissertatio vna cvm clarorvm Mathematicowm Chronologia*. Bononiae: Apuud Barth. Cochium.

Blåsjö, Viktor 2014: A Critique of the Arguments for Maragha Influence on Copernicus. *Journal for the History of Astronomy* 45(2), pp. 183–195. DOI: 10.1177/002182861404500203.

Blåsjö, Viktor 2018: A Rebuttal of Recent Arguments for Maragha Influence on Copernicus. *Studia Historiae Scientiarum* 17, pp. 479–497. DOI: 10.4467/2543702XSHS.18.017.9337.

Blumenthal, Geoffrey J. 2014: Copernicus's Development in Context: Politics, Astrology, Cosmology and a Prince-Bishopric. *Science in Context* 27(1), pp. 1–32. DOI: 10.1017/S0269889713000367. URL: https://typeset.io/pdf/copernicus-s-development-in-context-politics-astrology-1ada8unn3e.pdf (accessed on 20 May 2024).

Blumenthal, Geoffrey 2015: Astrology and Copernicus's Early Experiences in the World of Renaissance Politics. *Centaurus* 57(2), pp. 96–115. DOI: 10.1111/1600-0498.12083.

Boas Hall, Marie 1962, 1990, 1994: *The Scientific Renaissance 1450–1630*. New York: Dover Publication, Inc. URL: https://books.google.pl/books?id=TnW2YIrn2pEC&printsec=frontcover&source=gbs_book_other_versions_r&redir_esc=y#v=onepage&q&f=false (accessed on 20 May 2024).

Bònoli, Fabrizio; Bezza, Giuseppe; De Meis, Salvo; Colovita, Cinzia (eds.) 2012: *I pronostici di Domenico Maria Novara*. Florence: Olschki.

Borski, George; Kolkov, Ivan 2024: Was Copernicus an Astrologer? *Studia Historiae Scientiarum* 23, pp. 305–357. DOI: 10.4467/2543702XSHS.24.007.19580.

Broecke, Steven Vanden 2003: *The Limits of Influence: Pico. Louvain and the Crisis of Renaissance Astrology* ("Medieval and Early Modern Science" vol. 4). Leiden: E.J. Brill.

Brosseder, Claudia 2005: The Writing in the Wittenberg Sky: Astrology in Sixteenth-Century Germany. *Journal of the History of Ideas* 66 (4), pp. 557–576. Stable URL: https://www.jstor.org/stable/3654348.

Bühler, Curt Ferdinand 1958: *The University and the Press in Fifteenth-Century Bologna* ("Texts and Studies in the History of Mediaeval Education", No. 7). The Mediaeval Institute University of Notre Dame. Notre Dame, IN, USA: University of Notre Dame.

Burtt, Edwin Arthur 1925: *The Metaphysical Foundations of Modern Physical Science*. A Historical and Critical Essay. London: Kegan Paul, Trench, Trubner & Co., Ltd. New York: Harcourt, Brace & Company, Inc.

Campa, Riccardo 2016: La via platonica al Dio visibile di Copernico. *Orbis Idearum* 4(2), pp. 23–51. DOI: 10.26106/M4FE-R555. URL: http://www.orbisidearum.net/pdf/issue_6_article_37.pdf (accessed on 20 May 2024).

Campanus of Novara; Benjamin, Francis S.; Toomer, G.J. 1971: *Campanus of Novara and Medieval Planetary Theory Theorica planetarum*. Edited with an introduction, English translation, and commentary by Francis S. Benjamin, Jr., and G. J. Toomer. Madison, Wisconsin; London: University of Wisconsin Press.

Campion, Nicholas 2008–2009: *The Dawn of Astrology. A Cultural History of Western Astrology*. Vol. I: *The Ancient and Classical Worlds* (2008). Vol. II: *The Medieval and Modern Worlds* (2009). London: Continuum.

Cassirer, Ernst 1942a: Giovanni Pico della Mirandola. A Study in the History of Renaissance Ideas. Part 1. *Journal of the History of Ideas* 3(2), pp. 123–142. DOI: https://doi.org/10.2307/2707173. Stable URL: https://www.jstor.org/stable/2707173.

Cassirer, Ernst 1942b: Giovanni Pico della Mirandola. A Study in the History of Renaissance Ideas. Part 2. *Journal of the History of Ideas* 3(3), pp. 319–346. DOI: https://doi.org/10.2307/2707307. Stable URL: https://www.jstor.org/stable/2707307.

Chachaj, Marian 2023: *Mikołaj Kopernik. Czasy studenckie. Kraków, Bolonia, Rzym, Padwa i Ferrara (1491–1503). Miejsca – ludzie – książki*. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika.

Chrisogonus / Grisogono, Federicus 1507: *Speculum astronomicum*. Venice.

Chrisogonus / Grisogono, Federicus 1528: *De modo collegiandi, prognosticandi et curandi febres*. Venice. URL: https://books.google.pl/books?id=Tw9BAAAAcAAJ&printsec=frontcover&hl=pl&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false (accessed on 20 May 2024).

Christianson, John Robert 1968: Tycho Brahe's Cosmology from the Astrologia of 1591. *Isis* 59(3), pp. 312–318. Stable URL: https://www.jstor.org/stable/227885.

Christianson, John Robert 2000: *On Tycho's Island. On Tycho Brahe and His Assistants, 1570–1601*. Cambridge, United Kingdom: Cambridge University Press.

Cooper, Glen M. 2011: Galen and Astrology: A Mésalliance? *Early Science and Medicine* 16(2), pp. 120–146. Stable URL: https://www.jstor.org/stable/23047154.

Cooper, Glen M. 2013: Approaches to the Critical Days in Late Medieval and Renaissance Thinkers. *Early Science and Medicine* 18, pp. 536–565.

Cooper, Glen M. 2018: Astrology. The Science of Signs in the Heavens. [In:] P. T. Keyser, J. Scarborough (eds.), *The Oxford Handbook to Science and Medicine in the Classical World*. Oxford: Oxford University Press, pp. 381–407.

Copernicus, Nicolaus 1978: *On the Revolutions of the Heavenly Spheres*. Edited by Jerzy Dobrzycki Translation and Commentary by Edward Rosen. [In:] *Complete Works*, Vol. 2, Wroclaw: Polska Akademia Nauk. Published in Great Britain by The Macmillan Press Ltd.

Copernicus, Nicolaus 2015: *De revolutionibus orbium celestium. Des révolutions des orbes célestes.* Édition critique, traduction, introduction et notes par Michyel-Pierre Lerner, Alain-Philippe Segonds et Jean-Pierre Verdet avec collbaration de Concetta Luna, Isabelle Pantin, Denis Svpie et Michel Toulmonde. Vol. III. *Notes, Appendice, Dossierr iconographique, Index* général. Paris: Les Belles Lettres.

Copernicus, Nicolaus 2019: *Nicolaus Copernicus Gesamtausgabe*. Band IV, *Opera Minora. Die kleinen mathematisch-naturwissenschaftlichen Schriften*. Editionen, Kommentare und deutsche Übersetzungen / Menso Folkerts, Stefan Kirschner, Andreas Kühne.

Cornell, Howard Leslie 1933/(3rd rev. ed.) 1992: *Encyclopaedia of Medical Astrology*. York Beach, Maine: Samuel Weiser, INC.

Couderc, Paul 1951(VI wyd. 1978)/2005: *L'astrologie*. „*Que sais-je?: le point des connaissances actuelles*" vol. 508. Paris: Presses Universitaires de France; VI wyd. 1978. URL: https://gallica.bnf.fr/ark:/12148/bpt6k3354262q; wydanie internetowe 2005: URL: https://web.archive.org/web/20080205100013/http://pagesperso-orange.fr/oncle.dom/paranormal/astrologie/couderc/couderc.htm (accessed on 20 May 2024).

Crombie, Alistar C. 1952: *Augustine to Galileo*. Vol. I–II. London: William Heinemann Ltd.

Crombie, Alistar C. 1959 / 1960: *Medieval and early modern science*. Vol. 1–2; pol. tłum. 1960: *Nauka średniowieczna i początki nauki nowożytnej*. T. 1–2. Przełożył Stanisław Łypacewicz. Warszawa: Instytut Wydawniczy PAX.

Crombie, Alistar C. 1994: *The Styles of Scientific Thinking in the European Tradition*. Vol. I–III. London: Duckworth.

Curtze, Maximilian 1875: *Reliquiae Copernicanae:* nach den Originalen in der Universitäts-Bibliothek zu Upsala. Leipzig: B.G. Teubner. Stable URL: https://kpbc.umk.pl/Content/39114/download/.

Czartoryski, Pawel 1978: The Library of Copernicus. [In:] *Science and History. Studies in Honor of Edward Rosen* ("Studia Copernicana", vol. 16). Wroclaw: Ossolineum, pp. 355–396. Stable URL: https://kpbc.umk.pl/dlibra/publication/31622/edition/40362/content.

Di Bono, Mario 1995: Copernicus, Amico, Fracastoro and Tusi's Device: Observations on the Use and Transmission of a Model. *Journal for the History of Astronomy* 26, pp. 133–154.

Dobrzycki, Jerzy 1953: Kształtowanie się założeń systemu kopernikowskiego. *Przegląd Zachodni* 3, pp. 571–587.

Dobrzycki, Jerzy 1965: Teoria precesji w średniowiecznej astronomii. *Studia i Materiały z Dziejów Nauki Polskiej* ser. C, z. 11, pp. 3–47.

Dobrzycki, Jerzy 1971: *Astronomia przedkopernikowska*. ("Biblioteczka Kopernikańska", no. 7). Toruń: Towarzystwo Naukowe Toruńskie. Stable URL: https://kpbc.umk.pl/Content/44784/PDF/Copernicana_005_07.pdf.

Doktór, Tadeusz 1987: *Spotkania z astrologią*. Warszawa: Iskry.

Dooley, Brendan (ed.) 2014a: *A Companion to Astrology in the Renaissance*. "Brill's Companions to the Christian Tradition", vol. 49. Leiden: Brill.

Dooley, Brendan 2014b: Astrology and Science. [In:] Dooley, Brendan (ed.) 2014a: *A Companion to Astrology in the Renaissance*. "Brill's Companions to the Christian Tradition" vol. 49. Leiden: Brill, pp. 233–266.

Drewnowski, Jerzy 1978: Mikołaj Kopernik w świetle swej korespondencji, „Studia Copernicana", vol. 18. Wrocław–Warszawa–Kraków: Ossolineum. URL: https://kpbc.umk.pl/dlibra/publication/31624/edition/40364/content.

Drewnowski, Jerzy 1979: Kopernik a zasada względności ruchu. *Człowiek i Światopogląd* 10(171), pp. 98–118.

Dreyer, John Louis Emil 1906 / 1953: *History of the Planetary systems from Thales to Kepler*. Cambridge; przedruk 1953: *A History of Astronomy from Thales to Kepler*. New York: Dover.

Duhem, Pierre 1909: Un précurseur français de Copernic: Nicole Oresme (1377). *Revue générale des sciences pures et appliquées* 20, pp. 866–873.

Duhem, Pierre 1913–1959: *Le système du monde. Histoire des doctrines cosmologiques de Platon à Copernic*. Vol. 1–10. Paris: Hermann.

Faracovi, Ornella 2014: The Return to Ptolemy. [In:] Dooley, Brendan (ed.) 2014a: A Companion to Astrology in the Renaissance. "Brill's Companions to the Christian Tradition" vol. 49. Leiden: Brill, pp. 87–98.

Feke, Jacqueline 2009: *Ptolemy in Philosophical Context: A Study of the Relationships between Physics, Mathematics, and Theology*. PhD diss., University of Toronto.

Feke, Jacqueline 2018: *Ptolemy's Philosophy: Mathematics as a Way of Life*. Princeton: Princeton University Press.

Feldhay, Rivka; Ragep, F. Jamil (eds.) 2017: *Before Copernicus: The Cultures and Contexts of Scientific Learning in the Fifteenth Century*. Montreal: McGill-Queen's Univ. Press.

Ficino, Marsilio (tłum.) 1468: Poimandres / *Mercvrii Trismegisti Liber de potestate et sapientia Dei*. URL: https://dn720003.ca.archive.org/0/items/bib_fict_4102599/bib_fict_4102599.pdf (accessed on 20 May 2024).

Ficino, Marsilio 1559: *Theologia Platonica De immortalitate animorum: duo de viginti libris*. Parisis: Apud Aegidum Gorgianum. URL: https://books.google.pl/books?hl=pl&id=jUiwRmjQIEYC (accessed on 20 May 2024).

Ficino, Marsilio 1489: *De vita libri tres*. URL: https://tile.loc.gov/storage-services/service/gdc/gdcwdl/wd/l_/11/61/4/wdl_11614/wdl_11614.pdf (accessed on 20 May 2024).

Ficino, Marsilio 1493/1994, 2017: *Liber de sole*. Firenze: Antonio di Bartolommeo Miscomini. URL: https://ia904702.us.archive.org/15/items/ita-bnc-in1-00000500-001/ita-bnc-in1-00000500-001_text.pdf (accessed on 20 May 2024). / English translation *The Book of the Sun (De Sole)*. Translated by Geoffrey Cornelius, Darby Costello, Graeme Tobyn, Angela Voss & Vernon Wells (London). *Sphinx: A Journal for Archetypal Psychology and the Arts* 6, pp. 124–148. URL: http://www.users.globalnet.co.uk/~alfar2/ficino.htm / (accessed on 20 May 2024) / Polish translation. *Traktat O Słońcu*. Przekład z łaciny Paulina Piotrowska. „Biblioteka Polskiego Towarzystwa Astrologicznego", vol. 9.

Ficino, Marsili 2016: *Rozprawa przeciw orzekaniu astrologów*. Tłum., wstęp i komentarz PaulinaPiotrowska. Kraków: Universitas.

Fischer, Gordon 2006: *Marriage and Divorce of Astronomy and Astrology, A History of Astral Prediction from Antiquity to Newton*. Lulu.com. ISBN: 978-1411683266.

Gaida, Margaret 2017: *Encounters with Alcabitius: Reading Arabic Astrology in Premodern Europe*. A Dissertation Submitted to the Graduate Faculty in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy. Norman, Oklahoma. University Of Oklahoma Graduate College. URL: https://shareok.org/bitstream/handle/11244/51876/2017_Margaret_Gaida_Dissertation.pdf?sequence=2 (accessed on 20 May 2024).

Galen 2011: *Critical Days from Greek into Arabic*: A Critical Edition, with Translation and Commentary by Glen M Cooper, and Historical Introduction of Ḥunayn ibn Isḥāq, Kitāb ʾayyām al-buḥrān (volume 1). URL: https://www.academia.edu/977697/Galen_Critical_Days_from_Greek_into_Arabic_A_Critical_Edition_with_Translation_and_Commentary_and_Historical_Introduction_of_Ḥunayn_ibn_Isḥāq_Kitāb_ʾayyām_al_buḥrān_volume_1_NOW_IN_PAPERBACK (accessed on 20 May 2024).

Garin, Eugenio 1937: *Giovanni Pico della Mirandola. Vita e dottrina*. Firenze: Le Monnier.

Garin, Eugenio 1967: *Italian Humanism. Philosophy and Civic Life* in the Renaissance. Translated by Peter Munz. New York: Harper and Row, Publishers.

Garin, Eugenio 1973a: Copernico e i filosofi italiani del Rinascimento. *Belfagor* 28(6), pp. 664–684. Stable URL: https://www.jstor.org/stable/26142917.

Garin, Eugenio 1973b: Schede. *Rivista Critica di Storia della Filosofia* 28(1), pp. 82–91. Stable URL: https://www.jstor.org/stable/44020116.

Garin, Eugenio 1975: La rivoluzione copernicana e il mito solare. [In:] Eugenio Garin, *Rinascite e rivoluzioni. Movimenti culturali dal XV al XVIII secolo.* Roma-Bari: Laterza, pp. 255–282.

Garin, Eugenio 1976a: *Lo zodiaco della vita. La polemica sull'astrologia dal Trecento al Cinquecento.* Roma-Bari: Laterza & Figli.

Garin, Eugenio 1976b: Schede: I. Noterelle Copernicane (pp. 459–462); II. Divigazioni ermetiche (pp. 462–466); III. A propositio di Tomaso Cornelio (pp. 467–470). Rivista Critica di Storia della Filosofia 31(4), pp. 459–470. URL: https://www.jstor.org/stable/44021819.

Garin, Eugenio 1988: Il filosofi e il magi. [In:] Eugenio Garin (ed.), L' uomo del Rinascimento. Roma-Bari: Laterza & Figli Spa, pp. 169–202.

Gersh, Stephen 2021: Berthold of Moosburg, Nicholas of Cusa, and Marsilio Ficino as Historians of Philosophy. [In:] Stephen Gersh, The Renewal of Medieval Metaphysics, pp. 453–502. DOI: 10.1163/9789004471023_016. URL: https://brill.com/downloadpdf/display/book/edcoll/9789004471023/BP000021.pdf.

Gingerich, Owen (ed.) (1973b, wyd.) 1975b: *The Nature of Scientific Discovery. A Symposium Commemorating the 500th Aniversary of the Birth of Nicolaus Copernicus*. City of Washington: Smithsonian Institution Press.

Gingerich, Owen 1981: Kepler. [In:] *The Dictionary of Scientific Biography*, vol. 7. New York: Charles Scribner's Sons Macmillan Library Reference USA. Simon & Schuster Macmillan; London, Mexico City, New Delhi, Singapore, Sydney, Toronto: Simon & Schuster and Prentice Hall International, pp. 289–312.

Gingerich, Owen 2004a/2004b: *The Book Nobody Read. Chasing the Revolutions of Nicolaus Copernicus*. Walker Publishing Company Inc., Polish translation. 2004b: *Książka, której nikt nie przeczytał*. Przekład Jarosław Włodarczyk. Warszawa: Wydawnictwo Amber.

Goddu, André 2004: Copernicus's Annotations: Revisions of Czartoryski's «Copernicana». *Scriptorium* 58(2), pp. 202–226. URL: https://www.persee.fr/doc/scrip_0036-9772_2004_num_58_2_3878 (accessed on 20 May 2024).

Goddu, André 2010: *Copernicus and the Aristotelian Tradition: Education, Reading, and Philosophy in Copernicus's Path to Heliocentrism*. Brill.

Goddu, André 2013: A Response to Peter Barker and Matjaž Vesel, *Goddu's Copernicus*. *Aestimatio* 10, pp. 248-276. URL: https://jps.library.utoronto.ca/index.php/aestimatio/article/view/26040/19177 (accessed on 20 May 2024).

Goddu, André 2018: Birkenmajer's Copernicus: Historical Context, Original Insights, and Contributions to Current Debates. *Science in Context* 31(2), pp. 189–222. DOI: 10.1017/S0269889718000169.

Goldbeck, Ernst 1919: Weltbild und Physik. [In:] *Vom Altertum zur Gegenwart: Die Kulturzusammenhänge in den Hauptepochen und aufden Hauptgebieten. Skizzen*. Leipzig and Berlin: B.G. Teubner, pp. 220–234. URL: https://ia600301.us.archive.org/1/items/vomaltertumzurge00boll_0/vomaltertumzurge00boll_0.pdf (accessed on 20 May 2024).

Goldstein, Bernard R. 1969: Some Medieval Reports of Venus and Mercury Transits. *Centaurus* 14(1), pp. 49–59.

Goldstein, Bernard 2002: Copernicus and the Origin of his Heliocentric System. *Journal for the History of Astronomy* 33, pp. 219–235.

Granada, Miguel Angel; Tessicini, Dario 2005: Copernicus and Fracastoro: The Dedicatory Letters to Pope Paul III, the History of Astronomy and the Quest for Patronage. *Studies in History and Philosophy of Science* 36(3), pp. 431–476.

Grant, Edward 1962a: Late Medieval Thought, Copernicus, and the Scientific Revolution. *Journal of the History of Ideas* 23(2), pp. 197–220. DOI: https://doi.org/10.2307/2708155.

Grant, Edward 1962b: Hypotheses in Late Medieval and Early Modern Science. *Deadalus* 91, pp. 599–612. Stable URL: https://www.jstor.org/stable/20026730.

Grant, Edward 1994: *Planets, stars, and Orbs. The Medieval Cosmos, 1200–1687*. Cambridge: Cambridge University Press.

Grant, Edward; Nelson, Benjamin 1962: Hypotheses in Late Medieval and Early Modern Science. *Deadalus* 91, pp. 599–618. URL: https://www.jstor.org/stable/20026730.

Green, Jonathan 2010: The first Copernican astrologer: Andreas Aurifaber's Practica for 1541. *Journal for the History of Astronomy* 41, pp. 157–165.

Greenbaum, Dorian Giesler 2015: Astronomy, Astrology, and Medicine. [In:] Clive L.N. Ruggles (eds), *Handbook of Archaeoastronomy and Ethnoastronomy*. New York, NY: Springer, pp. 117–132. DOI: 10.1007/978-1-4614-6141-8_19.

Hackett, Jeremiah 2013: Albert the Great and the *Speculum astronomiae*: The State of the Research at the Beginning of the 21st Century. [In:] *A Companion to Albert the Great: Theology, Philosophy, and the Sciences*, ed. Irven M. Resnick, Leiden, pp. 437–449.

Hand, Robert 1994: Introduction to Ptolemy's *Tetrabiblos*. [In:] Claudius Ptolemy 1994: *Tetrabiblos*, Book I. Translated by Robert Schmidt. Edited by Robert Hand. Project Hindsight Greek Track, Volume V. Berkeley Springs, WV: The Golden Hind Press, pp. i–vi.

Heath, Thomas Little 1913: *Aristarchus of Samos, the Ancient Copernicus*. Oxford: Clarendon Press.

Heidari, Gholamhossein Moghaddam 2022: Medical Astrology in Hippocrates and Galen's Medical Works. *Iranian Journal of Medical Ethics and History of Medicine* 15(8). DOI: https://doi.org/10.18502/ijme.v15i8.11814.

Heilbron, John L. 2012: Robert Westman on Galileo and Related Matters. *Perspectives on Science* 20, pp. 379–388. DOI: 10.1162/posc_c_00106.

Hendrix, Scott Edward 2007: God's Deaf and Dumb Instruments: Albert the Great's *Speculum astronomiae* and Four Centuries of Readers. PhD diss. University

of Tennessee. URL: https://trace.tennessee.edu/utk_graddiss/186 (accessed on 20 May 2024).

Hendrix, Scott E. 2010: *How Albert the Great's "Speculum astronomiae" Was Interpreted and Used by Four Centuries of Readers*. Lewiston.

Hendrix, Scott E. 2018: Albert the Great, the *Speculum astronomiae*, and Astrology. *Studies in Medieval and Renaissance History*, 3rd Series, vol. 15, pp. 155–195. DOI: 10.13140/RG.2.2.15991.85927.

Hendrix, Scott E. 2020: Albertus Magnus and Rational Astrology. *Religions* 11(10), Art. No. 481. DOI: 10.3390/rel11100481.

Hendrix, Scott E. 2023: The Power of a Name: *Albert the Great, the Speculum astronomiae, and Legitimization of Astrology and Astrological Magic in the Twentieth and Twenty-First Centuries*. [In:] William Burns (ed.), *Astrology and Western Society from the First World War to Covid-19*. Palgrave, pp.73–99. DOI:10.1007/978-3-031-40486-3_3.

Heninger, S. K., Jr (1963, wyd.) 1965: The Triumph of Heliocentrism. [In:] Le soleil à la renaissance. Sciences et mythes. „Travaux de l'Institut pour l'Étude de la Renaissance et de l'Humanisme", II, 1965 (Colloque International tenu en avril 1963 sous les auspices de la Fédération Internationale des Instituts et Sociétés pour l'Étude de la Renaissance et du Ministère de l' Éducation Nationale et de la Culture de Belgique; Bruxelles: Presses Universitaires De Bruxelles, Paris: Presses Universitaires de France) pp. 34–53.

Horský, Zdeněk 1966: La cosmologie de Marsile Ficin. *Acta historiae rerum naturalium necnon technicarum*. Special issue, no. 2, Prague, pp. 57–68. URL: https://www.academia.edu/3093616/La_cosmologie_de_Marcile_Ficin_in_Acta_historiae_rerum_naturalium_necnon_technicarum_Special_Issue_2_Prague_1966_pp_57_68 (accessed on 20 May 2024).

Heninger, S. K., Jr 1974: *Touches of Sweet Harmony. Pythagorean Cosmology and Renaissance Poetics*. San Marino, Calif.: Huntington Library.

Hübner, Wolfgang 1989: Die Begriffe "Astrologie" und "Astronomie" in der Antike: Wortgeschichte und Wissenschaftssystematik mit einer Hypothese zum Terminus "Quadrivium." *Abhandlungen der Akademie der Wissenschaften und der Literatur Mainz*. Geistes und Sozialwissenschaftliche Klasse 1989/7. Wiesbaden, Germany: Franz Steiner.

Hübner, Wolfgang 2012: Astrology, Greece and Rome. [In:] *The Encyclopedia of Ancient History. Willey*. Edited by Roger S. Bagnall, Kai Brodersen, Craige B. Champion, Andrew Erskine, and Sabine R. Huebner; pp. 866–873. DOI: https://doi.org/10.1002/9781444338386.wbeah21050.

Hugonnard-Roche, Henri 1997 / 2000: Wpływ astronomii arabskiej na średniowieczny Zachód. [In:] Rashed, Morelon (ed.) 1997, *Influence de l'astronomie*

arabe en Occident medieval. T. 1, pp. 309–328. Paris: Editions du Seuil.; pol. tłum. Wpływ astronomii arabskiej na średniowieczny Zachód. [In:] Rashed, Morelon (red.) 2000, t. 1, pp. 305–325.

James, Jamie 1993/1996: *The Music of the Spheres. Music, Science, and the Natural Order of the Universe*. New York, NY USA: Grove Press; pol. przekład: *Muzyka sfer. O muzyce, nauce i naturalnym porządku wszechświata*. Przełożył Mieczysław Godyń. Kraków: Wydawnictwo „Znak".

Jan z Głogowa 1514: *Tractatus preclarissimusn iudiciis astrorum de mutatione aëris*. Cracoviae: Florian Unglern et Wolfgang Lern. URL: https://www.wbc.poznan.pl/Content/258315/download/ (accessed on 20 May 2024).

Jeck, Uno Rfänhold 1999: Die hermetische Theorie des Mikrokosmos in der Metaphysik Alberts des Grossen und im Prokloskommentar des Berthold von Moosburg. *Patristica et Mediaevalia* 20, pp. 3–18.

Jońca, Justyna 2013: Wróżenie z fusów przygotowało grunt pod nowoczesną meteorologię. „Projekt pulsar". URL: https://www.projektpulsar.pl/czlowiek/2197960,1,wrozenie-z-fusow-przygotowalo-grunt-pod-nowoczesna-meteorologie.read (accessed on 20 May 2024).

Juste, David 2024: Copernicus's Astrological Expertise, 22.05.2024 [draft version; the final version will be published in the Proceedings of the World Copernican Congress. 550th Anniversary of the Birth of Nicolaus Copernicus, 1473–2023. History of Astronomy Section, Toruń, 12–15 September 2023].

Kamiński, Stanisław 1973: Filozoficzne uwarunkowania rewolucyjnej idei Mikołaja Kopernika. [In:] Kurdziałek, Rebeta, Swieżawski (ed.) 1973, pp. 123–141, 156–158.

Karas, Marcin 2018: *Nowy obraz świata. Poglądy filozoficzne Mikołaja Kopernika*. Kraków: Wydawnictwo Uniwersytetu Jagiellońskiego.

Karliński, Michał Franciszek Ignacy 1873: *Żywot Kopernika i jego naukowe zasługi: rzecz czytana na publicznem posiedzeniu c. k. Uniwersytetu Jagiellońskiego dnia 19 lutego 1873*. URL: https://jbc.bj.uj.edu.pl/dlibra/publication/291246/edition/278647/content?format_id=2 (accessed on 20 May 2024).

Kennedy, Edward S. 1966: Late Medieval Planetary Theory. *Isis* 57(3), pp. 365–378. Stable URL: https://www.jstor.org/stable/228366.

Kennedy, Edward S.; Roberts, Victor 1959: The Planetary Theory of Ibn al-Shatir. *Isis* 50(3), pp. 227–235. Stable URL: https://www.jstor.org/stable/227308.

King, David V.; Saliba, George (eds.) 1987: *From deferent to equant: A Volume of Studies in the History of Exact Science in History of science in the Ancient and Medieval Near East in Honor of E.S. Kennedy*. ("Annals of the New York Academy of Sciences" Vol. 500).

Kleinert, Andreas 2003: Eine handgreifliche Geschichtslüge. Wie Martin Luther zum Gegner des copernicanischen Weltsystems gemacht wurde. *Berichte zur Wissenschaftsgeschichte* 26(2), pp. 101–111. DOI: 10.1002/bewi.200390032. URL: https://www.researchgate.net/publication/230385923_Eine_handgreifliche_Geschichtsluge_Wie_Martin_Luther_zum_Gegner_des_copernicanischen_Weltsystems_gemacht_wurde.

Knoll, Paul 2016: *A Pearl of Powerful Learning: the University of Cracow in the Fifteenth Century*. "Education and Society in the Middle Ages and Renaissance Series" 1. Leiden, Boston: Brill.

Knox, Dilwyn 1999: Ficino, Copernicus and Bruno On The Motion of the Earth. *Bruniana & Campanelliana* 5(2), pp. 333–366. Stable URL: https://www.jstor.org/stable/24331708.

Knox, Dilwyn 2002: Ficino and Copernicus. [In:] *Marsilio Ficino. His Theology, his Philosophy, his Legacy*. Editors: Michael Allen and Valery Rees. Contributor: Martin Davies. "Brill's Studies in Intellectual History" vol. 108. Leiden, Boston, Köln: Brill, pp. 399–418. DOI: 10.1163/9789047400547_022.

Knox, Dilwyn 2007: Copernicus's Doctrine of Gravity and the Natural Circular Motion of the Elements. *Journal of the Warburg and Courtauld Institutes* 68(1), pp. 157–211. DOI: 10.1086/JWCI40026197. URL: https://www.researchgate.net/publication/32895550_Copernicus%27s_Doctrine_of_Gravity_and_the_Natural_Circular_Motion_of_the_Elements.

Koch-Westenholz, Ulla 1995: *Mesopotamian astrology: An introduction to Babylonian and Assyrian celestial divination*. "CNI Publications" 19. Copenhagen: The Carsten Niebuhr Institute of Near Eastern Studies Museum Tusculanum Press, University of Copenhagen. URL: https://www.academia.edu/441807/Mesopotamian_astrology_an_introduction_to_Babylonian_and_Assyrian_celestial_divination (accessed on 20 May 2024).

Kokowski, Michał 1996: Copernicus and the hypothetico-deductive method of correspondence thinking. An Introduction. *Theoria et Historia Scientiarum* 5, pp. 7–101. DOI: 10.12775/ths.1996.002.

Kokowski, Michał 1997: *Krytyka Kuhnowskiej interpretacji rewolucji kopernikowskiej w świetle hipotetyczno-dedukcyjnej metody myślenia korespondencyjnego*. Rozprawa doktorska. Promotor rozprawy ks. prof. dr hab. Michał Heller. Warszawa: IHN PAN.

Kokowski, Michał 2001: *Thomas S. Kuhn (1922–1996) a zagadnienie rewolucji kopernikowskiej*. „Studia Copernicana" 39. Warszawa: Wydawnictwa IHN PAN. Stable URL: http://kpbc.umk.pl/dlibra/doccontent?id=41760.

Kokowski, Michał 2004: *Copernicus's Originality: Towards Integration of Contemporary Copernican Studies*. Warsaw – Cracow: Instytut Historii Nauki PAN.

Kokowski, Michał 2005a/2007a: Poszukiwania grobu Kopernika. Refleksje advocati diaboli. Cz. 1. Rozważania w kontekście aktualnych poszukiwań archeologicznych (według stanu poszukiwań na dzień 15.09.2005, relacjonowanych w prasie i publikacjach internetowych), I wersja opublikowana 30 października 2005. URL: https://home.cyf-kr.edu.pl/~n1kokows/kokowski_grob_kopernika_1.pdf (accessed on 20 May 2024); wydanie papierowe 2007: Kwartalnik Historii Nauki i Techniki, R. 52, 2007, nr 1, pp. 121–131.

Kokowski, Michał 2005b/2007b: Poszukiwania grobu Kopernika. Refleksje advocati diaboli. Cz. 2. Rozważania w kontekście aktualnych badań (według stanu poszukiwań na luty 2006), I wersja opublikowana 22 grudnia 2005. URL: https://home.cyf-kr.edu.pl/~n1kokows/kokowski_grob_kopernika_2.pdf (accessed on 20 May 2024); wydanie papierowe: 2007b: *Kwartalnik Historii Nauki i Techniki* 52(1), pp. 131–151.

Kokowski, Michał 2009: *Różne oblicza Mikołaja Kopernika. Spotkania z historią interpretacji*. Warszawa: Instytut Historii Nauki PAN, Kraków: Polska Akademia Umiejętności.

Kokowski, Michał (ed.) 2012a: *Tajemnica grobu Mikołaja Kopernika. Dialog ekspertów* (Kraków 22–23 lutego 2010). Kraków: Polska Akademia Umiejętności; Centrum Kopernika Badań Interdyscyplinarnych [recenzowana monografia zbiorowa].

Kokowski, Michał 2012b: O wadliwości argumentacji za ostatecznym odkryciem szczątków Mikołaja Kopernika. Cz. 1. Wyniki i interpretacja badań historycznych, archeologicznych, antropologicznych oraz antroposkopijnych. [In:] Kokowski (ed.) 2012, pp. 177–215. URL: https://home.cyf-kr.edu.pl/~n1kokows/kokowski_o_wadliwosci_1.pdf (accessed on 20 May 2024).

Kokowski, Michał 2012c: O wadliwości argumentacji za ostatecznym odkryciem szczątków Mikołaja Kopernika. Cz. 2. Wyniki i interpretacja badań genealogicznych, historycznych oraz genetycznych, . [In:] Kokowski (ed.) 2012, s. 217––314. URL: https://home.cyf-kr.edu.pl/~n1kokows/kokowski_o_wadliwosci_2.pdf (accessed on 20 May 2024).

Kokowski, Michał 2012d: Copernicus, Arabic Science, and the Scientific (R)evolution. [In:] *Asia, Europe, and the Emergence of Modern Science. Knowledge Crossing Boundaries*. Editor: Arun Bala, pp. 55–72. DOI:10.1057/9781137031730_4. URL: https://www.researchgate.net/publication/304793020_Copernicus_Arabic_Science_and_the_Scientific_Revolution (accessed on 20 May 2024).

Kokowski, Michał 2014: Odkrycie grobu Mikołaja Kopernika: fakt medialny czy naukowy? *Komunikaty Mazursko-Warmińskie* 4(286), pp. 567–600. URL: https://home.cyf-kr.edu.pl/~n1kokows/Kokowski-KMW-4-2014.pdf (accessed on 20 May 2024).

Kokowski, Michał 2020: Czy odkryto grób Mikołaja Kopernika? *Wiadomości Matematyczne* 56(2), pp. 311–317. URL: https://home.cyf-kr.edu.pl/~n1kokows/M.Kokowski-WM-2020.pdf (accessed on 20 May 2024).

Kokowski, Michał 2024: Perspektywy badań kopernikańskich a odmienne tradycje metodologiczne w 550. rocznicę urodzin Mikołaja Kopernika. *Klio* (złożone do druku).

Kokowski, Michał 2023: Dlaczego nadal interesuje nas Mikołaj Kopernik (1473–1543)? 550-lecie urodzin Mikołaja Kopernika i 150-lecie pierwszego publicznego posiedzenia Akademii Umiejętności w Krakowie. *Studia Historiae Scientiarum* 22, pp. 71–147. DOI: 10.4467/2543702XSHS.23.003.17694.

Konarska-Zimnicka, Sylwia 2018: *„Wenus panią roku, Mars towarzyszem…" Astrologia w Krakowie XV i początku XVI wieku*. Kielce: Wydawnictwo Uniwersytetu Jana Kochanowskiego.

Konarska-Zimnicka, Sylwia 2019: „Ad honorem celsitudinemque Dei omnipotentis" – sposoby rehabilitowania astrologii w twórczości mistrzów krakowskich epoki przedkopernikańskiej. *Saeculum Christianum* 26(1), pp. 33–47. DOI: 10.21697/sc.2019.26.1.4.

Konarska-Zimnicka, Sylwia 2021a: Kiedy najlepiej puszczać krew, a kiedy stawiać bańki? *Culture.pl*. 13 X 2021. URL: https://culture.pl/pl/artykul/kiedy-najlepiej-puszczac-krew-a-kiedy-stawiac-banki (accessed on 20 May 2024).

Konarska-Zimnicka, Sylwia 2021b: Krakowska katedra astrologii – ewenement na skalę europejską. *Culture.pl*. 13 X 2021. URL: https://culture.pl/pl/artykul/krakowska-katedra-astrologii-ewenement-na-skale-europejska.

Konarska-Zimnicka, Sylwia 2024: Was Copernicus an Astrologer? From the Perspective of a Historian of Astrology. *Studia Historiae Scientiarum* 23, pp. 359––394. DOI: 10.4467/2543702XSHS.24.008.19581.

Kopernik, Mikołaj / Copernicus, Nicolaus; Rheticus / Retyk, Joachim 1854: *Nicolai Copernici Toruniensis De Revolutionibus Orbium Coelestium libri sex. Accedit G. Joachimi Rhetici Narratio prima, cum Copernicis nonnullis scriptis minoribus, nunc primum collectis, eiusque vita. O obrotach Ciał Niebieskich ksiąg sześć. Nadto Opowiadanie J. Joachima Retyka, różne pisma mniejsze M. Kopernika zebrane i życiorys jego*. Tłumacz i wydawca: Jan Baranowski. Warszawa: Druk. St. Strąbski. Stable URL: https://kpbc.umk.pl/Content/42894/download?format_id=2.

Kopernik, Mikołaj 1953: *O obrotach sfer niebieskich*. Księga pierwsza. Ustalenie tekstu łacińskiego R. Gansiniec. Przekład M. Brożek. Komentarz A. Birkenmajer. Redaktor A. Birkenmajer. Warszawa: Państwowe Wydawnictwo Naukowe.

Kopernik, Mikołaj 1987: *O obrotach. Księga pierwsza*. Tłum. Brożek, Mieczysław. Redakcja Dobrzycki, Jerzy. Wrocław: Zakład Narodowy im. Ossolińskich Wydawnictwo. Stable URL: https://kpbc.umk.pl/dlibra/publication/24163/edition/48790/content?format_id=2.

Korpikiewicz, Honorata 1985: Mikołaj Kopernik a astrologia. *Problemy Astrologii*, pp. 23–30.

Kowalewska, Danuta 2009: *Magia i astrologia w literaturze polskiego oświecenia*. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika.

Koyré, Alexandre 1943: Nicolaus Copernicus. *Bulletin of the Polish Institute of Arts and Sciences in America* 1(4), pp. 705–730. Stable URL: https://www.jstor.org/stable/24724351.

Koyré, Alexandre 1961 / 1973a: *La révolution astronomique, Copernic–Kepler–Boreli*. Paris: Hermann. English translation 1973a: *The astronomical revolution: Copernic–Kepler–Boreli*. Paris: Hermann.

Kuczyńska, Alicja 1992: U źródeł hermeneutyki: wyjaśnianie według Marsilia Ficina. *Sztuka i Filozofia* 5, pp. 138–154. Stable URL: https://bazhum.muzhp.pl/media/files/Sztuka_i_Filozofia/Sztuka_i_Filozofia-r1992-t5/Sztuka_i_Filozofia-r1992-t5-s138-154/Sztuka_i_Filozofia-r1992-t5-s138-154.pdf.

Kuczyński, Stefan Krzysztof 1970: Pieczęć Mikołaja Kopernika. *Mówią Wieki* 13(10), pp. 12–13.

Kuczyński, Stefan Krzysztof 1971: Mikołaja Kopernika sygnet z Apollem. *Biuletyn Numizmatyczny* 4(62), pp. 69–71.

Kuhn, Thomas, S. 1957 (VII wyd. popr. 1985) / 1966, 1981: *The Copernican Revolution: Planetary Astronomy in the Development of Western Thought*. Cambridge, Mass: Harvard University Press; VII wyd. popr. 1985 (New York: MJF Books); Polish translation 1966: *Przewrót Kopernikański. Astronomia planetarna w dziejach myśli*. Z języka angielskiego tłumaczył S. Amsterdamski. Warszawa: Państwowe Wydawnictwo Naukowe.

Kuhn, Thomas, S. 1962/1968, 1970: *The Structure of Scientific Revolutions*. Chicago: The University of Chicago Press); Polish translation 1968: *Struktura rewolucji naukowych*. Tłumaczenie H. Ostromęcka. Tłumaczenie przejrzał, zredagował i posłowiem zaopatrzył S. Amsterdamski. Warszawa: Państwowe Wydawnictwo Naukowe; II wyd. rozszerzone 1970: Chicago: The University of Chicago Press.

Kurdziałek, Marian 1973: Średniowieczne stanowiska wobec tezy: ziemia jest jedną z planet. Kurdziałek, Rebeta, Swieżawski (ed.) 1973, pp. 57–100.

Kurdziałek, Marian; Rebeta, Jerzy; Swieżawski, Stefan (ed.) 1973: *Mikołaj Kopernik. Studia i Materiały Sesji Kopernikanskiej w KUL 18–19 II 1972 r*. Lublin: Towarzystwo Naukowe Katolickiego Uniwersytetu Lubelskiego.

Lanuza-Navarro, Tayra M.C.; Ávalos-Flores, Ana Cecilia 2008: Astrological prophecies and the Inquisition in the Iberian World. [In:] *The Global and the Local: The History of Science and the Cultural Integration of Europe. Proceedings of the 2nd ICESHS* (Cracow, Poland, September 6–9, 2006). Ed. by M. Ko-

kowski, pp. 681–688. URL: https://home.cyf-kr.edu.pl/~n1kokows/2nd_ICESHS/2ICESHS_Proceedings/Chapter_24/R-16_Lanuza_Avalos.pdf (accessed on 20 May 2024).

Lehman, J. Lee 2003: Medical Astrology. [In:] Jim Lewis, *The Astrology Book: The Encyclopedia of Heavenly Influences*. Detroit: Visible Ink Press, pp. 434–439.

Lemay, Richard 1978: The late medieval astrological school at Cracow and the Copernican system. [In:] E. Hilfstein, P. Czartoryski, F. Grande (eds.), *Science and History. Studies in Honor of Edward Rosen* (Wrocław: Ossolineum). *Studia Copernicana* 16, pp. 337–354. Stable URL: https://kpbc.umk.pl/dlibra/publication/31622/edition/40362/content.

Lerner, Michel-Pierre 2012: Planetary Order in the Long Sixteenth Century. *Journal for the History of Astronomy* 43, pp. 233–238.

Lerner, Michel-Pierre; Granada, Miguel 2012: Essay Review: Planetary Order in the Long Sixteenth Century, the Copernican Question: Prognostication, Skepticism, and Celestial Order. *Journal for the History of Astronomy* 43(2), pp. 233–243. DOI: 10.1177/002182861204300210.

Levere, Trevor H.; Shea, William R. (eds.) 1990: *Nature, experiment, and the sciences*. Dordrecht: Reidel.

Lewis, Jim 2003: *The Astrology Book: The Encyclopedia of Heavenly Influences*. Detroit: Visible Ink Press. URL: https://archive.org/details/astrologyencyclo-00lewi_0 (accessed on 20 May 2024).

Lindberg, David C.; Numbers, Ronald L. (eds.) (1981, wyd.) 1986: *God and Nature. Historical Essays on the Encounter between Christianity and Science*. (Rev. Papers from an international conference held at the University of Wisconsin – Madison, Apr. 23–25 1981). Berkeley–Los Angeles–London: University of California Press.

Lindberg, David C.; Westman, Robert S. (red.) 1990: *Reappraisals of the Scientific Revolution*. USA: Cambridge University Press (reprint 1991, 1994).

Long, A. A. 1982: Astrology: Arguments pro and contra. [In:] Jonathan Barnes, Jacques Brunschwig, Myles Burnyeat, Malcolm Schofield (eds.), *Science and Speculation: Studies in Hellenistic theory and practice* (Cambridge, London, New York, New Rochelle, Melbourne, Sydney: Cambridge University Press; Paris: Editions de la Maison des Sciences de Homme), pp. 165–192.

Losev, A. 2012: 'Astronomy' or 'astrology': a brief history of an apparent confusion. *Journal of Astronomical History and Heritage* 15(1), pp. 42–46. arXiv:1006.5209. Stable URL: https://arxiv.org/pdf/1006.5209.

Lubac, Henri de 1974: *Pic de la Mirandole. Études et discussions*. Paris: Aubier Montaigne.

Luther, Martin 1568/1887, 1916: *Colloquia oder Tischreden*. Ed. Johann Goldschmidt Aurifaber / 1887: *Dr. Martin Luthers Saemmtliche Schriften*. St. Louis:

Concordia Publishing House, ed. Johannes Georg Walch. URL: https://books.google.pl/books?id=YUxJAAAAcAAJ&printsec=frontcover / 1912: [In:] M. *Luthers Werke, Kritische Gesamtausgabe. Tischreden.* Weimar: Herman Böhlaus Nachfolger, t. I; 1916: Ed.: Anton Lauterbach. [In:] *M. Luthers Werke, Kritische Gesamtausgabe. Tischreden*. Weimar: Herman Böhlaus Nachfolger, vol. IV.

Luther, Martin 2017: Tischreden D. M. Luthers von der Astronomia und Sternkunst. *Martin Luthers Tischreden.* Berlin: Deutsche Bibliothek, Verlagsgesellschaft m. b. H. Herausgegeben von A. Frederking, rozdz. L. URL: https://www.projekt-gutenberg.org/luther/tischred/chap051.html.

Małłek, Janusz 2001: Mikołaj Kopernik jako lekarz i prawnik. *Rocznik Muzeum w Toruniu* 10, pp. 24–29. Stable URL: https://kpbc.umk.pl/Content/46263/PDF/Copernicana_012_12.pdf.

Markowski, Mieczysław 1968: Stanowisko Jana Burydana, Mikołaja z Kuzy i Mikołaja Kopernika wobec niektórych tez starożytnych teorii astronomicznych. *Materiały i Studia Zakładu Historii Filozofii Starożytnej i Średniowiecznej* 9, pp. 76–84.

Markowski, Mieczysław 1971: *Burydanizm w Polsce w okresie przedkopernikańskim*. "Studia Copernicana", vol. 2.

Markowski, Mieczysław 1972: Kosmologiczne poglądy Mikołaja z Oresme i Mikołaja Kopernika. *Analecta Cracoviensia* 4, pp. 9–31.

Markowski, Mieczysław 1973: Doktrynalne tło przewrotu kopernikańskiego. [In:] Kurdziałek, Rebeta, Swieżawski (ed.) 1973, pp. 13–31.

Markowski, Mieczysław 1975: Kształtowanie się krakowskiej szkoły astronomicznej; Powstanie pełnej szkoły astronomicznej w Krakowie; Szczyt rozkwitu i międzynarodowego promieniowania krakowskiej szkoły astronomicznej. [In:] Rybka (red.) 1975, vol. 1, pp. 57–126.

Markowski, Mieczysław 1993: *Uniwersytet krakowski jako miejsce duchowych narodzin Mikołaja Kopernika*. Kraków: Polskie Towarzystwo Miłośników Astronomii.

Markowski, Mieczysław et al. 1973: *Krakowski krąg Mikołaja Kopernika.* („Copernicana Cracoviensia" III). Kraków: Uniwersytet Jagielloński; Państwowe Wydawnictwo Naukowe. „Zeszyty Naukowe Uniwersytetu Jagiellońskiego" 314. „Prace Historyczne" 42.

McFleppers, Johansson; Ghosh, Nilay 2021: Did simultaneous transits of Mercury and Venus actually last occur in 373,173 BC? URL: https://astronomy.stackexchange.com/questions/41125/did-simultaneous-transits-of-mercury-and-venus-actually-last-occur-in-373-173-bc.

Meeus, J.; Vitagliano, A. 2004: Simultaneous transits. *Journal of the British Astronomical Association* 114(3), pp. 132–135. URL: https://articles.adsabs.harvard.edu/pdf/2004JBAA..114..132M.

Mossakowski, Stanisław 1973/1974, 2008: The symbolic meaning of Copernicus' Seal. *Journal of the History of Ideas* 34, pp. 451–460; Polish translation: 1974: Symbolika pieczęci Mikołaja Kopernika. *Rocznik Historii Sztuki* 10, pp. 222–230; reprinted [In:] Mossakowski 1980, pp. 57–68; *Kwartalnik Historii Nauki i Techniki* 53(3–4), pp. 87–100. Stable URL: https://bazhum.muzhp.pl/media/files/Kwartalnik_Historii_Nauki_i_Techniki/Kwartalnik_Historii_Nauki_i_Techniki-r2008-t53-n3_4/Kwartalnik_Historii_Nauki_i_Techniki-r2008-t53-n3_4-s87-100/Kwartalnik_Historii_Nauki_i_Techniki-r2008-t53-n3_4-s87-100.pdf.

Muszyński, Grzegorz 2012: *Czworoksiąg* i jego polski przekład. [In:] Klaudiusz Ptolemeusz, *Czworoksiąg (Tetrabiblos)*. „Biblioteka Antyczna". Przełożył i przypisami opatrzył Grzegorz Muszyński. Wstępami opatrzyli Jarosław Włodarczyk i Grzegorz Muszyński. Wrocław: Wydawnictwo Uniwersytetu Wrocławskiego, pp. 39–56.

Nallino, Carlo Alfonso 1944: *Raccolta di scritti editi e inedita*, vol. 5 *Astrologia. Astronomia. Geografia*. Rome: Istituto per l'Oriente.

Neugebauer, Otto 1957 / 1962, 1969: *The Exact Sciences in Antiquity*. Providence, Rhode Island: Brown University Press, 2nd ed.; New York: Harper & Bros (1962, reprint of original 2nd ed.); New York: Dover Publications (1969, corrected 2nd ed.).

Neugebauer, Otto 1968: On the Planetary Theories of Copernicus. *Vistas in Astronomy* 10, pp. 89–103.

Neugebauer, Otto; Swerdlow, Noel M. 1984: *Mathematical astronomy in Copernicus's De revolutionibus* ("Studies in the History of Mathematics and Physical Sciences" 10). NY: Springer-Verlag Inc.).

North, John 1994: *The Fontana History of Astronomy and Cosmology*. London: Fontana Press An Imprint of Harper Collins Publishers.

Papritz, Johannes; Schmauch, Hans (red.) 1943: *Kopernikus-Forschungen*. Hrsg. v. Johannes Papritz u. Hans Schmauch. Leipzig.

Pedersen, Olaf 1993: Chapter Eighteen: Medieval Astronomy. *Early physics and astronomy: a historical introduction* (rev. ed.). Cambridge [England]: Cambridge University Press.

Peurbach, Georg, von; Regiomontanus 1496: *Epitome in Almagestum Ptolemaei*. Venice: Casspar Grossch, Stephanus Roemer. Stable URL: https://www.bibliotekacyfrowa.pl/dlibra/publication/153652/edition/144669?language=en (accessed on 20 May 2024).

Pfeffer, Michelle 2023: Reassessing the Marginalization of Astrology in the Early Modern World. *The Historical Journal* 66, pp. 1152–1176. DOI: 10.1017/S0018246X23000328. URL: https://www.cambridge.org/core/journals/

historical-journal/article/reassessing-the-marginalization-of-astrology-in-the-early-modern-world/873EA8DCA2DFA2D3FF5F86E7F4CBEB52 (accessed on 20 May 2024).

Philips, Laura 2023: Medical Astrology: Science, Art, and Influence in early-modern Europe. Curated by Laura Phillips, History of Art, Yale University. URL: https://onlineexhibits.library.yale.edu/s/medicalastrology/page/introduction (accessed on 20 May 2024).

Pico della Mirandola, Giovanni 1496 (2nd ed. 1498; 3rd ed. 1557): *Disputationes adversus* [Opera], edited by Giovanni Francesco della Mirandola. Bologna: Benedictus Hectoris. URL: https://ia801403.us.archive.org/0/items/A335045/A335045.pdf / 2nd ed.: Pico della Mirandola, Ioanni 1498: *Disputationes adversus astrologos*. [In:] Opera. P. II. Ed. Ioannes Franciscus Picus. Venetia (14 VIII 1498): Bernardino de Vitali, pp. 1r-119r (all 237). URL: https://portail.biblissima.fr/ark:/43093/edata13d39dba5d96f8935f1e620bf220a38de9a2c84e, https://www.dbc.wroc.pl/dlibra/publication/35103/edition/31797/content?ref=L3B1YmxpY2F0aW9uLzgxMTUvZWRpdGlvbi83NDUw (accessed on 20 May 2024)/ *Disputationes adversus astrologiam divinatricem*. [In:] *Opera omnia*. Ed. Johannes Reuchlin. Basel: Henricpetri, 1557, pp. 411–732. URL: https://www.e-rara.ch/cgj/content/zoom/2095182 (accessed on 20 May 2024).

Pico della Mirandola, Giovanni 1946–1952: *Disputationes adversus astrologiam divinatricem*. Ed./trans. Eugenio Garin. 2 vols. Firenze: Vallecchi.

Pietro d'Abano 1472: *Conciliator differentiarum philosophorum et praecipue medicorum*. Mantua: Lodovicho de Gonza.

Pines, Shlomo 1964: The Semantic Distinction between the Terms Astronomy and Astrology according to al-Biruni. *Isis* 55(3), pp. 343–349. Stable URL: https://www.jstor.org/stable/228577.

Pingree, David 1968, 1973: Astrology. [In:] *Dictionary of the History of Ideas. Studies of Selected Pivotal Ideas,* vol. I, New York: Charles Scribner's Sons, pp. 118–126. URL: http://archive.org/details/dictionaryofhist01wien (accessed on 20 May 2024).

Pingree, David 1997: *From astral omens to astrology: from Babylon to Bīnāker*. Roma: Istituto Italiano per L'Africa e Loriente. "Serie orientale Roma" 68.

Piotrowski, Piotr 2012: Kopernik i astrologia. *Astroportal.pl. Wszystko o astrologii*. URL: http://www.astroportal.pl/index.php?id=105 (accessed on 20 May 2024).

Piotrowski, Piotr 2023: Co Mikołaj Kopernik wyczytał w swoim horoskopie? *Nieznany Świat* 8, pp. 62–63.

Poggi, Isotta 2003: History of Western Astrology. [In:] Jim Lewis, *The Astrology Book: The Encyclopedia of Heavenly Influences*. Detroit: Visible Ink Press, pp. 313–321.

Polkowski, Ignacy, ks. 1873: *Żywot Mikołaja Kopernika*. Gniezno: Drukiem J.B. Langiego (two editions). Stable URL: https://bc.radom.pl/Content/39109/Żywot%20M.Kopernika%2058488.pdf.

Polkowski, Ignacy, ks. 1873 (red.) 1873–1875: *Kopernikijana czyli materiały do pism i życia Mikołaja Kopernika*. Vol. I–III. Gniezno: Drukiem J. Langiego.

Ptolemy, Claudius 1940: *Tetrabiblos*. Loeb Classical Library. Part of the text is available online. URL: https://penelope.uchicago.edu/Thayer/E/Roman/Texts/Ptolemy/Tetrabiblos/home.html.

Ptolemy, Claudius 1994: *Tetrabiblos*, Book I. Translated by Robert Schmidt. Edited by Robert Hand. Project Hindsight Greek Track, Volume V. Berkeley Springs, WV: The Golden Hind Press.

Rabin, Sheila J. 1997: Kepler's Attitude Toward Pico and the Anti-Astrology Polemic. *Renaissance Quarterly* 50(3), pp. 750–770. DOI: https://doi.org/10.2307/3039261. URL: https://www.jstor.org/stable/3039261.

Ragep, F. Jamil 1993: General Introduction. [In:] F.J. Ragep (ed.), Naṣīr al-dīn al-Ṭūsī's *Memoir on Astronomy (al-Tadhkhira fi 'ilm al-hay'a)*, vol. 1, pp. 1–88.

Ragep, F. Jamil 2001a: Freeing Astronomy from Philosophy. An Aspect of Islamic Influence on Science. *Osiris* 16, pp. 49–64. Stable URL: https://www.jstor.org/stable/301979.

Ragep, F. Jamil 2001b: Tūsī and Copernicus: The Earth's Motion in Context. *Science in Context* 14(1–2), pp. 145–163.

Ragep, F. Jamil 2017: From Tūn to Toruń: The Twists and Turns of the Ṭūsī-Couple. [In:] Rivka Feldhay, F. Jamil Ragep (eds.) 2017: *Before Copernicus: The Cultures and Contexts of Scientific Learning in the Fifteenth Century*. Montreal: McGill-Queen's University Press, pp. 161–197.

Rashed, Roshdi; Morelon, Régis (eds.) 1997/ (red.) 2000: *Histoire des sciences arabes*. Vol. 1–3; Polish translation: *Historia nauki arabskiej*. T. 1–3. Warszawa: Wydawnictwo Akademickie.

Ravetz, Jerome R. 1965a / 1965b: *Astronomy and Cosmology in the Achievements of Nicolaus Copernicus*. Wrocław-Warszawa-Kraków: Ossolineum; Polish translation: 1965b: *Astronomia i kosmologia w dziele Kopernika*. Tłum. Jerzy Dobrzycki. Wrocław–Warszawa–Kraków: Ossolineum.

Rheticus, George Joachim 1540/1854: *De libris revolutionum Copernici narratio prima*. Danzig: Franz Rhode. Stable URL: https://dlibra.bibliotekaelblaska.pl/dlibra/publication/5299/edition/5019/content. Reprinted and Polish translation 1854 [in:] Kopernik, Retyk 1854, pp. 487–547. Stable URL: https://kpbc.umk.pl/Content/42894/download?format_id=2 (accessed on 20 May 2024).

Rheticus, George Joachim 1550: *Ephemerides novae* ad annum 1551. Lipsiae: Ex Officina Vvolphangi Gvunteri. URL: https://books.google.pl/books?id=LQZTAAAAcAAJ (accessed on 20 May 2024).

Rheticus, Georg Joachim 2015: *Narratio prima or First Account of the Books On the Revolutions by Nicolaus Copernicus*. With an Introduction by Jarosław Włodarczyk. Warszawa: Wydawnictwa Uniwersytetu Warszawskiego. URL: https://www.academia.edu/75933770/Narratio_prima_or_First_Account_of_the_Books_On_the_Revolution_by_Nicolaus_Copernicus (accessed on 20 May 2024).

Roberts, Victor 1957: The Solar and Lunar Theory of Ibn ash-Shatir. A Pre-Copernican Copernican Model. *Isis* 48(4), pp. 428–432. Stable URL: https://www.jstor.org/stable/227515.

Roberts, Victor 1966: The planetary theory of Ibn ash-Shatir: Latitudes of the planets. *Isis* 57(3), pp. 208–219. Stable URL: https://www.jstor.org/stable/227960.

Rochberg, Francesca 1988: Elements of the Babylonian contribution to Hellenistic astrology. *Journal of the American Oriental Society* 108(1), pp. 51–62. DOI: 10.2307/603245. Stable URL: https://www.jstor.org/stable/603245.

Rochberg, Francesca 2004: *Heavenly Writing: Divination and Horoscopy, and Astronomy in Mesopotamian Culture*. Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo: Cambridge University Press.

Rochberg, Francesca 2010: If p then q': form and reasoning in Babylonian divination. [In:] Amar Annus, ed., *The interpretation of signs in antiquity*. Chicago, Illinois: The Oriental Institute of the University of Chicago. "Oriental Institute Seminars" No. 6, pp. 19–27.

Rochberg-Halton, Francesca 1984: New Evidence for the History of Astrology. *Journal of Near Eastern Studies* 43(2), pp. 115–140. Stable URL: https://www.jstor.org/stable/10.2307/545087.

Rochberg-Halton, Francesca 1992: Astrology in the Ancient Near East. [In:] D.N. Freedman (ed.), *Anchor Bible Dictionary*. New York, vol. 1, pp. 504–507.

Rok, Bogdan 2023: Kalendarze oświecone i nieoświecone XVIII wieku. *Pasaż Wiedzy. Muzeum Pałacu Króla Jana III w Wilanowie*. URL: https://www.wilanow-palac.pl/kalendarze_oswiecone_i_nieoswiecone_xviii_wieku.html.

Rosen, Edward 1939 (2nd rev. ed. 1959; 3rd ed. 1971): *Three Copernican Treaties. The Commentariolus of Copernicus*, *The Letter Against Werner*, *The Narratio Prima of Rheticus*. Translated with Introduction, Notes and Bibliography. New York: Octagon Books.

Rosen, Edward 1962: Was Copernicus a Pythagorean? *Isis* 53(4), pp. 504–508. Stable URL: https://www.jstor.org/stable/227725.

Rosen, Edward 1970: Was Copernicus a Hermetist? *Minnesota Studies in the Philosophy of Science* 4, pp. 163–171.

Rosen, Edward 1978a: See Copernicus 1978.

Rosen, Edward 1978b: Aristarchus of Samos and Copernicus. *Bulletin of the American Society of Papyrologits* XV, pp. 85–93. Stable URL: https://www.jstor.org/stable/24518756 (accessed on 20 May 2024).

Rosen, Edward 1978c: *Science and History. Studies in Honor of Edward Rosen* (Wroclaw: Ossolineum). *Studia Copernicana* 16. Stable URL: https://kpbc.umk.pl/dlibra/publication/31622/edition/40362/content.

Rosen, Edward 1983: Was Copernicus a Neoplatonist? *Journal of the History of Ideas* 43, pp. 667–669.

Rosen, Edward 1984: *Copernicus and the Scientific Revolution*. Malabar, Fla.: Robert E. Krieger.

Rosińska, Grażyna 2002: Krakowski księgozbiór Mikołaja Kopernika w kodeksach Copernicana 4 i Copernicana 6 Biblioteki Uniwersyteckiej w Uppsali. *Res Historica* 13, pp. 105–123. URL: https://kpbc.umk.pl/dlibra/publication/36054/edition/44486/content?format_id=2.

Rożek, Michał 2016: *Magia, alchemia… i królewskie ogrody*. Kraków: Petrus.

Rutkin, H. Darrel 2002: *Astrology, Natural Philosophy and the History of Science, c. 1250–1700: Studies Toward an Interpretation of Giovanni Pico della Mirandola's Disputationes adversus astroligiam divinatricem*. Indiana University: Unpublished Ph.d dissertation.

Rutkin, H. Darrel 2006: Astrology. [In:] Katharine Park, Lorraine Daston (eds.), *The Cambridge History of Science: Early modern science*. Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, Sao Paulo: Cambridge University Press. ISBN 0-521-57244-4, pp. 541–561.

Rutkin, H. Darrel 2010: The Use and Abuse of Ptolemy's *Tetrabiblos* in Renaissance and Early Modern Europe: Two Case Studies (Giovanni Pico della Mirandola and Filippo Fantoni). [In:] Alexander Jones (ed.), *Ptolemy in Perspective. Use and Criticism of his Work from Antiquity to the Nineteenth Century*. "Archimedes" 23. DOI 10.1007/978-90-481-2788-7. Springer Science+Business Media B.V., pp. 135–149. URL: https://www.academia.edu/20272250/_The_Use_and_Abuse_of_Ptolemy_s_Tetrabiblos_in_Renaissance_and_Early_Modern_Europe_Two_Case_Studies_Giovanni_Pico_della_Mirandola_and_Filippo_Fantoni.

Rutkin, H. Darrel 2018: How to Accurately Account for Astrology's Marginalization in the History of Science and Culture. *Early Science and Medicine* 23(3), pp. 217––243. Stable URL: https://www.jstor.org/stable/26567137.

Rybka, Eugeniusz 1967: The influence of the Cracow intellectual climate at the end of the fifteenth century upon the origin of the heliocentric system. *Vistas in Astronomy* 9, pp. 165–169. DOI: 10.1016/0083-6656(67)90026-8.

Rybka, Eugeniusz 1971: Ruch planet w astronomii narodów islamu. *Kwartalnik Historii Nauki i Techniki* 16(1), pp. 11–25. Stable URL: https://bazhum.muzhp.pl/media/

files/Kwartalnik_Historii_Nauki_i_Techniki/Kwartalnik_Historii_Nauki_i_Techniki-r1971-t16-n1/Kwartalnik_Historii_Nauki_i_Techniki-r1971-t16-n1-s11-25/Kwartalnik_Historii_Nauki_i_Techniki-r1971-t16-n1-s11-25.pdf.

Rybka, Eugeniusz (ed.) 1975: *Historia astronomii w Polsce*. Vol. I. Wrocław–Warszawa–Kraków–Gdańsk: Ossolineum.

Saliba, George 1984: Arabic Astronomy and Copernicus. *Zeischrift für Geschichte der Arabisch-Islamischen Wissenschaften* I, pp. 73–87.

Saliba, George 1987: The Rôle of Maragha in the Development of Islamic Astronomy: A Scientific Revolution before the Renaissance. *Revue de synthése* IVe S. Nos 3–4, juil.–déc.1987, pp. 361–373.

Saliba, George 1991: The astronomical tradition of Maragha: A historical survey and prospects for future research. *Arabic sciences and philosophy*, vol. I (1991), pp. 67–99.

Saliba, George 1994: *A History of Arabic Astronomy: Planetary Theories during the Golden Age of Islam*. New York.

Saliba, George 1997/ Polish translation 2000: Teorie planetarne w astronomii arabskiej po XI wieku. [In:] Rashed, Morelon (red.) ([1997]); Polish translation 2000, pp. 69–134.

Sarton, George 1959: *Ancient Science and Modern Civilization*. New York: Harper & Brothers, Publishers.

Saunders, Hamish 1998: A Brief Overview of the History of Western Astrology. URL: https://www.astrology-house.com/content/docs/articles/brief_history_of_western_astrology.pdf.

Schiaparelli, Giovanni Virginio 1873 / 1876: *I Precursori del Copernico nell' antichità* (Milano); German translation 1876: *Die Vorläufer des Copernicus im Alterthum*. Unter Mitwirkung des Verfassers ins deutsche übertragen von Maximilian Curtze. Leipzig: Verlag von Quandt.

Schmauch, Hans, von 1942: Neu Funde zum Lebenslauf Koppernikus. *Zeitschrift für die Geschichte und Altertumskunde Ermlands* 28(1). Stable URL: https://wmbc.olsztyn.pl/dlibra/publication/13140/edition/12761/content.

Schmauch, Hans, von 1943: Nicolaus Kopernikus und der Deutsche Ritterorden. [In:] Papritz, Schmauch (red.) 1943, pp. 202–219.

Schmeidler, Felix 1998: *Kommentar zu 'De revolutionibus'*. [In:] Copernicus, *Gesamtausgabe*, vol. 3/1.

Sellar, Wanda 2008: *An Introduction to Medical Astrology*. Wessex Astrologer.

Sextus Empiricus 1949 (reprinted: 1961, 1971): *Against Astrologers*. [In:] Sextus Empiricus, [*Collected works*,] vol. 4. *Against the Professors*. Translated by R. G. Bury. "Loeb Classical Library" vol. 382. London: William Heinemann Ltd;

Cambridge, Massachusetts: Harvard University Press, book 5, pp. 324–371 (even pages: Greek original; odd pages: English translation).

Shank, Michael H. 2014a: Made to Order *The Copernican Question: Prognostication, Skepticism, and Celestial Order* by Robert S. Westman (review). *Isis* 105(1), pp. 167–176. Stable URL: https://www.jstor.org/stable/10.1086/675561.

Shank, Michael H. 2014b: Rejoinder. *Isis* 105(1), pp. 185–187. Stable URL: https://www.jstor.org/stable/10.1086/675715.

Shank, Michael H. 2017: Regiomontanus and Astronomical Controversy in the Background of Copernicus. [In:] Rivka Feldhay, F. Jamil Ragep (eds.) 2017: *Before Copernicus: The Cultures and Contexts of Scientific Learning in the Fifteenth Century*. Montreal: McGill-Queen's University Press, pp. 79–109.

Shumaker, Wayne 1972: *The Occult Sciences in the Renaissance, A Study in Intellectual Patterns*. Berkeley, Los Angeles, London: University of California Press.

Sighinolfi, Lino 1920: *Domenico Maria Novara e Nicolò Copernico: allo studio di Bologna*. Modena: E. Ferragutti e C. Tipografi. URL: https://kpbc.umk.pl/dlibra/publication/29287/edition/39017?language=pl.

Skuhala Karasman, Ivana; Borsic, Luka 2016: Federik Grisogono, the iatromathematician. *Croatian Studies Review* 12, pp. 21–43. URL: https://www.academia.edu/86135160/Federik_Grisogono_the_iatromathematician.

Stahl, William Harris 1945: The Greek Heliocentric Theory and Its Abandonment. *Transactions and Proceedings of the American Philological Association* 76, pp. 321–332. DOI: 10.2307/283344. Stable URL: https://www.jstor.org/stable/283344.

Steinschneider, Moritz 1865: Die „mittleren" Bücher der Araber und ihre Bearbeiter. *Zeitschrift für Mathematik und Physik* 10, pp. 456–498. URL: https://www.digitale-sammlungen.de/en/view/bsb10594436?page=504,505 (accessed on 20 May 2024).

Steinschneider, Moritz 1892: *Die arabischen Bearbeiter des Almagest*. "Bibliotheca Mathematica" F.6. Red. par G. Erneström. Stockholm.

Steinschneider, Moritz 1893: *Die Hebraeischen Uebersetzungen des Mittelalters*. Berlin: Kommissionsverlag des Bibliographischen Bureaus. URL: https://dn790007.ca.archive.org/0/items/diehebraeischen00steigoog/diehebraeischen00steigoog_text.pdf (accessed on 20 May 2024).

Steinschneider, Moritz 1903: Miscellen und Notizen. *Zeitschrift für hebräische Bibliographie* pp. 58–61. URL: https://sammlungen.ub.uni-frankfurt.de/download/pdf/7600123.pdf (accessed on 20 May 2024).

Stimson, Dorothy 1917: *The Gradual Acceptance of the Copernican Theory of the Universe*. New York: Trade Selling Agents, The Baker & Taylor Co. URL: https://www.gutenberg.org/files/35744/35744-h/35744-h.htm (accessed on 20 May 2024).

Suchodolski, Bogdan 1973: Słońce świata, czyli znaczenie Kopernika w rozwoju nauk o przyrodzie i człowieku. [In:] Kurdziałek, Rebeta, Swieżawski (red.) 1973, pp. 107–122.

Swerdlow, Noel M. 1973: The Derivation and First Draft of Copernicus's Planetary Theory. A translation of the *Commentariolus* with Commentary. *Proceedings of the American Philosophical Society* 117(6), pp. 423–512.

Swerdlow, Noel M. 1990: Regiomontanus on the critical problems of astronomy. [In:] Trevor H. Levere, William R. Shea (eds.) 1990: *Nature, experiment, and the sciences*. Dordrecht: Reidel, pp. 165–195.

Swerdlow, Noel M. 1993: Science and Humanism in the Renaissance: Regiomontanus on the Dignity and Utility of the Mathematical Sciences. [In:] Horwich, Paul (ed.) 1993: *World Changes. Thomas Kuhn and the Nature of Science*. A Bradford Book. Cambridge, Massachusetts, and London, England: The MIT Press, pp. 131–168.

Swerdlow, Noel M. 2004: An Essay on Thomas Kuhn's First Scientific Revolution. The Copernican Revolution. *Proceedings of the American Philosophical Society* 148(1) (Mar., 2004), pp. 64–120. Stable URL: https://www.jstor.org/stable/1558245.

Swerdlow, Noel M. 2012a: Copernicus and Astrology, with an Appendix of Translations of Primary Sources. *Perspectives on Science* 20, pp. 353–378. DOI: https://doi.org/10.1162/posc_a_00071.

Swerdlow, Noel M. 2012b. Appendix of Translations of Primary Sources. URL: https://direct.mit.edu/posc/article-abstract/20/3/353/15325/Copernicus-and-Astrology-with-an-Appendix1-of (once you have selected the link you will then need to select the "Supplement 1" link on this website).

Swerdlow, Noel M. 2013: On Professor Westman's Reply to *Copernicus and Astrology*, with an Appendix of Translations of Additional Primary Sources. *Perspectives on Science* 21(3), pp. 384–385. DOI: 10.1162/posc_c_00105.

Swieżawski, Stefan 1973: Podsumowanie. [In:] Kurdziałek, Rebeta, Swieżawski (red.) 1973, pp. 254–262.

Swieżawski, Stefan 1974a: *Dzieje filozofii europejskiej w XV wieku*. Vol. I *Poznanie*. Warszawa: Akademia Teologii Katolickiej.

Swieżawski, Stefan 1974b: *Dzieje filozofii europejskiej w XV wieku*. Vol. II *Wiedza*. Warszawa: Akademia Teologii Katolickiej.

Swieżawski, Stefan 1980: *Dzieje filozofii europejskiej w XV wieku*. Vol. V *Wszechświat*. Warszawa: Akademia Teologii Katolickiej.

Swieżawski, Stefan 1983a: *Dzieje filozofii europejskiej w XV wieku*. Vol. VI *Człowiek*. Warszawa: Akademia Teologii Katolickiej.

Swieżawski, Stefan 1983b: *Między średniowieczem a czasami nowymi*. Warszawa: Biblioteka «Więzi».

Sylla, Edith Dudley 2017: The Status of Astronomy as a Science in Fifteenth-Century Cracow: Ibn al-Haytham, Peurbach, and Copernicus. [In:] Rivka Feldhay F. Jamil Ragep (eds.) 2017: *Before Copernicus: The Cultures and Contexts of Scientific Learning in the Fifteenth Century*. Montreal: McGill-Queen's University Press, pp. 45–78.

Tanzella-Nitti, Giuseppe 2002: Sky. [In:] *INTERS – Interdisciplinary Encyclopedia of Religion and Science*. Edited by G. Tanzella-Nitti and A. Strumia. URL: https://www.inters.org.

Tarn, William Woodthorpe 1927/1952 (3 ed. revised by author G.T. Griffith): *Hellenistic Civilization*. Cleveland and New York: Meridian Books, The World Publishing Company.

Tarrant, Neil 2020: Reconstructing Thomist Astrology: Robert Bellarmine and the papal bull *Coeli et terrae*. *Annals of Science* 77(1), pp. 26–49. DOI: 10.1080/00033790.2020.1714286.

Tatarkiewicz, Władysław 1972: Mikołaj Kopernik a symetria świata. "Rocznik Krakowski" XLIII, pp. 7–18. Stable URL: http://mbc.malopolska.pl/dlibra/docmetadata?id=59369&from=publication.

Taub, Liba 2003: *Ancient meteorology*. London, New York: Routledge.

Taub, Liba 2012: Astrometeorology. [In:] *The Encyclopedia of Ancient History*. Willey. Edited by Roger S. Bagnall, Kai Brodersen, Craige B. Champion, Andrew Erskine, and Sabine R. Huebner; pp. 875–876. DOI: 10.1002/9781444338386.wbeah21051.

Taub, Liba 2020: Astronomy in Its Contexts. [In:] Taub L. (ed.), *The Cambridge Companion to Ancient Greek and Roman Science. Cambridge Companions to Philosophy*. Cambridge University Press, pp. 208–228.

Taylor, Robert Jonathan 2006: *An Analysis of Celestial Omina in the Light of Mesopotamian Cosmology and Mythos*. Thesis Submitted to the Faculty of the Graduate School of Vanderbilt University in partial fulfillment of the requirements for the degree of Master of Arts in Religion. May, 2006. Nashville, Tennessee. URL: https://ir.vanderbilt.edu/bitstreams/a9f822de-13c2-409f-9c06-3c7e403fa6ea/download (accessed on 20 May 2024).

Thagard, Paul R. 1978: Why Astrology is a Pseudoscience. *Proceedings of the Biennial Meetings of the Philosophy of Science Association* 1, 223–234. URL: https://watarts.uwaterloo.ca/~pthagard/Articles/astrology.pdf (accessed on 20 May 2024).

Thijssen, J.M.M.H. 2004: The Buridan School Reassessed. John Buridan and Albert of Saxony. *Vivarium* 42(1), pp. 18–42. Stable URL: https://www.jstor.org/stable/41963717.

Thorndike, Lynn 1934a: *A History of Magic and Experimental Science*. Vol. III. *The Fourteenth and Fifteenth Centuries,* part 1. Columbia University Press.

Thorndike, Lynn 1934b: *A History of Magic and Experimental Science*. Vol. IV. *The Fourteenth and Fifteenth Centuries,* part 2. Columbia University Press.

Thorndike, Lynn 1941a: *A History of Magic and Experimental Science*. Vol. V. *The Sixteenth Century*. Part 1. New York: Columbia University Press.

Thorndike, Lynn 1941b: *A History of Magic and Experimental Science*. Vol. VI. *The Sixteenth Century*. Part 2. New York: Columbia University Press.

Thorndike, Lynn 1955: The True Place of Astrology in the History of Science. *Isis* 46(3), pp. 273–278. Stable URL: https://www.jstor.org/stable/226346.

Truffa, Giancarlo 2007: Novara, Domenico Maria da. [In:] Hockey, T., *et al., The Biographical Encyclopedia of Astronomers*. New York. NY: Springer, pp. 840–841. DOI: 10.1007/978-0-387-30400-7_1021.

Ulanowski, Krzysztof 2022: Between divinatory and magical practices in Mesopotamia. *Przegląd Religioznawczy* 4 (286), pp. 187–209. DOI: 10.34813/ptr4.2022.12.

Valla, Giorgio 1501: *De expetendis ac fugiendis rebus*. Editori: Manuzio, Aldo; Valla, Giampietro. Venetiis: in aedibus Aldi Romani: impensa, ac studio Ioannis Petri Vallae filii pientiss., mense Decembri 1501. URL: https://books.google.pl/books?id=kB1LAAAAcAAJ&printsec=frontcover&redir_esc=y#v=onepage&q&f=false (accessed on 20 May 2024).

Van der Waerden, Bartel Leendert 1952–1953: History of the Zodiac. *Archiv für Orientforschung* 16(2), pp. 216–230. Stable URL: https://www.jstor.org/stable/41635784.

Van Helden, Albert 1985: *Measuring the Universe: Cosmic Dimensions from Aristarchus to Haley*. Chicago–London: Chicago University Press.

Vasoli, Cesare 1973: Copernico e la cultura filosofica italiana del suo tempo. *Giornale di fisica* 14, pp. 79–107, at pp. 87–89.

Vescovini, Graziella Frederici 1987: Peter of Abano and Astrology. [In:] Patrick Curry (ed.), *Astrology, Science and Society*. Woodbridge: The Boydell Press, pp. 19–40.

Vescovini, Graziella Federici 2014: The Theological Debate. [In:] Dooley, Brendan (ed.) 2014a: *A Companion to Astrology in the Renaissance*. "Brill's Companions to the Christian Tradition" vol. 49. Leiden: Brill, pp. 99–140.

Vickers, Brian (ed.) 1984: *Occult Scientific Mentalities*. Cambridge University Press. DOI: 10.1017/CBO9780511572999.

Voss, Angela 2000/2003: The Astrology of Marsilio Ficino. *Culture and Cosmos. A Journal of the History of Astrology and Cultural Astronomy* 4(2), pp. 29–45. URL: https://www.cultureandcosmos.org/pdfs/4-2/4-2_Voss_Ficino.pdf; (accessed on 20 May 2024). [reprinted in:] Jim Lewis, *The Astrology Book: The Encyclopedia of Heavenly Influences*. Detroit: Visible Ink Press, 2003, pp. 237–243.

Voss, Angela 2016: Marsilio Ficino. "Western Esoteric Masters" vol. 9. Edited and introduced by Angela Voss. Berkeley, California: North Atlantic Books. URL: https://books.google.pl/books?id=kImfTOtG444C&printsec=frontcover (accessed on 20 May 2024).

Wardęska, Zofia 1975: *Teoria heliocentryczna w interpretacji teologów XVI wieku*. „Studia Copernicana" t. XII Wrocław: Ossolineum. Stable URL: https://kpbc.umk.pl/dlibra/publication/31618/edition/40246/content.

Wasiutyński, Jeremi 1938 (II wyd. 2007): *Mikołaj Kopernik. Twórca nowego nieba*. Warszawa: Wydawnictwo Przeworskiego; II wyd. 2007 Toruń: Wydawnictwo Adam Marszałek.

Wasiutyński, Jeremi 1963: Uwagi o niektórych kopernikanach szwedzkich. *Studia i Materiały z Dziejów Nauki Polskiej*, seria C, 7(1963), pp. 65–84.

Wasiutyński, Jeremi 2003: *The Solar Mystery. An Inquiry into the Temporal and the Eternal Background of the Rise of Modern Civilization*. Oslo: Solum Forlag.

Westman, Robert S. 1972a: Kepler's Theory of Hypothesis and the Realist Dilema. *Studies in the History and Philosophy of Science* 3(3), pp. 233–264.

Westman, Robert S. 1972b: The Comet and the Cosmos: Kepler, Maestlin and the Copernican Hypothesis. *Studia Copernicana* V, pp. 7–30.

Westman, Robert S. (1973a) 1975a: The Wittemberg Interpretation of the Copernican Theory. [In:] Gingerich (red.) (1973b) 1975b, pp. 393–429.

Westman, Robert S. (1973b) 1975b: Three Responses to the Copernican Theory: Johannes Praetorius, Tycho Brahe, and Michael Maestlin. [In:] Westman (ed.) (1973c) 1975c, pp. 285–345.

Westman, Robert S. (ed.) (1973c) 1975c: *The Copernican Achievement*. Edited by Robert S. Westman. Berkeley–Los Angeles–London: University of California Press.

Westman, Robert S. (1973d) 1975d: Michael Maestlin's Adoptions of the Copernican Theory. *Studia Copernicana* XIV, pp. 53–63.

Westman, Robert S. 1975e: The Melanchthon Circle, Rheticus and the Wittenberg Interpretation of the Copernican Theory, *Isis* 66(2), pp. 165–193. Stable URL: https://www.jstor.org/stable/229415.

Westman, Robert S. 1977: Magical reform and Astronomical Reform. The Yates Thesis Reconsidered. [In:] Westman, McGuire (eds.) 1977, pp. 1–23.

Westman, Robert S. 1980/1982: The Astronomer's Role in the Sixteenth Century: A Preliminary Study. *History of Science* XVIII, pp. 105–147; Polish translation 1982: Rola astronoma w XVI wieku (tłum. Mikołaj Szymański). *Odrodzenie i Reformacja w Polsce* XXVII, pp. 19–56.

Westman, Robert S. 1984: Nature, art, and psyche: Jung, Pauli, and the Kepler–Fludd polemic. [In:] Vickers (ed.) 1984, pp. 177–229.

Westman, Robert S. (1981) 1986: The Copernicans and the Churches. [In:] Lindberg, Numbers (ed.) (1981) 1986, pp. 76–113.

Westman, Robert S. 1990 (repr. 1991, 1994a): Proof, poetics, and patronage: Copernicus's preface to *De revolutionibus* (1st version 1986, 2nd short version 1987, 3rd version 1990, 1991, 1994. [In:] Lindberg, Westman (red.) 1990; repr. 1991; 1994a, pp. 167–205.

Westman, Robert S. 1993: Copernicus and the Prognosticators: The Bologna Period, 1496–1500. *Universitas. Newsletter of the International Centre for the History of Universities and Science* [Bologna], no. 5, pp. 1–5.

Westman, Robert S. 1994: Two Cultures or One? A Second Look at Kuhn's The Copernican Revolution. *Isis* 85(1), pp. 79–115.

Westman, Robert S. 2001: Kepler's Early Physical-Astrological Problematic. *Journal for the History of Astronomy* 32(3), pp. 227–236. DOI: 10.1177/002182860103200304. URL: https://www.researchgate.net/publication/234431516_Kepler's_Early_Physical-Astrological_Problematic.

Westman, Robert S. 2011a: *The Copernican Question: Prognostication, Skepticism, and Celestial Order*. Berkeley, Los Angeles, London: University of California Press.

Westman, Robert S. 2011b: Copernicus and the Crisis of the Bologna Prognosticators, 1496–1500. [In:] *The Copernican Question: Prognostication, Skepticism, and Celestial Order*. Berkeley, Los Angeles, London: University of California Press, pp. 76––105. DOI:10.1525/california/9780520254817.003.0004.

Westman, Robert S. 2013: The Copernican Question Revisited: A Reply to Noel Swerdlow and John Heilbron. *Perspectives on Science* 21(1), pp. 100–136. DOI: 10.1162/POSC_a_00087.

Westman, Robert S. 2014: Reply to Michael Shank. *Isis* 105(1), pp. 177–184. Stable URL: https://www.jstor.org/stable/10.1086/675714.

Westman, Robert S. 2016: *Copernicus and the Astrologers (Dibner Library Lecture, December 12, 2013)*. Washington, DC: Smithsonian Libraries. URL: https://www.researchgate.net/publication/313438854_Copernicus_and_the_Astrologers (accessed on 20 May 2024).

Westman, Robert S. 2019: How Did Copernicus Become a Copernican? *Isis* 110(2), pp. 296–301. https://www.journals.uchicago.edu/doi/pdf/10.1086/703410 (accessed on 20 May 2024).

Westman, Robert S. 2024: Nicolaus Copernicus. *Encyclopædia Britannica*, 8 August 2024. URL: https://www.britannica.com/biography/Nicolaus-Copernicus (accessed on 18 August 2024).

Westman, Robert S.; McGuire J. E. (eds.) 1977: *Hermeticism and the Scientific Revolution*. Los Angeles, Calif.: W.A. Clark Memorial Library.

Wikipedia 2024: Tranzyt Merkurego. URL: https://pl.wikipedia.org/wiki/Tranzyt_Merkurego (accessed on 20 May 2024).

Wisłocki, Władysław 1886: *Liber diligentiarum facultatis artisticae Universitatis Cracoviensis*, vol. I: 1487–1563. Kraków: Nakładem Polskiej Akademji Umiejętności.

Włodarczyk, Jarosław 2015: Introduction. [In:] Rheticus, Georg Joachim 2015a: *Narratio prima or First Account of the Books On the Revolutions by Nicolaus Copernicus*. With an Introduction by Jarosław Włodarczyk. Warszawa: Wydawnictwa Uniwersytetu Warszawskiego, pp. 9–70. Stable URL: https://www.academia.edu/75933770/Narratio_prima_or_First_Account_of_the_Books_On_the_Revolution_by_Nicolaus_Copernicus.

Yates, Frances A. 1964: *Giordano Bruno and the Hermetic Tradition*. Chicago: The University of Chicago Press; London: Routledge & Kegan Paul Ltd.; Toronto: The University of Toronto Press.

Yates, Frances A. 1973/1997: Copernicus. BBC Radio 3 talk, later broadcast also by the Australian Broadcasting Commission; published in *The Listener*, 15 March 1973, reprinted in: Frances A. Yates, *Ideas and Ideals in the North European Renasissance*. Selected works, vol. X, Routledge 1997, pp. 256–261.

Zambelli, Paola 1992: The *Speculum Astronomiae* and Its Enigma: Astrology, Theology, and Science in Albertus Magnus and His Contemporaries. "Boston Studies in the Philosophy of Science" 135. Dordrecht: Springer Netherlands.

Zarka, Philippe 2011: Astronomy and astrology. *Proceedings of the International Astronomical Union* 5 (S260), pp. 420–425. DOI: 10.1017/S1743921311002602.

Zinner, Ernst 1943/2nd ed. 1988: *Entstehung und Ausbreitung der coppernicanischen Lehre. Zum 200 jährigen Jubiläum der Friedrich-Alexander-Universität zu Erlangen*. Erlangen: Universitäts-Buchdruckerei Junge & Sohn; 2nd ed. 1988: *Entstehung und Ausbreitung der coppernicanischen Lehre*. Heurausgegeben und ergänzt von Heribert M. Nobis und Felix Schmeidler. München: C. Beck.