Chapter 5
Conrad Tockler's Research Agenda

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Abstract Conrad Tockler, alias Noricus, was a university professor in Leipzig at the beginning of the sixteenth century and *Rector magnificus* of the university from 1512 on. He was a physician adept at astrological medicine and was also a fairly skilled mathematician. His publication list begins in 1502 with a *Libellus de sole*, a commented reprint of Marsilius Ficinus's homonimous work. Tockler also authored two different commented editions of Johannes de Sacrobosco's *Tractatus de sphaera*. In his view, cosmological knowledge was directly connected with his medical activities via astrology.

The paper reconstructs the intellectual context in which Tockler was active with the aim to understand how much he can be considered innovative, or whether he was in truth a late expression of an already declining late Medieval knowledge system that unified astronomy, astrology, and medicine in form of a structure pivoted around cosmological knowledge.

1 Introduction

Conrad Tockler (1470–1530) was born in Nuremberg—for this reason he went by "Noricus"—and came from a well-to-do family. His first contact with the university took place at the age 13, when he matriculated at Leipzig (Erler 1895–1902, 1, 398), and he remained in this city until his death. In 1502, he earned the degree of *Magister artium*, and in 1510 he finished his medical studies. His shining moments

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arrived after graduation, first when he joined the faculty of medicine as a professor, and then when he was appointed *Rector magnificus* of the entire university in 1512. He had to leave the university in 1518, apparently because of drug abuse, but was finally re-admitted to the university as a professor under the aegis of Duke George of Saxony (1471–1539) (Kreussler 1810, 45; Grosse 1839, 1, 309). Upon his death, as he had no living heir, Tockler's possessions were confiscated by the Duke, who then opened a third chair for medicine—a chair in physiology *alias* theoretical medicine—by using the finances acquired from this confiscation. The chair was named in honor of the deceased professor: the *Tockleriana* (Doppelmayr 1730, 36; Schmidt-Thieme 2002).[1] It remained operative at least until the eighteenth century (Rabl 1909, 2).

There is no encompassing bibliography of Tockler.[2] He authored quite a number of *judicia*, almanacs, and *practica* in Latin, German, and Czech. It is well known that most of these kinds of prints had a limited life and were mostly destroyed or their paper re-used once their dates of validity had passed. Tockler seems to have been particularly active in the production of these kinds of works, which testifies to the relevance of his public profile in the city of Leipzig, especially between 1503 and 1514. Besides this group of works, there are the textbooks produced for his intensive teaching activity at the university. These works, many of which remained unpublished, clearly show that the peaks of Tockler's intellectual production were concomitant with his two major career steps in 1503 and in 1510. Their content ranges from music to arithmetic and from optics to astronomy and cosmology. Tocker published a commentary on the *Sphaera* of Sacrobosco in 1503 and a second updated edition of the same in 1509 (de Sacrobosco et al. 1503, 1509). Outside these two major groups of works, a few other works seem to indicate Tockler's

[1] For the transcription of the decree that instituted the new chair, see (Freytag 1752–1753, 2, 1417–18).

[2] Many of Tockler's works remained unpublished. Nevertheless, they were preserved thanks to the decision of Duke George to confiscate all the possessions of Tockler. The Österreichische Nationabibliothek still possesses a collection under the title "Philosophische Sammelhandschrift," which is basically the main collection of Tockler's unpublished texts, which he was using for his lecturing. This collection contains: (a) Tockler's commentary on John Peckham's (1230–1292) *Perspectiva communis* with a short introduction (Tockler 1502–1506, 1r–37v), (b) further annotations of Tockler on Peckham's work (Tockler 1502–1506, 39r–52r), (c) Tockler's commentary on Georg von Peuerbach's *Theorica planetarum* with a short introduction to describe the different branches of mathematics (Tockler 1502–1506, 57r–120v), (d) a collection of 130 statements of astrological nature (Tockler 1502–1506, 121r–123v), (e) two variants of Jean de Murs's (1290–1351) *Musica speculativa* (Tockler 1502–1506, 124r–136r, 139r–154r). A further collection of manuscripts, entitled "Mathematische und astronomische Sammelhandschrift" and ascribed to the mathematician, astrologer, and famous publisher of many of Johannes Regiomontanus's works, Johannes Schöner (1477–1547), also contains texts and fragments of Conrad Tockler, most of which have not been analyzed in depth for the purpose of this work. Most of these texts are concerned with the *theorica et practica* of many types of solar clocks and further instruments as well as a short treatise on measuring volumes of barrels (*arte visoria*). For Tockler's texts with documents of Schöner inserted in-between, see (Schöner and Tockler 16th cent., 10r–51r).

specific interests as well as further social aspects of his life. The first of these is the 1502 (Ficinus and Tockler 1502) printed edition of Marsilius Ficinus's (1433–1499) *Librum de sole* (Ficinus 1493).[3] The second work that does not fit in well with the others is a collection of 130 astrological statements (*Liber centium et triginta verborum in astrologica scientia probatorum*) (Tockler 1502–1506, 121r–23v). This unpublished work, written in 1506, is dedicated to George, Duke of Saxony, a testimony to the social connection between the then university lecturer of mathematics and the court.

At first sight, mathematics, medicine, and astrology seem to be the knowledge domains within which Tockler defined his intellectual and social profile. After a closer look at his works, his research agenda as well its intellectual profile will be reconstructed in depth.

2 Tockler's Reception of Marsilius Ficinus

The humanist Marsilius Ficinus is well remembered for his important role in the process of re-vitalizing Platonic and neo-platonic ideas as a knowledge system consistent with the Christian theology of the early modern period. His philosophical system influenced culture, science, and natural philosophy for generations. As Paul Oskar Kristeller has clearly shown, Ficinus's metaphysic is supported by the ontological assumption that all ideas are symbolically represented by real objects. Thus, God is an archetype of the sun in the cosmos, and light is consequently not only a physical phenomenon but one that has a strong influence on both the material and spiritual aspects of human life (Kristeller 1972, 72–108). Less known is Ficinus's engagement in medicine. Certainly because of the persistent recurrence of the plague during the fifteenth century, Ficinus, against the background of his unifying vision of the cosmos, related cosmological and astronomical aspects to the quality of the air in the sublunar world—in his opinion, the ultimate cause of the plague. Although this idea was certainly spread long before Ficinus's work, it became a predominant medical explanation of the plague only once it was fully integrated into an all-encompassing worldview. These medical ideas were first expressed in handwritten texts such as the Italian "Suggestions against the pestilence" (Ficino and Musacchio 1983) or the more famous *De vita libri tres* (Kaske and Clark 1989). It is very rare, however, to find such practical aspects of Ficinus's ideas directly associated with his philosophical and theological vision of the world. An exception to this rule is represented by *De sole* (Ficinus 1493), which, as a printed book, possibly experienced faster circulation.[4] The book begins with the physical characteristics of the sun and its light: They warm up, they generate, and they cause motion. The argument then

[3] The work *Librum de sole* was published together with two other works of Ficinus: *Librum de lumine* and *Apologia in librum suum de Sole & Lumine*.

[4] For a modern Latin edition, with Italian translation, of Ficinus's *De sole*, see (Garin 1952, 970–1009).

moves to cosmological subjects such as the size of the sun, its position, and its relation to the constellations of the Zodiac, as well as the relation of these to the seasons. All the planetary motions, positions, and configurations are then discussed with particular attention to facets concerning their astrological meanings and influences. The generative power of the sun and its light are then exemplified by discussing the generation of the humors and, after a theological disquisition, the text concludes by investigating the relations between the divine sun and the sky on one hand and the quality of the air on the other. In only fifteen folios, Ficinus offers a quick run-through from his metaphysics down to his medical considerations.

Tockler re-published Ficinus's work nine years after the original publication (Ficinus and Tockler 1502), but he did not leave comments alongside Ficinus's text. Instead, he added a short introduction to the text by means of which he indicated his own specific interest: natural theology. By this term, he meant a theological view according to which the investigation of God's influence is achieved through an investigation of the physical rules of the cosmos. The astrological approach is therefore inherent to this worldview. Tockler clearly specified that the main goal of this text is to show how all aspects of life are deeply influenced by the sun, whose function is "*creare atque vitam movere, augere, proficiere, nutrire, mondare, et renovare*" (Ficinus and Tockler 1502, 1v).

Finally, Tockler goes back to Ficinus's idea that light is also the cause of motion. This mechanical concept makes use of the pneumatic experience relating the elements of air and water and it is reminiscent of the Heronian fountain: Two closed containers are connected to each other by a pipe, one empty and the other filled with water, with a hole on the top; when light hits the air in the empty container, it heats it up, causing the air's volume to expand; the expansion of air applies pressure to the pipe and some water is consequently pushed out through the hole. This device and its underlying phenomenon were known since antiquity, though the works of Hero of Alexandria (1st cent. AD) were not yet circulating in the period of Ficinus and Tockler.[5] In spite of the vagueness of Ficinus's explanation, Tockler made the point more precise by specifying that the investigation of the effect of sunlight is necessary to comprehend the process of air's condensation and rarefaction, which is in turn fundamental to medicine in terms of its applicability to respiratory problems.

Already at this early stage of his career, Tockler clearly showed that his main interest was in astrological medicine, a set of practical inquiries that was nonetheless integrated into a great metaphysical system drawn from the works of Marsilius Ficinus. As a matter of fact, his further works, whether contextually emerging from his teaching activities or not, show that his research agenda aimed to make Ficinus's ideas operative.

[5] For further information on Hero of Alexandria's pneumatics and it's renaissance in the early modern period, see (Valleriani 2010, 2014).

3 The Textbooks and the Teaching

The group of Tockler's textbooks is quite prominent and the historical sources show that, as a teacher, he covered the full spectrum of subject matter in the framework of the quadrivium.

The statutes of the University of Leipzig valid for this period (1499–1522) show that the traditional spectrum of the quadrivium was covered. Dividing between lessons and exercises, both for the *magister* and the bachelor course of studies, students were supposed to attend classes in geometry ("Euclidis," for two or three quarters of a year), *perspectiva communis* (12–14 weeks), music ("musica muris," for 3–4 weeks), *theorica planetarum* (for 5–6 weeks), arithmetic ("arismetica communis," for 3–4 weeks), and cosmology ("De coelo et mundo," lessons for 3–4 months and exercises for 4 months during the *magister*), preceded by exercise classes during the bachelor on the *spera materialis* for 6 weeks (Zarncke 1861, 461–462).

Tockler's own teaching activity was well documented by Georg Erler for the entire course of Tockler's professorship in the faculty of liberal arts. Except for the summer semester of 1503, he regularly taught from the winter semester 1502 until the winter semester 1510. He taught classes in *spera materialis* (1502, 1504, 1506, and 1507[6]), *aritmetica communis* (1502), *musica muris* (1502), *theorica planetarum* (1504), *Euclidis* (1504, both semesters in 1506, 1507, 1508, and both semesters in 1509 and 1510), and *perspectiva communis* (1504, 1505, both semesters in 1506, 1508, and both semesters in 1509 and 1510) (Erler 1895–1902, 2, 389–460). On the basis of Erler's reconstruction, it appears therefore that Tockler was mostly teaching geometry and *perspectiva communis*, whereas he taught subjects like music only during his first years of activity. Moreover, it appears that classes such as music were not taught regularly anymore after 1503. Nevertheless, as the entries concerning his teaching on the *Sphaera* in 1506 and 1507 show, Erler's reconstruction is certainly not complete.

In spite of the fact that Tockler almost certainly introduced students to the work of Euclid nearly every semester, there is no printed book or handwritten manuscript as a source proving this specific activity. Instead, his commentary on Peckham's *Perspectiva communis*, his texts on arithmetic and on speculative music, the two editions of his commentary on the *Sphaera* of Sacrobosco, as well as his works on calendric and on the calculation of the mean motions of the sun and the moon are still at our disposal.

[6] Tockler's teaching on the *Sphaera* in 1506 and 1507 is testified to by his annotations on an Venetian edition of the treatise of Sacrobosco published in 1499 (http://hdl.handle.net/21.11103/sphaera.100021). Tockler's copy of this edition of the treatise is still preserved at the Library of the University of Leipzig under the signature "Astron. 15." Tockler's annotation is on the retro of the cover of the book.

3.1 A Commentary on John Peckham's Perspectiva communis

In the same year of the publication of Tockler's re-edition of Ficinus and Tockler 1502), Tockler prepared a commentary on John Peckham's (1230–1292) *Perspectiva communis*, a late medieval prominent work on optics (Tockler 1502–1506, 1r–37v).[7] Tockler's work is not at all a copy of Peckham's. Tockler used what David C. Lindberg called the unrevised version of Peckham's work (Lindberg and Pecham 1970, 12–20) but he copied only the propositions and expanded on them with his own commentaries. This handwritten and unpublished text, signed by Tockler, is accompanied by sophisticated hand-colored diagrams, a preface, and a further *Consideration* before the text actually begins (Tockler 1502–1506, 1r–v). Tockler's *Consideration* declares the 'agenda of the commentator' in this text. Quite surprisingly, he justifies the study on optics and theory of vision by referring to the works of Iamblichus Platonicus (245–325), better known as Iamblichus Chalcidensis. Iamblichus was a neoplatonic philosopher and mathematician whose texts, especially his *Life of Pythagoras* (Iamblichus and Taylor 1986), play a role in Ficinus's works on esthetics and theology.[8] In *De sole*, Ficinus states that it was Iamblichus who defined light as the act and visible image of divine intelligence (Ficinus 1493, chap. 2; Garin 1952, 972).

Since the time of its original compilation, Peckham's text was used in the frame of university teaching activity. The same was certainly true at the beginning of the sixteenth century and in the case of Conrad Tockler. From the perspective of the Ficinian program, as Tockler embraced it, Peckham's work furnishes the geometric basis for an understanding of the movement of the sun's rays. The principles of radiation, such as refraction and reflection, as well as Peckham's principle according to which the difference in strength between rays depends on their inclination (Lindberg and Pecham 1970, 33–51), must have provided Tockler with a sort of geometric, astronomic, and astrological infrastructure to precisely determine the influence of the motion of the celestial bodies on earth. Such a program was not entirely new. Back in the late Medieval period, the subjects of light, light's rays, and optics were absolutely central and, besides Peckham, were also discussed by Robert Grosseteste (ca. 1175–1253) and Roger Bacon (ca. 1219–ca. 1292). As Yael Kedar puts it, "light, the source of all causal action, became thus the key to the study of the material universe" (Kedar 2017, 2). However, Tockler reframed it against the background of the recently published Ficinian program that he was realizing.

[7] For a critical edition of Peckham's *Perspectiva communis*, see (Lindberg and Pecham 1970).

[8] Tockler's commentary on Peckham's *Perspectiva communis* seems to have been prepared for print, as it is a clean compilation with final emendations. As no edition of this text exists, it is not possible in the frame of this work to compare the original text with the commentary in its entirety.

3.2 Two Textbooks on Arithmetic

One year later, Tockler published two further texts, this time on the subject of mathematics. These texts were deeply connected to each other. In fact, the first (Tockler 1503b) represents the main text and the second its commentary (Tockler 1503a).[9]

In their broad outlines, the texts certainly represent an abridged version of the traditional Boethian text *De institutione arithmetica*.[10] Nevertheless, they also reflect the fundamental changes that had occurred during the late Middle Ages. They include, for instance, Arabic numeration. The texts were the basis for an introduction to what today could be called 'number theory'. This was—and had always been—quite usual for university arithmetic instruction. In particular, the texts explain a series of fundamental types of proportions that were then propaedeutic for the teaching of music and, of course, for that of astronomy. It concerned the cosmos and its harmony (*musica mundana*). As Doroty V. Schrader says,

> Arithmetic corresponded roughly to present-day number theory, being a philosophical approach to what is implied in number; it was a mathematical discussion of properties of numbers, proof, and formal demonstration, a mixture of mathematical rigor and pseudo-scientific, semi-magical mysticism. (Schrader 1967, 266)[11]

A careful comparison with university textbooks for arithmetic reveals that Tockler's texts are original compositions, albeit abridged ones. This might explain the fact that, contrary to many of his other textbooks, these ones were printed. It is also interesting to note that the main title—*Common arithmetic*—seems to have been in use in the same period, especially in South Germany.[12]

3.3 Two Textbooks on Speculative Music

Speculative music was one branch of the musical discipline of the quadrivium. Following the traditional Boethian division, music was divided into *mundana*, *humana*, and *instrumentalis*. Speculative music was oriented toward the subjects of *musica mundana*, that is, it was mostly regarded as a mathematical discipline for investigating cosmological harmony. Traditionally associated with Boethius's (born

[9] Usually, early modern commentaries show the main text interrupted by passages of commentary written in smaller characters. While the difference in the size of characters in print is maintained according to this practice, Tockler's texts are nevertheless distinct. The way these texts are connected to each other is explained in (Tockler 1503b, last page).

[10] For a modern translation of Boethius's *De institutione arithmetica*, see (Masi 1983).

[11] For an extensive analysis of the function of music according to Boethius, according to which speculative music was also regarded as an introduction to philosophy, see (Heilmann 2007, 242–90).

[12] Dorty V. Schrader mentions that the course on arithmetic at the University of Ingolstadt prescribed "the first book of Euclid, Algorism, and common arithmetic" (Schrader 1967, 273).

480) text *De institutione musica*, university teaching could rely on a further series of texts including Jean de Murs's (ca. 1290–ca. 1355) *Musica speculativa*, written at the beginning of the fourteenth century, which probably was the most relevant and widespread.[13] As Christoph Falkenroth points out, Jean de Murs's text was usually integrated into three different intellectual frames. The first was more concerned with mathematical subjects. This is the traditional frame of the quadrivium, which also encompasses astronomy, geometry, and arithmetic. The second included Jean de Murs's text in a more hybrid frame that might take into account astronomical and cosmological works and, together with these, works on astrology and optics. The third frame is more concerned with music as such, without disregarding its practical aspects (de Muris and Falkenroth 1992, 29). Tockler's work with Jean de Murs's text is to be interpreted as belonging to the second intellectual frame.

Tockler compiled two different manuscripts for the teaching of speculative music in Leipzig, both in 1503. One of the two texts is a one-to-one copy of Jean de Murs's *Musica speculativa* (Tockler 1502–1506, 124r–36r). Apparently Tockler had at his disposal the longer version of the work, which includes the introduction of the original author (de Muris and Falkenroth 1992, 77–91). In the other manuscript (Tockler 1502–1506, 139r–54r), Tockler did not copy Jean de Murs's introduction but chose instead to add a few pages before the beginning of the first proposition (Tockler 1502–1506, 139r–140v). These pages contain the fundamental concepts of musical research in the spirit of Pythagoras (ca. 570–ca. 495 BCE), as explained at length already in the fourth century by St. Augustine (354–430) in the first book of his *De musica* (Heilmann 2007, 267–71).[14] With the title *Musica est scientia recte modulandi*, Tockler connects in this text the purely mathematical and numerological meaning of music in the ancient context with the more modern attention, expressed by Jean de Murs, on the technical aspects of music notation, which developed as a result of the advent of the polyphonic musical style in the late Medieval period (Marongiu 2012, 29–70).

[13] For a critical edition of Jean de Murs's *Musica speculativa*, which however is not informative concerning the scientific content of the work, see (de Muris and Falkenroth 1992). Apparently, Jean de Murs decided to write his text, which is an abridge of the one of Boethius, as a reaction to the decline of interest in the formation on music theory. Such a decline was due to the embedment into the teaching of further Aristotelian texts. In one of these, *De caelo*, Aristoteles developed a physical argument against cosmological harmony (Aristoteles and Stocks 1922, Book 2.9). Such an argument, according to which the physical sound of the spheres cannot exist, had a profound impact and certainly meant the beginning of the declining phase of such a study. Nevertheless, a more mathematics-oriented interpretation of the *musica mundana* came back on the agenda, apparently, also in the frame of teaching, at the end of the fifteenth century as a consequence of the re-emerging Platonism. For more information, see (Haar 1960, 299–328; Břenková 2015).

[14] The introduction of Tockler's manuscript shows a paraphrased extract from the first of the six books of St. Augustine's *De musica*. Most of St. Augustine's work investigates the relation between rhythm, grammar and linguistic metric. *De musica* circulated widely during the late Middle Ages and, at the time when Tockler prepared his manuscript for teaching, the first print of the entire work was already accomplished, namely in 1491 in Venice by the printer Dionysius Bertochus.

The order and function of the two texts for teaching remains somewhat unclear, though the temporal difference might only be a matter of months. What is sure is that the colophon of the mixed manuscript shows that this was the text for the public lectures Tockler evidently delivered in Leipzig. This is again a clean text without emendations and accompanied by hand-colored mathematical diagrams. In spite of this attention and in order to achieve an elegant copy, the manuscripts do not seem to show any original work of Tockler on this subject apart perhaps from the composition of de Murs's text with an extract of St. Augustine's *De musica*.[15]

3.4 *A Commentary on Georg von Peuerbach's* Theorica planetarum

In 1505, Tockler completed a further substantial step of his research agenda with the final compilation of a dense commentary on Georg von Peuerbach's (1423–1461) *Theorica planetarum* (Peuerbach 1474; Tockler 1502–1506, 57r–120v). Only one copy of Tockler's own manuscript is preserved. It clearly shows that this text was also intended for publication, as it contains only a few emendations.[16] The title page contains a mention of the University of Leipzig, indicating that this text was also conceived for teaching purposes. In addition, the commentary is preceded by an introduction to arithmetic to assist the younger students. This introduction to arithmetic does not coincide with either of the two printed texts on arithmetic mentioned above. It nevertheless shows clear similarities with the one entitled *Commentatio arithmeticae communis* (Tockler 1503a).

Consistent with the Ficinian approach that correlates theological aspects to the reality of objects, Tockler chose to support his agenda by making use of a mathematical astronomy that was perceived as having a strong ontological value (Chap. 6). The orbits of the planets as described by Peuerbach were in fact considered real spheres and not mere mathematical constructs useful for the determination of the positions of the planets but deprived of any reality (Barker 2011; Malpangotto 2016).

That this work was intended as a further expansion of the Ficinian program is declared by Tockler in the letter of dedication to George, Duke of Saxony, by means of which he opens the text (Tockler 1502–1506, 58r–59v). After having explained that astronomy is a science based on the accomplishments of Ptolemy (born 100 AD), Tockler mentions that astronomy is especially important for understanding the behavior of the sun and moon, and in particular because "*Sol est rex celi / statua Dei*." This is a clear paraphrase of the title of chapter nine of Ficinus'

[15] As Tockler's texts on speculative music have not been taken into consideration while preparing the critical edition of Jean de Murs's *Musica speculativa*, it cannot be excluded that a closer inspection of the manuscripts would reveal original variations by Tockler inserted into the body of de Murs's text.

[16] Unfortunately, no critical edition has been accomplished to date in the case of Tockler's commentary on Peuerbach's *Theorica planetarum*.

De sole—Sol statua Dei. Comparatio Solis at deum—, which is then drawn into a long disquisition concerning the influence of the planets on the four elements which constitute everything in the sublunar world (Ficinus 1493, chap. 2; Garin 1952, 990).

Tockler's basic agenda had therefore already taken shape by 1505. The sun, which is the representation of God, is the dominant planet. Its influence is literally irradiated, following clear rules that are expressed geometrically (as taught by Peckham). The sun and the other planets exert an influence not directly on human beings or inanimate objects, but on their constituents, that is, the elements. Following Tockler's dedication letter to the commentary on the *Theorica*, this influence can take very different forms. Ranging from fire to earth, Tockler expresses the influence on both material and psychic aspects of life. The focus, however, is almost exclusively on medical matters, which represent the frame in which and the reason why, according to Tockler, students needed to learn how to calculate the positions of the planets.

After the dedication letter and the introduction to arithmetic, the 55-folio-long commentary on Peuerbach follows. This is sumptuously enriched by a series of hand-colored diagrams and, as mentioned, lightly spotted by some emendations. One of them seems to be of particular relevance, because it is to be found in other texts, as discussed below. The emendation concerns the reference Tockler made to Ptolemy's *Almagest*. Throughout the entire manuscript, such reference is substituted by the reference to Regiomontanus's (1436–1476) *Epitoma Ioannis de Monte Regio in Almagestum Ptolomei*, published for the first time just 9 years before Tockler finished this commentary (Regiomontanus 1496). When the references were specific to certain sections of the work of Ptolemy, however, they were not changed once the substitution took place. This seems to indicate that Tockler was initially using Peuerbach's and Regiomontanus's works as if it were Ptolemy's work itself. This peculiarity is strongly connected to the transformation that took place between the publication of Tockler's two commentaries on the *Sphaera* of Sacrobosco, published respectively in 1503 and 1509 (de Sacrobosco et al. 1503, 1509).

3.5 *Two Editions of a Commentary on the* Tractatus de sphaera *of Sacrobosco*[17]

Both editions contain a Latin translation of a work by Thābit ibn Qurra (836–901), known in the Latin tradition under the title *De recta imaginatione spere*. This was originally written around the end of the ninth century and dealt with the construction of celestial lines according to the equatorial, equinoctial, and horizontal references

[17] In the following discussion, it will not be possible to always give precise indications for the passages of the commentaries discussed in this section because the editions do not have page numbers.

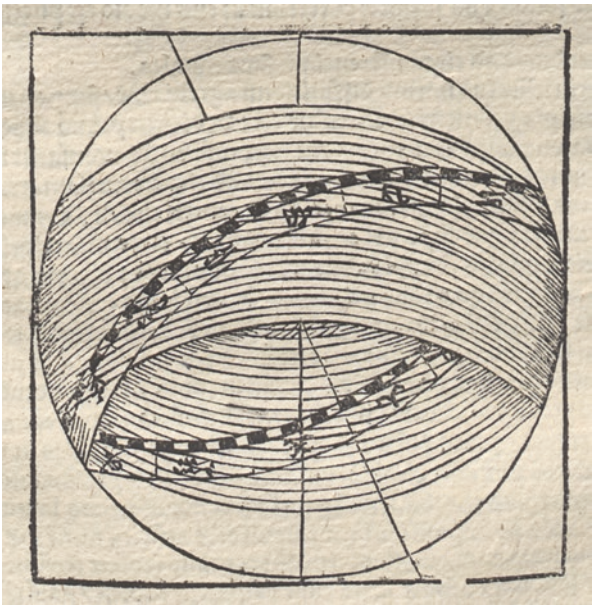

Fig. 5.1 Image accompanying the Latin translation of Thābit ibn Qurra's *De recta imaginatione spere* in both of Tockler's editions of the commentary on the *Sphaera* of Sacrobosco. From (de Sacrobosco et al. 1503, Aiii r). Bavarian State Library Munich, Res/2 A.lat.a. 199#Beibd.5, http://mdz-nbn-resolving.de/urn:nbn:de:bvb:12-bsb00015066-8

(Carmody 1955, 236). (Fig. 5.1). In the corpus of the early modern printed commentaries on the *Sphaera* of Sacrobosco, this text appears three times. The first two appear in the editions of Tockler and the third one in the monumental 1518 Venetian commentary on Sacrobosco's *Sphaera* published by Ottaviano Scoto.[18] Through a comparison between these three texts, it becomes evident that Tockler managed to insert some changes, in particular a short introductory part of the text (*revisus et additus*), though they were not pertinent to the scientific content of the text.

While this text remained fundamentally unchanged between the first and the second edition, the overall work indeed underwent quite a profound transformation. First of all, the second edition contains a short introduction to the whole book, a kind of mission statement. In this text, Tockler draws the attention of the reader to the reason for studying cosmology. He does so by discussing the relationship of astronomy, conceived as mathematical astronomy, and astrology, as the science that investigates the influences and mutations operated by the celestial bodies on the sublunar world.[19] Tockler clearly distinguished them from each other and stated the dependency of astrology on the first. However, he added, both astrologers and astronomers need to begin their studies with the doctrine of the celestial circles,

[18] Ottaviano Scoto was an active publisher between 1479 and 1498. For Ottaviano Scoto's production of commentaries on Sacrobosco's *Sphaera*, see: http://hdl.handle.net/21.11103/sphaera.100310. The *Repertorium* of the medieval texts does not mention the 1503 edition. For more information, see (Schönberg et al. 2012, 4, 3631–32). See also (Carmody 1956, 118–19). Thābit's text was then printed again during the early modern period in 1559, but not in the corpus of Sacrobosco's *Sphaera* (Hasse 2016, 405–06).

[19] For the role and function of astronomy during the early modern period, see (Omodeo 2017).

which is the content of Sacrobosco's *Sphaera*. In this introduction, Tockler also immediately mentioned what he considered the two main masters of these disciplines: While for mathematical astronomy Ptolemy is unsurprisingly mentioned, astrology is placed under the guardianship of Leopoldus *alias* Leopold of Austria.[20]

Leopold's treatise is a compilation of astrological works prepared during the second half of the thirteenth century. The identity of the author remains, however, quite unclear, as it could be ascribed to more than one member of the Dukedom of Austria in the same period. According to Benjamin N. Dykes, Leopold's intention was to create a sort of handy book able to touch on all relevant aspects of the discipline and therefore to allow the reader to acquire a sophisticated knowledge without having to consider the many relevant treatises circulating in the same period.[21] Leopold's book is sub-divided into ten treatises, each of them dedicated to a different subject. The first two are short introductions to cosmology and to the scheme of the motion of the planets (*theorica planetarum*[22]), respectively. Leopold introduces a cosmos consisting of ten spheres. Besides the usual seven spheres for the seven planets, the tenth represents the *primum mobile* and the ninth the one which "shows" the constellations of the zodiacal signs as projected from the eighth sphere, which is the one of the fixed stars. The reason for such a proliferation of spheres is the will to associate a sphere with each detected movement (Chap. 8). The *primum mobile* was therefore associated with the diurnal motion, while the ninth sphere was needed for the movement of the precession of equinoxes, and the eight was seen as showing the movement *traepidatio*, as it had often been called since the twelve century (Nothaft and Philipp 2017; Leopold of Austria and Dykes 2015, 21–24).[23] It is only with the third treatise—a defense of astrology—that Leopoldus's work enters the subject matter.

While Tockler was writing his books, the text of Leopoldus was experiencing a revival because of its *editio princeps*, which was produced in 1489 in Augsburg by Erhard Ratdolt (ca. 1447–ca. 1527).[24] Therefore, Tockler was making use of a text which was old and authoritative and yet new and circulating (at least in his geographic area) at the same time.

Another fundamental difference between the two editions is represented by the insertion of a new text between the first and second chapter of the commentary on

[20] For a modern commented translation of Leopold's treatise, see (Leopold of Austria and Dykes [13th cent] 2015).

[21] For an introduction to Leopold's treatise, see ibid. (Leopold of Austria and Dykes [13th cent] 2015, 1–19). Dykes, however, reaches the conclusion that in spite of this agenda, Leopold's treatise would have appeared too obscure to a reader new to astrology.

[22] Leopold introduced a conception of the sphere of the planets that has similarities with the one developed later by Peuerbach, as each planet is contained in three shell-like orbs.

[23] While Leopold of Austria certainly included the three movements in his cosmological vision, he was nevertheless not completely sure concerning their associations with the spheres. In Prop. 18 of the first treatise, for instance, he admitted that the precession of the equinoxes is associated to the ninth *or* the eighth sphere (Leopold of Austria and Dykes [13th cent] 2015, 24).

[24] For Erhard Ratdolt and his activity concerning the corpus of Sacrobosco's *Sphaera*, see http://hdl.handle.net/21.11103/sphaera.100947

the *Sphaera*. This text is a detailed instruction about the mechanical composition of the armillary sphere (*Ordinatio spere materialis*) (de Sacrobosco et al. 1509, 36r–38r). The text, which is divided into five parts, was prepared in the same year of the second edition, as a separate manuscript found at the Österreichische Nationalbibliothek shows (Schöner and Tockler, 16th cent, 28r–29r). This original contribution of Tockler, which bears the date in the printed text before the second chapter of the commentary begins, was probably meant to be even more extended and to embrace more subjects related to instruments. The above-mentioned manuscript in Vienna indeed contains many descriptions of the construction of solar clocks.[25]

Besides these differences at the level of the structure and design of the book, differences can be noted on a deeper level of analysis. Tockler had his books printed by Martin Landsberg,[26] a pioneer of the new print technology active in Leipzig between 1485 and his death in 1523, and also the owner of an additional bookstore in Frankfurt Oder from 1506 on. As a publisher, he printed eleven books containing the text of Sacrobosco, four of them with only the tract on the *Sphaera* and seven with the tract and a commentary on it. The text of the original tract of Sacrobosco appears in all of them exactly in the same way and accompanied by the same images. When Tockler therefore decided to publish his work, he could count on a publisher, who came from an established tradition. The only task he had to accomplish was to prepare the passages of the commentary and decide where to insert them.[27]

The content of Tockler's commentary follows two major directions. According to the first, Tockler tended to just explain the content of the original work. This is clearly the result of the century-long tradition of commentaries in university textbooks prepared for a class. The other direction is clearly dictated by the wish of Tockler to immediately link cosmological topics with astrological and medical knowledge.

Sacrobosco introduced the subject of the number of cosmic spheres after providing geometric definitions of the sphere at the beginning of the first book. As is well known, the number of spheres for Sacrobosco is nine: the *primum mobile*, the Firmament, and the seven planets. The image connected to this text but inserted in Tockler's commentary indeed reproduces a cosmos comprised of nine spheres, yet where the *primum mobile* contains the sign of the zodiac, which indicates the influence of Leopold's cosmology (Fig. 5.2).

Tockler's commentary on this begins with the statement that the spheres do not move each other in the same way as a body moves another body. There is no bodily

[25] For more information, see fn. no. 2.

[26] For Martin Landsberg and his activity concerning the corpus of Sacrobosco's *Sphaera*, see http://hdl.handle.net/21.11103/sphaera.100808

[27] A close inspection of the images, however, reveals that from time to time the woodblocks were re-shaped after consumption. Moreover, by comparing several of Landsberg's editions, it becomes evident that woodblocks were often turned upside down inadvertently. All editions have the same image on the title page, a very common one depicting an armillary sphere, but in Tockler's 1509 edition it is set upside-down.

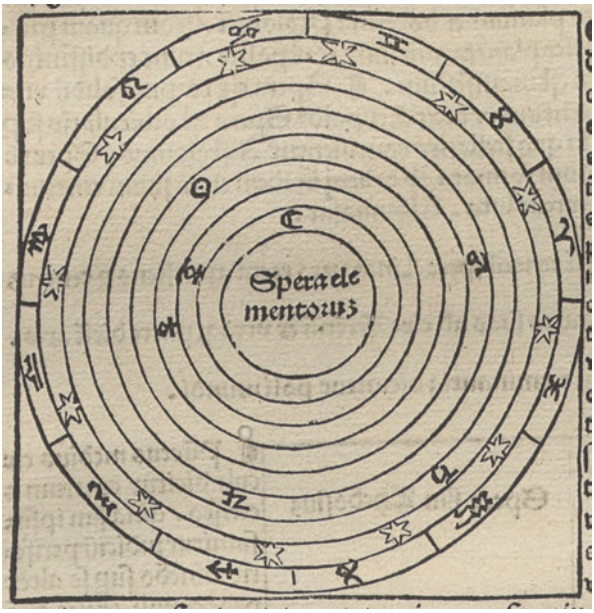

Fig. 5.2 Representation of the cosmos in Tockler's second edition of his commentary on the *Sphaera* of Sacrobosco. The cosmos consists of nine spheres, but the *primum mobile* also contains the constellations of the signs of the Zodiac separated from the Firmament, as influenced by the cosmological view of Leopold of Austria. From (de Sacrobosco et al. 1509, Aiv v). Bavarian State Library Munich, 2 A.gr.b. 213#Beibd.2, urn:nbn:de:bvb:12-bsb00014923-9

contact but rather a spiritual contact, a pure influence. Such influence is nevertheless identifiable with a visible phenomenon, light. Light spreads through the entire cosmos from one unique point, following geometric rules for the concave and convex shapes of the cosmological spheres, as explained in propositions five and six of the first part of Peckham's *Perspectiva communis*. At this point, Tockler's text proceeds with a long enumeration of the kinds of astrological influences that are assigned to each planet, starting from the outermost planetary sphere of Saturn. When it comes to the sun, this is identified with the light source, and for a more abstract explanation of the influence of the sun, Tockler refers to his publication of Ficinus's *De Sole*. The same passage of the commentary then deepens the question of the number of the spheres but does not make any declaration to at least explain the presence of the zodiacal signs on the sphere of the *primum mobile*, separated from the sphere of the fixed stars. Instead, he just informs those wishing to know whether the spheres number nine or ten that this information "*scriptum est in Theoricis nostris planetarum*," referring therefore to his own commentary on Peuerbach's *Theorica planetarum*. Indeed, Tockler discusses the subject in the last page of the handwritten dedicatory letter that accompanies the commentary and specifies that in his opinion, in truth there are nine celestial spheres in the world, while the tenth is the prime mover. In the terrestrial world there are nine spheres of elements, while the tenth is the place of the human beings.[28]

[28] The original text reads: "…in mundo vero celesti sint novem spherem. Decima vero sit primum mobile. In mundo terrestri novem spere elementorum decima sit habitatio hominum." From: (Tockler 1502–1506, 59v).

Tockler never published a description of his vision that there are no less than twenty spheres, ten in the superlunar world and ten in the sublunar one. The curious issue, however, is that he only considered nine of the spheres of the superlunar world celestial, whereas the sphere of the *primum mobile* was just the tenth that carries everything.[29]

In connection with the discussion concerned with the number of the sphere in the first chapter of his commentary, Tockler uses the opportunity to introduce the first relevant aspects of astrological medicine, namely, the theory of critical days as attributed to Galen.

After the description, then, of the major circles of the astronomic sphere, in chapter two Tockler inserted a long commentary to explain the fundaments of astrological medicine, namely the knowledge that connects cosmology, astronomy, meteorology, and medicine. This would then turn out to be the background against which works such as *practica* could be compiled.[30] Tockler attributes the paternity of this knowledge to Avicenna (ca. 980–1037).

If astrology was Tockler's main interest since the very beginning, and he stated this explicitly in the first edition of the commentary, one still observes significant changes between the first and second editions. The most relevant one is probably due to the fact that at the time of the first edition, Tockler had not yet have worked throughout Peuerbach's *Theorica*. As a matter of fact, the second edition is decidedly more advanced from the point of view of mathematical astronomy. In spite of the fact that the two commentaries, if compared page by page, look almost identical, Tockler actually reworked the entire text line by line. Many passages and tables were taken out and replaced or modified, especially those containing the values of astronomic observations and explanations of the motions of the single planets.[31]

This improvement is moreover demonstrated by a radical change to which sources the text mentions. Beyond the fact that Peuerbach's text was completely absent in the first edition, several corrections show that Tockler underwent an impressive period of study in the intervening years. In his works, Tockler was extremely generous in displaying his sources. Ancient as well Arabic sources in astronomy and astrology show his wide spectrum of interests and specializations. Some of them, however, were mentioned with great imprecision in the first edition.

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[29] Considering Tockler's vision in its entirety, similarities seem to arise with the vision of Abū Naṣ Muḥammad ibn Muḥammad al Fārābī (ca. 872–ca. 950), who in turn might have influenced the cosmological vision of Robert Grosseteste, another supporter of the ten-spheres and irradiation model. For more information, see (Sparavigna 2014).

[30] For Tockler's activity as a compiler of *practica* and almanacs, see the section below "Works of Astrological Character."

[31] An example of such changes the commentary passages at the end of the first chapter—where Sacrobosco discussed the subject of the diameter of the Earth—can be used for comparison, as all the given dimensions and their respective calculations and results have been changed. An actual example for Tockler's use of Peuerbach's *Theorica planetarum* is in his commentary on chapter two of Sacrobosco's description of the distance between the Zenith and the equinoctial circle. At the end of this passage, Tockler calculates the elevation of the Sun when it enters the sign of Aries, taking Leipzig as point of reference.

For instance, Tockler makes extensive use of Muhammad ibn Zakariya al-Razi's (854–925) medical *Aphorisms*, which he erroneously cites in the first edition under the name of the Caliph Al-Mansur (714–775). As in the case of the manuscript of Tockler's commentary on Peuerbach's *Theorica*, all mentions of Ptolemy's *Almagest* that can be found in the first edition of the commentary were replaced in the second with mentions of Regiomontanus's *Epitoma*.

Concerning Tockler's teaching on the *Sphaera*, there remains an anomaly that deserves some attention. It concerns Tockler's own annotated copy of another edition of Sacrobosco's treatise, published in Venice in 1499 and still preserved at the Library of the University of Leipzig.[32] As Tockler's annotations on the back of the cover show, he was using this book to teach at least during the years 1506 and 1507. Considering the year of the first edition of his own commentary, this anomaly could be explained by the hypothesis that no copy of his 1503 treatise was available on the market anymore. A second hypothesis would be that he did not have his own library to rely upon because of the pestilence that was claiming victims during those years in the area of Leipzig. One of the annotations dated 1507 indeed specifies that he had been teaching on the *Sphaera* in the Lecture Hall on Ritterstr., which was a place used for teaching during outbreaks of pestilence. Tockler also wrote that, in spite of the plague, sixty-four students attended his class.[33]

The 1499 Venetian edition possessed by Tockler was published by Simone Bevilaqua,[34] and contains the commentaries on *De sphaera* of Sacrobosco by Cecco d'Ascoli (1257–1327), Francesco Capuano di Manfredonia (15th cent.) (Chap. 4) and Jacques Lefèvre d'Étaples (ca. 1455–1536) (Chap. 2). From the analysis of the annotations, which were somewhat extensive only in connection with Cecco d'Ascoli's commentary, it seems that Tockler was not at all interested in any of the commentaries printed in this edition. The annotations' function is clearly descriptive of the content of the original text of Sacrobosco. Cecco d'Ascoli's commentary is indeed elegantly printed around the original text of Sacrobosco, which is in turn set into boxes at each page and printed with a greater font size and line spacing. Tockler's handwriting can only be found among the lines of the original text and at the margins of the page, at the height where the original text is set on the printed plate. In the original text, he added some words to slightly expand the content,[35] while at the margin he added explicative texts which do not correspond in any way to the commentaries he printed in his own editions.

Although a more systematic analysis might reveal further aspects of it, this historical source poses the question of the relation between the lecturers' own

[32] For Tockler's annotated copy of this edition of the *Sphaera*, see Footnote 6.

[33] According to the habit of the time, this note was first written on a piece of paper and then glued onto the book. A reproduction of Tockler's note is published in (Sudhoff 1909, 87–88, Tab. XVI).

[34] For Simone Bevilaqua and his activity concerning the corpus of Sacrobosco's *Sphaera*, see http://hdl.handle.net/21.11103/sphaera.100340

[35] An example is the last part of the last sentence of the famous *proemium* of the text. This reads: "…& de causis [de sole et lune] ecclypsium," where "de sole et lune" is the handwritten addition of Tockler.

commentaries and the real content of their teaching. As mentioned, however, the use of this source might have been due to exceptional circumstances and as such might not be entirely representative. For sure, it shows the depth of Tockler's dedication to his teaching activity.

3.6 Textbooks on the Calendar and Mean Motions

The last two works in the series of Tockler's textbooks were both published in 1511 (Tockler 1511a, 1511b). The first was a work on the calendar—a canon to define the solar and lunar cycles and to pre-determine the movable feasts—and the second on a canon to determine the mean motions of the sun and the moon, as well as of the five remaining planets. Both booklets were printed by Martin Landsberg with a note on the title page that they were meant to be 'read in public' (*publice lecti*), clearly indicating that they were intended for university teaching. A closer look reveals that these texts were supposed to accompany mathematical instruments by means of which both the determination of the movable feasts and of the position of the planets could be easily achieved.[36] According to Tockler's description, these instruments were volvelles. Unfortunately, the instruments are not included in the books, either in the form of drawings or of diagrams to be cut out and recomposed.[37] In the case of the canon for the determination of the mean motions of the sun and the moon, however, the appendix shows that it must have been quite a sophisticated volvelle, as 26 scales of measurements are listed. As he stated, Tockler was certainly teaching on the basis of such instruments. However, it is also quite probable that he was using them especially in the frame of his social contacts with the court as a freshly graduated physician and expert on astrology (and therefore on astrological medicine). As a matter of fact, he probably was promoting himself at the faculty of medicine and as a *Rector* by means of these works.

4 Works of Astrological Character

Deepening his skills in calendric calculations and finding the mean motions of the sun and moon was clearly a prerequisite for his compilation of *judicia*, almanacs, and *practica*.[38] Tockler produced a great amount of such works and not all of those which survived could be analyzed here. Ten documents dated between 1503 and

[36] A clear indication of the deictic character of these texts are in (Tockler 1511a, Canon sextus) and in (Tockler 1511b, Canon primum).

[37] A closer look at the collection of mathematical and astronomic writings (Schöner and Tockler 16th cent.) might reveal some of these instruments.

[38] For a description of the genres *judicia*, almanacs, and *practica*, and a discussion about their emergence, see (Kremer 2017).

1514 were collected for the purpose of this work: one *judicium*, four *practica*, and five almanacs. *Judicia* and *practica* are genres that very much resemble each other. The major difference stems from the fact that while *judicia* were written in Latin, *practica* was the genre developed in German. In spite of the fact that *judicia* and *practica* tended to be very similar, their contents were also modeled according to the audiences these works targeted. The enormous success of the German *practica* between the fifteenth and the sixteenth centuries testifies to a widespread interest in these genres that went far beyond the social boundaries of the *intelligentia*.

Judicia are texts that contain predictions of social and political events, such as wars, pestilences, or important marriages. *Practica* contain the same kind of information but seem to be more focused on information relating to medicine. As an example, Tockler's *practica* for the year 1515 in Leipzig will be closely analyzed (Tockler [1514]) (Fig. 5.3).

The text is constituted of eight folios and the title page bears an image that depicts the main characteristics of the year, which are consequences of the conflict between Mercury and Jupiter. The title itself promises that, after the actual judicial forecast, the reader will find a summary of the *regimen sanitatis* extracted from the work of the *hochberühmten Mayster Avicenna*. The text is organized into chapters, each devoted to a forecast for a particular subject and/or a particular group of people. The first chapter, however, is a sort of introduction that explains the general situation of the configuration of the planets and its influence on the pestilence in Europe and in the region around Leipzig. The following twelve chapters handle subjects that range from 'war' and 'sicknesses' to the harvest of several agricultural products and the fate of *Wanderer* (journeyman years) and virgins. Of course, there are also chapters specifically dedicated to the local authorities, the Pope, and the Roman Catholic Emperor. This section is then followed by one dedicated to a meteorological forecast. This is structured through the series of new moons for the entire year. For each new moon, the date and the kind of weather to be expected are described in detail. The final *regimen* is in turn divided into two further parts. The first is concerned with dietetics and makes direct reference to Avicenna. Here the reader can find, in the form of short statements, useful suggestions on how to maintain a good state of health. The first statement, for instance, suggests moderating the quantity of food and drinks that are ingested. The second section instead summarizes which aspects of Leipzig citizens' health will face particular danger in 1515 according to their Zodiacal sign. Cancers, for instance, were expected to have problems specifically related to their lungs and stomach.

Tockler was also a proud compiler of almanacs. These were leaves of paper that could be put on the wall like modern calendars. The major function of the almanacs was to summarize the information concerning the dates of the major liturgic festivities—the movable feasts—and especially to help the citizens make decisions on each day of the year concerning their health. This was a direct and very practical output of medical astrology and was mostly directed to specific actions and especially to bloodletting, as this was considered one of the most efficient means of maintaining one's health. In his almanac for the city of Leipzig for the upcoming

Fig. 5.3 Title page of Tockler's *practica* for the city of Leipzig for the upcoming year, 1515. The conflict between Mercury and Jupiter dominates the events of the year to come. From (Tockler [1514], fol. 43r). University Library Erlangen-Nürnberg, H61/4 TREW.S 83/119#88, https://nbn-resolving.org/urn:nbn:de:bvb:29-bv008943848-9

year of 1507 (Tockler 1506a), Tockler wrote how the almanac should be read (Fig. 5.4). This legend lists ten symbols and their explanations. Each day of the year is then associated with one or more symbols. Their meanings are the following: (a) new moon, (b) first quarter of the moon, (c) full moon, (d) last quarter of the moon, (e) bloodletting in good quantity is recommended, (f) bloodletting is recommended in a moderate quantity, (g) taking a good quantity of medicine is recommended,

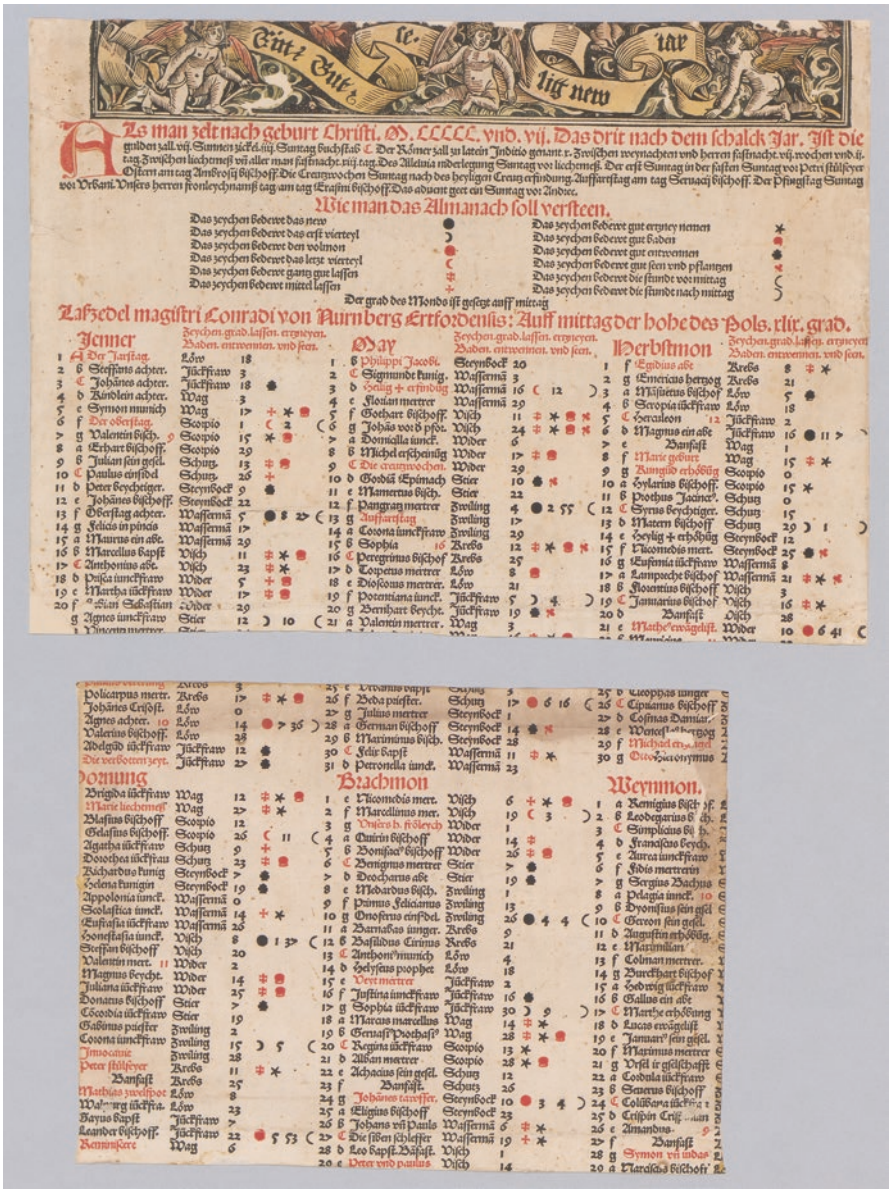

Fig. 5.4 Almanac for the city of Leipzig for the year 1507. The legend "how to read the almanac" is at the top of the leave. From (Tockler 1506b). The National Library of the Czech Republic, Warm fragm. 503

(h) bathing is recommended, (i) appropriate for weaning, (j) appropriate to sow and to plant, (k) during the hours before midday, l) during the hours after midday. The 19th of January 1507, for instance, was the day of the Virgin Martha, the day when Taurus was at the seventeenth degree, and a good day for an abundant bloodletting and taking a bath.

Two further curious aspects concern the spread and the transformation of these works. The first is their language. For the same years and the same city (Leipzig) it is still possible to find the same almanac published by different printers in different languages. For instance, the same almanac for the year 1507 exists also in Czech (Tockler 1506b). This was probably due to the flow of migrants into this region from Czech-speaking territories, bringing many new citizens to this traditionally German-speaking city. Other almanacs are in Latin. This testifies to the great demand for these works and for the consequent fact that Tockler must have been well known in the city. The second aspect to consider is that a comparison with later almanacs, such as the one in Latin for the year 1511, clearly shows that Tockler's level of sophistication in his calculations increased in that the legends increasingly differentiate between quantities and times for each of the mentioned activities.

The last astrological work, already mentioned above, is a collection of 130 astrological statements compiled in 1506 (Tockler 1502–1506, 121r–23r). These statements are formulated so as to have general validity; the text therefore cannot be seen as a *judicia*, as it does not refer to a specific year and is not a forecast strictly speaking. But the subjects are indeed those of the *judicia* and *practica*. Statement number forty-seven, for instance, tells that "Saturn, when it is in its retrograde motion in Libra, creates tensions between rulers from the West and those from the North" (Tockler 1502–1506, 122r). In the colophon it is moreover explained that this work was compiled under commission. One can therefore circumstantially infer that this is a sort of compact and handy summary of the basics of judicial astronomy, apparently a subject in which the Duke of Saxony was particularly interested.[39]

This text was compiled in the same year Tockler prepared the commentary on Peuerbach's *Theorica*, and both texts are dedicated to George, the Duke of Saxony. These are, however, not the only common characteristics. As a matter of fact, the first statement reads "*Sol est rex celi: statua dei*" (Tockler 1502–1506, 121r). Thus, the Ficinian program of identifying the sun with the principle of the life of the cosmos is once again at the core of Tockler's agenda.

5 Tockler's Research Agenda in its Social Context

At a very early step of his intellectual and social career, Tockler had already laid the fundaments for his entire research agenda. With the re-publication of Ficinus's *De sole*, only nine years after the original publication, Tockler showed that he had a clear idea of his interests. In particular, it was Ficinus's ontology, the requirement that any effect must be associated with a corporeal substance and a natural phenomenon, that served as a basis for Tockler's move into natural theology, within whose

[39] Tockler's text of astrological statements is clearly compiled following the example of the so-called *Ptolemy's Centiloquium*, an extremely influential text on astrology often also used in teaching. For more information, see (Sela 2003, 321).

bounds he sought to scientifically determine the fate of the cosmos and of human beings.

Peckham's geometry of light—the material means of the diffusion of God's will through the movements of the celestial bodies—and its dynamic principles, according to which strong or weak effects on the sublunar world could be defined, turned out to be the perfect instrument for investigating how cosmological influences operate. However, this step required an increasingly sophisticated mathematical astronomy, which was offered by Peuerbach's *Theorica* and its ontological assumption of the planetary orbs' reality.

All of Tockler's texts were also conceived for his lecturing activity at the university. In this context, it is easy to understand why he also relied on the mandatory commentaries on Sacrobosco's *Sphaera* to pursue his objective of closely connecting cosmology, astronomy, medicine, and astrology. The *Sphaera* was a duty and an opportunity at the same time, and after the mathematical turn of 1506, a new updated edition turned out to be necessary.

There is a clear continuity between his public role and his scientific agenda, which also included other fields, such as speculative music and theory of numbers. Clearly Tockler was not interested in any practical use of arithmetic (rather called 'logistic') or of music. His interest was directly only toward the cosmos and therefore to the series of arithmetical proportions needed to understand the *musica mundana*, the harmony of the cosmos that could only be conceived mentally, not listened to.

The collection of astrological statements rounds off the public profile of Tockler, demonstrating his close relationship to the court and therefore to the city. The intensive work on almanacs and *practica* are the clear effect of this perfect social integration in the intellectual and social tissue of the place where he was active. Through his personal Ficinian program, Tockler was therefore able to embed in one and the same agenda the roles of university teacher and "social" physician, giving general advice on how to conduct a healthy life, advice which was virtually present in any building with an almanac hanging on the wall. Finally, the last works Tockler published, regarding calendars and calculating the means of planetary motions, show that his interest had not changed but his approach was increasingly dictated by the need for a more sophisticated mathematical apparatus, which he did not neglect to impart to his pupils.

6 Conclusions

At first sight, Tockler's intellectual profile looks like a reminiscence of the late Medieval university framework. However, the re-emergence of neo-platonic tendencies eventually gave an impulse to re-visiting the late Medieval doctrines through the lens of astrological medicine and Christian theology (Chap. 3). By comparison, most of the commentaries on Sacrobosco's *Tractatus de sphaera* after the 1530s no longer engaged with astrological and medical subjects. Instead, themes related

to cosmography and geography and to technical developments in the realm of mathematical instruments began to be the dominant subjects at the beginning of the sixteenth century.[40]

The texts of Peckham and Leopold, for instance, as well as those of Boethius and Jean de Murs, the background against which Tockler prepared his own texts, are indeed all compilations either from antiquity or from the early days of the Western university. Nevertheless, Tockler commented on most of them and in this way was able to update their content. In the case of Leopold's treatise, moreover, he could rely on a printed edition that was produced just a few years before he published the first edition of his commentary on the *Sphaera*.

Finally, many further texts that evidently played a major role in his research were all new or relatively new but only recently printed. This is the case for instance for Peuerbach's *Theorica*, the text that probably exerted the most profound influence on Tockler's agenda after Ficinus. At the time of Tockler's commentary on Peuerbach, the original text was only twenty-eight years old. The most relevant cases, however, are those of Ficinus and Regiomontanus's *Epitoma*. Both works were more or less contemporary to Tockler's own, seeing as they began to circulate during his university studies.

To conclude, the case of Tockler makes clear that the lines of continuity between the late Middle Ages and early modern times are stronger than what historians often are willing to admit, and shows that this was also due to the "re-issuance" of medieval works into the market of the printed book. Tockler was completely up to date for the times, in spite of the fact that he was relying on texts that were already older than 100 or even 150 years. Still, from the historical perspective of the corpus of the commentaries on Sacrobosco's *Sphaera*, which reached its apex in the second half of the sixteenth century, the currency of Tockler's work appears to be in steady decline. This was due to the incipient beginning of the decline of astrology as a scientific discipline in the universities and, in a broader sense, to a split between the new practical science of the early modern period and neoplatonic culture.

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[40] For an overview of general scientific tendencies reflected in the transformative process the commentaries of Sacrobosco's *Sphaera* underwent, see (Valleriani 2017).

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