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Instruments and demonstrations in the astrological curriculum: evidence from the University of Vienna, 1500–1530

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ABSTRACT

Historians have used university statutes and acts to reconstruct the official astrology curriculum for students in both the arts and medical faculties, including the books studied, their order, and their relation to other texts. Statutes and acts, however, cannot offer insight into what actually happened during lectures and in the classroom: in other words, *how* and *why* astrology was taught and learned in the medieval university. This paper assumes that the astrology curriculum is better understood as the set of practices that constituted it and gave it meaning for both masters and students. It begins to reconstruct what occurred in the classroom by drawing on published and unpublished lecture notes. These offer insight into how masters presented the material as they did, and why. The paper argues three points: first, the teaching of astrology centered on demonstrations involving astrological instruments: specifically, various kinds of paper astrolabes. Second, the astrological instruction focused on conveying the pragmatics of astrology rather than esoteric, theoretical issues. Finally, astrology as it was taught in the arts curriculum was explicitly intended to provide a foundation for students who would advance to study medicine at the university.

1. Introduction

On the first Thursday in March, 1519, students gathered to hear Andreas Perlach, a young master in mathematics and astrology at the University of Vienna, deliver his opening lecture on almanacs. Perlach began with the basics:

> The Arabic 'Almanac', Latin 'Diale' or 'Diurnale', Greek 'Ephemerides', is a book in which the planets are presented from day to day. Note: each planet and each zodiacal sign has a certain resemblance or likeness to its symbol, which denotes that actual planet, and therefore those symbols are not assigned by chance or accident. Accordingly the symbol of Aries is as follows ♈, which resembles two horns like those of a ram.[1]

In this first lecture Perlach worked through the symbols for the zodiacal signs and the planets. Although the notes end abruptly after Perlach's introductory remarks, they provide a tantalizing glimpse at the astrological curriculum at the University of Vienna, a curriculum that thrived below the surface of officialdom. Perlach's lecture on almanacs occurred on a Thursday afternoon, a time typically reserved for extraordinary lectures. Falling outside the strictly prescribed curriculum, extraordinary lectures offered masters a chance to lecture on and students the opportunity to hear subjects that were not fully treated in ordinary lectures. At the University of Vienna, the students had to pay particularly high fees to hear extraordinary lectures. Masters there supplemented their income through these fees, provided they offered lectures

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[1] 'A magistro Andrea perlachio Stiro Super Almanach collectanea 1519 die jovis ante Esto mihi. Almanach arabum, Diale/Diurnale latinum, Ephemerides grecum est liber in quo astra de die in diem destribunture. Nota Quilibet planeta eciam quodlibet zodiaci signum quandam habent commemenciam [sic] seu similitudinem ad suum characterem qui ipsum denotat non ergo fortuitu et a casu illi characteres impositi sunt. Est igitur arietis character talis qui videtur duo cornua qualia arietis sunt representare' (Andreas Perlach, 'Super almanach collectanea', ÖNB Hss. Cvp S.n. 4265, fol. 307^{v}).

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that would attract students willing to pay those fees.[2] Simply because these lectures were not prescribed, however, did not necessarily make them ephemeral or insignificant. Perlach's lectures in 1519 apparently found a receptive audience and became part of his teaching at the university for the next thirty years. During this time he expanded and refined his lectures on almanacs. In 1551 he published a thick textbook based on his lectures, his *Commentaria ephemeridium*.[3]

The University of Vienna presents something of a puzzle for historians of astronomy and astrology. During the fifteenth century the university was alma mater to Johannes de Gmunden, Georg von Peuerbach, and Johannes Regiomontanus, who were central to developments in astronomy and astrology throughout Europe. Yet there is little evidence of advanced instruction in astronomy or astrology by any of these masters. Historians have expected to find their innovations reflected in the curriculum.[4] However, the flourishing astronomical and astrological activity in Vienna seems to have had little impact on the university. Unlike the universities of Pavia, Bologna and Krakow, the University of Vienna had no chair in astrology.[5] Official documents provide no trace of Gmunden's, Peuerbach's, or Regiomontanus's developments in astronomical and astrological theory and practice. Indeed, the statutes, which prescribed the official courses of study students were expected to attend, suggest that the curriculum had ossified early in the fifteenth century and did not change until the reforms under Archduke Ferdinand in the 1520s.[6] The Acts of the Arts Faculty as well as the Acts of the Medical Faculty are similarly silent regarding any curricular innovations or changes.[7] Although Peuerbach composed what became the most important textbook on astronomy, he lectured on the Latin poets Juvenal, Horace and Virgil.[8] Historians have suggested that the interesting curricular developments occurred 'below the threshold of officialdom'.[9] We can begin to recover the contours of the astrological curriculum by looking closely at students' lecture notes that survive from the early sixteenth century.

During the early decades of the sixteenth century a close-knit group of masters at the University of Vienna were responsible for much of the education in astrology and astronomy there. This group included masters recruited from neighboring universities, such as Johannes Stabius and Andreas Stiborius who came from the University of Ingolstadt, as well as students who had been educated elsewhere but came to Vienna to become university masters, such as Georg Tannstetter. By the second decade of the sixteenth century recent members of this group had been educated at the University of Vienna and had stayed there to teach in the Arts or the Medical Faculties, including Andreas Perlach and Johannes Vogelin. Examining the careers of Andreas Stiborius and Georg Tannstetter through students' lecture notes allow us to begin to reconstruct the astrological and astronomical instruction at the university. These notes reveal a vibrant astrological curriculum that has largely escaped notice. Stiborius' and Tannstetter's lectures reveal the importance of astronomical and astrological instruments in the astrological curriculum, and how these instruments were used as demonstration devices to convey practical knowledge. Finally, their lectures uncover the close interactions between the Arts Faculty and the Medical Faculty, at least in regard to the use of instruments in the practice of astrology.

2. Andreas Stiborius and astrological instruments

Andreas Stiborius began his career at the University of Ingolstadt, where he lectured on astronomical topics, including the use of instruments such as the astrolabe.[10] In 1497 he left his teaching position there and moved to Vienna. Not long after he arrived at the University of Vienna, Stiborius began holding lectures entitled 'Liber umbrarum'.[11] The 'Liber umbrarum' were Stiborius' foundational lectures on various methods of stereographic projection and the uses of astronomical instruments, usually different types of astrolabes. Although he had probably held similar lectures in Ingolstadt, he revised them when he came to Vienna, drawing on information specific to Vienna for his examples. His descriptions and calculations regularly use the south face of the university's tower as a point of reference for the polar elevation, the zenith, the latitude, or other celestial descriptions.[12] These lectures introduced various methods of determining the important astronomical information for any given location and then explained how to use this information to establish the time of day, the rising and setting of constellations, and the degree of the rising sign. The 'Liber umbrarum' also formed the basis for Stiborius' more sophisticated lectures on astrological instruments and played an important role in his larger series of lectures at the University of Vienna. Although he treated summarily the stereographic projection used to make a standard planispheric astrolabe, Stiborius spent most of his time and effort discussing the methods of stereographic projection that underlay various universal astrolabes.

The standard planispheric astrolabe was based on a projection of the heavenly sphere onto a surface coplanar with the equator. Because the visible portion of the sky varies with latitude, such a projection is accurate for only a narrow latitude. Consequently, a standard astrolabe usually had a number of plates for different latitudes, often for specific cities such as Rome, Paris, Vienna, or London. A universal astrolabe, by contrast, relied on a projection of the heavenly sphere onto a plane perpendicular to the plane of the equator. The resulting projection is valid for all latitudes, removing the need for multiple plates for different latitudes. Of the various universal projections, Stiborius was particularly interested in the saphea, which assumed a point of projection infinitely distant on the line formed by the equinoctial points, that is, the line formed by the two points where the ecliptic crossed the celestial equator.

[2] On the importance of the extraordinary lectures and private lectures, especially regarding the income masters could realize from these lectures, see the early statute from Vienna that outlines the fees for some of the extraordinary lectures (Kink, 1854, p. 215). A later statute from 1509 points to other supplementary lectures and the fees associated with them (ibid., p. 317). On the relative difference in fees between Vienna and Paris, see Rashdall (1936), p. 243 n. 1.

[3] Perlach (1551). This textbook represents the culmination of Perlach's long career at the University of Vienna and his lectures on almanacs. He first published a handbook on almanacs in 1518 (Perlach, 1518).

[4] On the developments in astrology and astronomy during the fifteenth century, see Klug (1943); Zinner (1968); Grössing (1983). This literature needs to be consulted with care.

[5] For a recent study of astrological studies at the University of Pavia, see Azzolini (2005).

[6] On Ferdinand's reforms, see Mühlberger (2003, 2005).

[7] On the statutes and the course lists in the acts, see Kren (1983, 1987).

[8] Shank (1996).

[9] Shank (1997), p. 269.

[10] There is little evidence of Stiborius' actual lectures at Ingolstadt (see Schöner, 1994, p. 212).

[11] I have been able to locate only a fragment of these lectures, copied in 1500 by Jakob Ziegler. Zeigler noted at the end of his copy that the original he had used was missing the last section (Andreas Stiborius, 'Liber umbrarum', BSB Clm 24103, fol. 21^{v}). There is no evidence that Ziegler ever studied at Vienna, though he was certainly familiar with the both Stiborius' and Tannstetter's lectures there. In addition to this text, he printed Tannstetter's commentary on Pliny's *Historia naturalis*.

[12] All of Stiborius' examples use data for Vienna. Some of these are quite specific: 'Describatur itaque primo Meridianus secundum gradus declinationis cancri scilicet 27 computatis a meridie ad occasum qualiter est superficies meridiana turris collegij Vienne' (Stiborius, 'Liber umbrarum', BSB Clm 24103, fol. 5^{r}).

By using a saphea, a person could, in principle, make an instrument with a single plate that was valid for all latitudes. The instrument, however, introduced a number of challenges, and despite its apparent advantage, the saphea and related universal astrolabes remained far less common. Just as the theory of stereographic projection that undergirded the saphea was unfamiliar, how to use the saphea to carry out actual calculations was also unfamiliar.[13] For these reasons, Stiborius focused almost exclusively on the different techniques for using universal astrolabes. He explained to the student how to determine the elevation of the pole, how to locate the horizon and the zodiacal houses, how to tell time and to find the positions and the rising and setting times of constellations.[14] Throughout his lectures Stiborius described the various operations as if the students had ready access to an astrolabe, instructing them to place the rule on a particular point and then find where the rule crosses the limb of the instrument, explaining how to inscribe different hour lines on the surface of an astrolabe.[15] It would have been impractical for Stiborius to use a typical, brass astrolabe as a demonstration device in his lectures. Astrolabes were generally too small to be seen from a distance of more than a few feet. Moreover, marking a brass instrument with the reference points he refers to in his lectures would have been difficult. And it would have been prohibitively expensive for each student to have his own brass astrolabe.[16] Instead of relying on brass instruments, Stiborius probably used cheaper, paper instruments in his lectures. It is possible that during his lectures Stiborius gestured to a large, paper astrolabe.[17] Such an instrument could have been colored, as Stiborius claims in a later lecture, and would have functioned well to demonstrate how to move the various parts of an astrolabe.[18] At the same time, Stiborius' students could have easily afforded their own paper astrolabes, which they could have colored according to Stiborius' instructions during his lectures. In this way, Stiborius could indicate clearly what portions of the instrument were to be manipulated while students performed the operations on their own paper astrolabes.

Throughout his career, Stiborius reexamined the advantages and disadvantages of different methods of stereographic projection. His subsequent lectures often contain long discussions on various projections and the usefulness of certain ones over others. Already in his 'Liber umbrarum' Stiborius was looking forward to future lectures: 'All these projections can be variously arranged. Because there are innumerable theories of projection, I intend to write a little book specifically on each of these. Their amazing uses, which up to this point have been described by no one, will be laid out'.[19] The 'Liber umbrarum' provided the foundation for much of Stiborius' later work both in content and in style. Not only did he establish his area of expertise but he also initiated a series of teaching practices that would become standard in his lectures. Stiborius' lectures focused on astronomical instruments and consistently relied on such instruments as demonstration devices in those lectures.

Despite the importance of the 'Liber umbrarum' for Stiborius' larger project, and whatever popularity these lectures might have enjoyed, Stiborius' lectures did not appear on the official lecture lists compiled at the beginning of each year. Moreover Stiborius himself did not seem to occupy an important position at the university.[20] His lectures on astrolabes, however, continued a long tradition of lectures on astronomical instruments stretching at least as far back as the 1430s when Gmunden lectured on the astrolabe.[21] Stiborius' 'Liber umbrarum' also must have enjoyed some popularity. Masters at the University of Vienna relied heavily on income provided by students who attended private or extraordinary lectures. Since Stiborius' 'Liber umbarum' did not appear on the lecture lists, it seems likely that he lectured on astronomical instruments in private or extraordinary lectures.[22] Everything changed in 1501 with the founding of Conrad Celtis's *Collegium poetarum et mathematicorum*—a graduate faculty at the university. Stiborius was appointed to one of the two chairs in mathematics and astronomy at the *Collegium*. Two years later he was appointed to a chair in the *Collegium ducale*. By 1503 Stiborius had become one of the rising stars of the University of Vienna, with appointments in two colleges and his pay coming directly from the imperial coffers.[23] Stiborius wasted no time and quickly developed a series of lectures that expanded his treatment of astrolabes that he had begun in his 'Liber umbrarum'. He would continue these lectures throughout his career at the university.

Perhaps as early as 1504 Stiborius had completed at least one new set of lectures, his 'Canones astrolabij'.[24] In these Stiborius turned his attention back to the standard astrolabe and its uses. He began simply enough, laying out the basic techniques needed to carry out more complicated calculations. He treated fundamental astrological topics such as locating the sun and the planets as well as determining the four cardinal points—the ascendant, *medium coeli*, descendent, and *imum coeli*—and the remaining horoscopic house divisions. He also covered various time-telling conventions in use

[13] Emmanuel Poulle has tried to explain the discrepancy between the number of texts on universal astrolabes and the near absence of actual universal astrolabes by suggesting that the texts formed an important part of the astronomy education. Stiborius' discussion of the saphea supports this claim (see Poulle, 1969). The lack of popularity of these instruments can be inferred from the surviving instruments in museum collections, which often contain only a handful of universal astrolabes while they list dozens of standard astrolabes. For example, see the online catalog of astrolabes from the Museum of the History of Science (2006). See also the printed catalog from the Adler Planetarium, Webster & Webster (1998); Turner (1985). The Epact online catalog, which combines the instruments from the Museum of the History of Science, Oxford, the Instituto e Museo di Storia della Scienza, Florence, The British Museum, London, and the Museum Boerhaave, Leiden, likewise lists only a few universal astrolabes. Although the universal astrolabe was developed in the Islamic context, the saphea and related instruments failed to enjoy much popularity amongst Islamic makers (see Gibbs & Saliba, 1984).

[14] Stiborius, 'Liber umbrarum', BSB Clm 24103, fols. 1^{v}–7^{r}.

[15] For example, ibid., fols. 5^{v}, 7^{r}, 13^{r}.

[16] If a significant number of students had owned astrolabes, some of those instruments would have to survive. Unfortunately, no metal astrolabe survives that can with any certainty be traced back to this early sixteenth-century Viennese *milieu*. One possible candidate is an astrolabe dated 1521 that resembles Georg Hartmann astrolabes. Accounting for this lack of material evidence presents another challenge for historians. The tentative suggestions offer a tentative solution to this difficulty.

[17] For an extended study of paper instruments and related printed devices, see Schmidt (2006), especially pp. 180–274.

[18] In a later set of lectures Stiborius told his students how to color an astrolabe to correspond to the motion of the four humors (Stiborius, 'Canones astrolabij', BSB Clm 19689, fols. 75^{r}–75^{v}).

[19] 'Haec omnia licet sibi invicem varie commisceri. Ideo proieccionum speculationes sunt inexhaustae de quo seorsum specialiter intendo scribere libellum in quo mirifici usus a nemine hactenus descripti docebuntur' (Stiborius, 'Liber umbrarum', BSB Clm 24103, fol. 13).

[20] The lectures for the upcoming year were distributed at the first faculty meeting each year, in mid-September. These lists are recorded in the Acts of the Arts Faculty. There is no indication that Stiborius was assigned any books. For the lecture lists during Stiborius' tenure at the university, see 'Acta facultatis artium Universitatis Vindobonensis', Vol. IV: 1497–1555', UAW Cod. Ph 9. For an analysis of these lists that extends to the late fifteenth century, see Kren (1983, 1987).

[21] Kren (1987), p. 19.

[22] On the importance of private and extraordinary lectures, see Kren (1983), pp. 21–22.

[23] Grössing suggests that Stiborius along with Georg Tannstetter and Johannes Stabius were the most important members of the 'second Viennese mathematical school' (see Grössing, 1983, p. 174).

[24] Two copies of this text survive, one of which includes the comment: 'et advertens poeta laureatus et Imperatoris Romanorum Maximiliani historiographus atque Cosmographus Joannes Stabius, vir numeri seculi doctissimus'. Stabius was crowned poet laureate sometime in 1503/1504. Stiborius, 'Canones astrolabij Magistri Andree Stiborij boij partim ex veteribus ordinate partim nov invencione additi', BSB Clm 19689, fol. 77^{v}.

and how to convert between them. He recognized that his students were, for the most part, interested in the real-world applications, rather than the theoretical issues that lay behind those applications. Accordingly, he introduced theoretical points only when needed to carry out the desired operation. Stiborius' pragmatic approach is further reflected in the fact that once again he clearly expected all of his students to have access to an astrolabe, or at least a model of one. His instructions for finding the right ascensions of the signs are typical of his approach. He begins by stating the canon, defining the terms, and then explaining how to solve the problem. Stiborius explicitly relies on an astrolabe, instructing the student on how to move various parts and how to read the results from the face of the instrument.[25]

Throughout Stiborius concentrated on how to use an astrolabe to solve a wide range of practical, astrological problems, such as determining the true ascendant at the time of an election or conjunction, dividing the zodiac into houses, and predicting the motions of the humors. At least one of his students was excited by Stiborius' lectures and recognized their immediate applicability to astrology, noting in the margin of his text that these applications 'were not found in previous treatises and will be useful for judgments'.[26] Stiborius' originality here was not as great as he suggested, though he did strive to bring together operations that were spread throughout a rather broad literature. More importantly, Stiborius was foregrounding instruments in both his own teaching and in the practical tasks of astrologers and physicians.[27] He explicitly linked his lectures to other courses at the university, drawing attention to topics that his students would encounter again during their time at the University of Vienna. When he pointed out that a physician could use an astrolabe to predict the flux and reflux of humors or to determine the critical days of a disease, he was saying little that was new—astrology had long been used to predict the course of diseases and humors.[28] He did, however, draw attention to the astrolabe as a means of facilitating prognosis, and he provided his students with a preview of topics they would encounter in a few years in Georg Tannstetter's lectures on medical astrology. Indeed, Tannstetter's students would have been well advised to return to their notes from Stiborius' class, where they would find detailed instructions for employing an astrolabe in medical practice.[29]

Stiborius' lectures on standard astrolabes provided his students with the foundation necessary to advance to more sophisticated and complex astrolabes, namely universal astrolabes. Stiborius presented the first of these in his lectures 'Canones saphee'. Although the saphea had been known for nearly three centuries, it had never enjoyed the popularity of the standard astrolabe, which provided simple solutions to the most common tasks astrologers needed to accomplish. Stiborius recognized that his students would most likely be unfamiliar with the saphea and so opened with a brief definition, history, and justification of the instrument.[30] He emphasized the advantages offered by the saphea, pointing out that it solved terrestrial problems as well as celestial problems, and that the range of problems could be extended when the saphea was fitted with a special rule and a type of rete, that is, a map of the stars that rotates about the center of the instrument to indicate the positions of the stars in the sky.[31]

When he turned to the substance of his lectures, Stiborius remained sensitive to the fact that his students might be unfamiliar with the saphea and went to great pains to present the various operations in a logical progression of increasing complexity. He began with those tasks that could be solved simply by using the face of the instrument. These canons occupy only a small section of the lectures and focus how to tell time, to determine the rising and setting time of the sun, or to calculate the distances between towns.[32] When fitted with a rete and moveable zodiac, however, the saphea became a handy astrological tool, useful for quickly calculating the rising time of signs, the mundane houses, and the ascendant, as well as determining the *medium coeli*, and the positions of the constellations.[33] Stiborius concluded his lectures with a list of alternative methods for finding the cardinal points of a horoscope, dividing the zodiacal houses, and adjusting the significator in order to determine critical days and to cast elections.[34]

These canons depended not only on the earlier ones presented in these lectures, but also on Stiborius' previous lectures on the 'Canones astrolabij', and 'Liber umbrarum'. At times he simply referred his student to his former lectures for a detailed treatment of some point or other.[35] The close relationship between Stiborius' lectures was not lost on his students, some of whom bound their lecture notes together in the appropriate order for easy reference.[36] The series of lectures Stiborius developed at the University of Vienna focused on the astrological uses of various types of astrolabes. Throughout his lectures he refers to astrolabes to illustrate particular operations, and he instructs students to manipulate their own astrolabes. Although instruments were at the center of Stiborius' lectures, he clearly understood them as astrological tools. Whether or not he was the only master at the university at that time lecturing on astrological instruments, Stiborius was continuing a long tradition in Vienna that situated astrolabes and related instruments at the center of astronomical and astrological teaching. In the 1430s, Johannes de Gmunden lectured on astrolabes while Johannes Angerer de Mülldorf lectured on the Richard of Wallingford's albion. A decade later Martin Hemerl was again lecturing on astrolabes.[37] Regiomontanus extended their work in his lectures on various astrological instruments.

Although Stiborius' status at the University of Vienna continued to improve during his tenure there, he failed to appear in any of the official course lists or lectures.[38] His official absence neither

[25] Ibid., fol. 73^{v}.

[26] One student placed the following heading at the beginning of the second part: 'Secuntur utilitates addite A. Magistro Andrea Stiborio que in antequis exemplarijs non habentur et iudiciarie deservient' (ibid., fol. 74^{v}).

[27] One of the main points in Jim Bennett's recent article is that astrolabes and indeed most instruments in the sixteenth century were instruments of 'doing' rather than 'knowing'. By that he tries to emphasize the fact that instruments were practical devices aimed at providing a solution to a problem or response to a particular question (see Bennett, 2003, esp. pp. 135–136). For a discussion of the changes in expectations about instruments, see also Warner (1990).

[28] On the relations between astrology and medicine, see in general Siraisi (1990), esp. Ch. 5; O'Boyle (1991, 2005); French (1994); Azzolini (2005).

[29] For example, Stiborius, 'Canones astrolabij', BSB Clm 19689, fols. 75^{r}–76^{r}.

[30] All three surviving copies of this text begin with exactly the same passage. See, for example, Stiborius, 'Canones saphee', BSB Clm 24103, fol. 22^{r}.

[31] Stiborius, 'Canones saphee', BSB Clm 19689, fol. 293^{v}.

[32] Ibid., fols. 297^{v}–306^{r}.

[33] Ibid., fols. 306^{r}–308^{r}.

[34] Ibid., fols. 308^{r}–312^{r}.

[35] For example, '… de quibus latius in canonibus astrolabij et libris meis umbrarum mencionem feci' (Stiborius, 'Canones saphee', BSB Clm 19689, fols. 311^{v}, 312^{r}).

[36] The surviving copies of Stiborius' lectures are bound in the order in which the students would have attended them: BSB Clm 19689: 'Canones astrolabij', fols. 67^{r}–84^{r}, 'Canones saphee', fols. 292^{v}–316^{r}, 'Canones super instrumentum universale', fols. 317^{r}–322^{v}; BSB Clm 24103: 'Liber umbrarum', fols. 1^{r}–21^{r}, 'Canones saphee', fols. 22^{r}–34^{r}, 'Canones super insturmentum universale', fols. 35^{r}–38^{r}; BSB Clm 24105: 'Canones saphee', fols. 69^{r}–84^{r}, 'Canones super instrumentum universale', fols. 85^{r}–88^{r}.

[37] Kren (1983), pp. 19–20.

[38] Although the Acts fail to record the lecture lists for various years after 1500, Stiborius fails to appear in any of the official lists. It seems reasonable to infer that his lectures never formed part of the prescribed curriculum.

deterred students from attending his lectures, which were probably given as extraordinary lectures, nor affected his reputation.[39] Jakob Ziegler, renowned for developing an historical geography, was interested enough in Stiborius' lectures to copy out the version he was able to acquire, even though he feared that it was incomplete.[40] The famous Swiss humanist Joachim Vadianus, likewise, guarded his copy of Stiborius' 'Canones astrolabij', taking it with him from Vienna when he returned home to St. Gallen.[41] And more than forty years after Stiborius' death, Joachim Rheticus praised his accomplishments in developing various instruments and astronomical machines.[42]

Although Stiborius concentrated on different types of astrolabes, he recognized that instruments formed only one part of the larger practice and teaching of astrology.[43] He admitted that in order to understand his lectures, students would also have to know and understand the theories and causes of celestial motions and phenomena. Indeed, he characterized his own work on instruments as built upon this foundational body of knowledge, exemplified in the work of his younger colleague and one-time student Georg Tannstetter. In his second prefatory letter, this one to Tannstetter's edition of Regiomontanus's *Tabulae primi mobilis*, Stiborius explicitly states that all his work on instruments is dependent on Regiomontanus's tables and calculations:

> Likewise, innumerable instruments depend on this knowledge of the primum mobile: the astrolabe, saphea, organum ptolomei, meteorscope, armilary sphere, torquetum, rectangle, equatoria, compass, quandrant and many other similar types. Oh how splendid, how noble, how necessary for all students of astronomy, just as the alphabet is preliminary knowledge, without this nothing is finished, nothing accomplished in this preeminent discipline of astronomy. Therefore, you who are a true friend of the heavens, take these tables produced and printed with diligence and solicitously by my dear colleague Georg Tannstetter.[44]

Stiborius' closing statement was more than just hollow praise. By this time, he and Tannstetter had long been colleagues and close friends. Their relationship had begun when Tannstetter studied under Stiborius at the University of Ingolstadt.[45] Their friendship continued when they both moved to Vienna, where they worked together throughout their careers at the University of Vienna.[46] Tannstetter's interest in the theoretical and calculational facets of astrology offered the perfect complement to Stiborius' concentration on instruments and observations.

3. Georg Tannstetter, editor and lecturer

Georg Tannstetter arrived at the University of Vienna in 1501. His move to Vienna was, like Stiborius', precipitated Emperor Maximilian I's efforts to revive the university. Stiborious seems to have helped Tannstetter obtain his initial appointment in the Arts Faculty.[47] Tannstetter quickly established a reputation as a talented mathematician, especially as applied to the problems of astronomy and astrology. By 1505 he had taken over the task of producing yearly *judicia* and wall calendars.[48] Tannstetter's lectures, however, rarely appeared in the official lists of ordinary lectures compiled at the beginning of the academic year.[49] Twice he agreed to lecture on the *Theorica planetarum*, once as a young new faculty member in 1505 and again in 1511, as an established master at university.[50] Although the Acts of the Arts Faculty do not indicate which version of the *Theorica* Tannstetter had selected, a few facts suggest that he probably intended to lecture on Peuerbach's *Theorica planetarum nova*.

First, Tannstetter closely annotated his copy of Albertus de Brudzewo's *Commentum in theoricas planetarum Georgii Purbachii*, which was published in 1495 and quickly became the standard commentary on Peuerbach's treatise.[51] Furthermore, by the mid-1510s Tannstetter assumed that his students would be familiar with Peuerbach's *Theorica*, casually citing or quoting the text a number of times in his own lectures.[52] Finally, perhaps sensing a lack of readily available editions of Peuerbach's *Theorica*, Tannstetter produced in 1518 a small, affordable edition of this text paired with Sacrobosco's *De sphaera*.[53] This book was clearly intended for use in the classroom, combining Sacrobosco's more elementary text with Peuerbach's more advanced text. Any student wishing to progress in the

[39] Claudia Kren suggests that the official lectures at the University of Vienna reflect only a small portion of the activities of masters there. Michael Shank reiterates this claim in his discussion of astrological consulting at the university in the late fifteenth century (see Kren, 1983; Shank, 1997).

[40] Ziegler's copy of the 'Liber umbrarum' is today in BSB Clm 24103, fols. 1^{r}–21^{r}.

[41] Vadianus's copy of the 'Canones astrolabij' is found in KBV Vadianische Sammlung, MS 66, fols. 43^{r}–83^{r}.

[42] See Rheticus's dedicatory letter to Emperor Ferdinand I in his edition of Johannes Werner, *De triangulis sphoericis libri quatuor. De meteoroscopiis libri sex* (Rheticus, 1557).

[43] There is some evidence that Stiborius' interests ranged rather broadly. The most significant of this is found in Georg Tannstetter's 'Viri mathematici' that he added to his 1514 edition of Peuerbach's *Tabulae eclipsium*. Tannstetter groups Stiborius' works into six categories: perspective, geometry, astronomy, arithmetic, metaphysics, and magic. On Tannstetter's 'Viri mathematici', including the text and a German translation, see Graf-Stuhlhofer (1996), pp. 154–171.

[44] 'Pendent item ex hac primi mobilis scientia instrumenta pene infinita. Astrolabium: saphea: organum Prolaemei: metheoroscopion: armilae: torquetum: rectanguls: aequatoria: compassi: quadrantes: & alia id genus multa. O quam ampla: quam nobilis: quam necessaria omnibus astronomiae studiosis: & tanquam alphabetaria & præliminaris scientia. sine qua nihil perfectum: nihil consummatum in hac astronomica præcellenti discplina. Age igitur quisquis es cœli verus amator has tabulas ductas diligentia & sollicitatione confratris mei charissimi doctoris Georgii Tannstetter impressioni datas' (Stiborius, 1514, sig. AA3v).

[45] On the relationship between Tannstetter and Stiborius at the University of Ingolstadt, see Schöner (1994), pp. 255–261.

[46] For example, they co-authored a work on calendar reform, undertaken at the emperor's request and published in 1514 (Stiborius & Tannstetter, 1514).

[47] Tannstetter had intially been allowed to examine students before being appointed a master in the arts faculty. See 'Acta facultatis artium', UAW Cod. Ph 9, fols. 4, 30^{v}, 32^{v}.

[48] The emperor charged the university with the task of producing the annual wall calendars, probably with the expectation that Tannstetter would be responsible for completing the task. Tannstetter composed wall calendars and complementary *judicia* and *practica* for over two decades, until the late 1520s.

[49] Graf-Stuhlhofer has tried to explain the lack of evidence for Tannstetter's teaching by arguing that he was, in fact, part of Celtis's *Collegium poetarum et mathematicorum*, and that after Celtis's death in 1508 Tannstetter continued to lead this college until the late 1510s. See Graf-Stuhlhofer (1996, 1999, 1981, esp. p. 28).

[50] 'Acta facultatis artium', UAW Cod. Ph 9, fols. 4, 41^{v}, 75^{v}. It is possible that he lectured on this text earlier, but there is no record of it. The Acts of the Arts Faculty fail to report booklists for a number of years in the early sixteenth century, for example, between 1502 and 1505 the Acts contain no booklists.

[51] This book, along with fifteen other texts from Tannstetter's library, was acquired by the rare book dealer, H. P. Kraus in 1966. All these texts were bound together in a sixteenth-century binding until H. P. Kraus separated them and sold the individual tracts. Tannstetter's copy of Brudzewo was purchased by Columbia University, where it remains today. For a description of the original Sammelband, see Kraus (1971), pp. 112–115. See also H. P. Kraus's sale catalog, Kraus (1973), nos. 1, 2, 4, 5,10, 12, 14, 17, 65, 71, 73.

[52] In his lectures on ephemerides, Tannstetter cites Peuerbach no less than six times, often quoting the *Theoricae*. See, for example, Georg Tannstetter, 'Georgij Collimitij Dictata in Ephemerides', KBV Vadianische Sammlung, MS 66, fol. 28^{v}.

[53] I follow Graf-Stuhlhofer here, and before him both Günther and Aschbach, in ascribing this text to Tannstetter. Although his name does not appear on this text anywhere, he is most likely the editor. Like a number of his other works, it was paid for by Lucas Alantse, Bishop of Vienna and long-time supporter of the various mathematical disciplines at the university. Tannstetter's coat of arms appears on the colophon along with the same woodcut that adorns his 1514 edition of Peuerbach's *Tabulae eclypsium*. There is little work on Alantse and his brother, Leonard, who funded so many of the texts produced by the masters at the University of Vienna. A full study of these two men would be an enormous contribution to our understanding of the development of the mathematical disciplines at the University of Vienna in the opening years of the sixteenth century. For a brief treatment of these interesting figures with a partial list of the books they paid for, see Denis (1782), pp. xix–xii.

study of astrology and astronomy would first work through these texts. In fact, students in the arts curriculum at the university were still using this edition well into the middle of the century.[54] In all likelihood, then, Tannstetter had selected Peuerbach's *Theorica planetarum nova* to lecture on in 1505 and again in 1511.

Beyond these two instances, Tannstetter's lectures escaped any notice in the official records, either the lists of ordinary lectures or the Acts of the Arts Faculty in general. Tannstetter was active at the university for nearly three decades, and in that time his name appeared in the lecture lists twice and is mentioned in the Acts and the matriculation records a handful of times, usually when he was elected dean of the Arts Faculty or Rector of the university.[55] After 1513, Tannstetter's obligations increased as he moved into the Medical Faculty and became *Leibarzt* to Emperor Maximilian I.[56] Nevertheless, he remained active in the Arts Faculty, regularly holding lectures on how to use ephemerides. Tannstetter's courses on the ephemerides were popular because they offered immediate solutions to the many practical problems students encountered when making astrological calculations, drawing horoscopes—especially nativities, elections and interrogations—and predicting the effects of solar and lunar eclipses.

After covering the information found on the opening pages of an ephemerides, Tannstetter devoted considerable time to the calculations necessary to convert the data in the almanac to different locations. In a plain and direct style he introduced each correction and then explained how to carry out the calculation.[57] Tannstetter divided the remainder of his lectures into two sections, each focusing on a different astrological topic. In the first section, he concentrated on eclipses and the detailed calculations an astrologer had to carryout in order to predict the effects of the eclipse. Aping Ptolemy, Tannstetter considered eclipses to be the most powerful of the common celestial events.[58] He had already pointed out that the illustration on the first page of an ephemerides indicated any eclipses in the coming year, whether or not those eclipses would be solar or lunar, and how much of the luminary would be occulted during the eclipse.[59] This information, however, was insufficient for making detailed predictions. The astrologer had to note *inter alia* the latitude of the moon, the location of the true conjunction as distinguished from the apparent conjunction, and whether or not an eclipse occurred near the *caput draconis* or the *cauda draconis*.[60] Accordingly, Tannstetter provided a number of canons explaining in detail how to calculate this information.[61] Here Tannstetter was following Ptolemy, who had established that all these were important variables that needed to be considered when making predictions from eclipses.

In the final part of his lectures, Tannstetter shifted his attention from eclipses and predictions based on them to judicial astrology—nativities, elections, and interrogations. Judicial astrology required much more than simply locating the planets in the zodiac. The astrologer also had to interpret the influences of those planets and thus had to take into consideration the motion of a planet—whether direct, retrograde, or stationary—as well as its celestial latitude, speed, the distance from the earth, and interplanetary aspects or the relative position of the planets to one another. Each of these variables affected the strength and duration of a planet's influence on terrestrial events. Tannstetter made these topics the subject of the next section of his lectures. At the same time, he introduced a new layer of sophistication, one that relied heavily on the theories of planetary motion developed by Peuerbach in his *Theorica planetarum nova*. Tannstetter's detailed explanation of the observed motion of a planet as the combination of the motions of the center of the planet's epicycle and the rotation of the epicycle itself as well as his explanation of why the moon never seemed to retrogress came directly out of Peuerbach's text.[62] Although the practicing astrologer did not need to understand this astronomical theory—he could glean the information he needed directly from the ephemerides—Tannstetter implied that an astrologer who understood why a planet moved in a particular manner was more competent to interpret the effects of that planet. Other canons addressed particular celestial variables that affected the planetary influence. Some of these could be culled from the tables in an ephemerides, such as the planetary latitudes, but in each case Tannstetter provided a more thorough discussion of these points and explained why the astrologer should attend to them—only by knowing the latitude of a planet could the astrologer determine precisely the true conjunctions between the planets themselves and between the planets and the fixed stars as well as their rising and settings with the fixed stars.[63] In each canon, Tannstetter was quick to point out how his exposition relied on Peuerbach's *Theorica planetarum nova* and also clearly indicated how and why different variables had to be taken into account when constructing a horoscope.

While these lectures were primarily a set of practical instructions, they formed an important part of Tannstetter's larger project at the university. In a passing remark toward the end of his canon for finding the true motions of the sun, moon, and five planets, Tannstetter referred his students to his recently published edition of Regiomontanus's *Tabulae primi mobilis*.[64] This text, along with Peuerbach's *Tabulae eclypsium*, offered advanced treatment of the very topics Tannstetter was concerned with in his lectures on the ephemerides. Tannstetter's remark links these texts to his lectures at the university and suggest that he might have intended them for use in more advanced lectures he held at the university. Tannstetter's lectures on the ephemerides, then, served perhaps as the introduction to his more advanced lectures on similar subjects, and at the least, were conceptually linked to his editions of Peuerbach's and Regiomontanus's more sophisticated and detailed works.

Tannstetter's lectures at the University of Vienna were motivated by the pragmatic demands of astrological practice: what variables did an astrologer have to use and how did he carryout the relevant calculations. Like Stiborius, he structured his lectures around the actual tools his students would use as practicing astrologers: the ephemerides that contained the necessary data. Students probably heard his lectures on ephemerides in private lessons or in extraordinary lectures. When combined with Stiborius' lectures on astrolabes, which also occurred in outside the regular curriculum, it is clear that students at the University of Vienna were could acquire a practical training in astrology. For the many students who left the university with an arts degree, the courses offered by Tannstetter and Stiborius provided the

[54] Goldmann (1916), p. 158.
[55] Graf-Stuhlhofer (1996), pp. 71–78
[56] Ibid., pp. 73–75.
[57] Tannstetter, 'Georgij Collimitij Dictata in Ephemerides', KBV Vadianische Sammlung, MS 66, fols. 3^{v}–16^{v}.
[58] Ptolemy had in his *Quadripartitum* discussed at length the efficacy of eclipses and how the astrologer should use them in predicting future events.
[59] Tannstetter, 'Georgij Collimitij Dictata in Ephemerides', KBV Vadianische Sammlung, MS 66, fol. 17^{v}.
[60] The *caput draconis* and *cauda draconis* are ascending and descending nodes of the moon. That is, they are the points where the moon's path crosses the ecliptic, first moving north of the ecliptic and then moving south. The *caput draconis* and *cauda draconis* were important, in part, because eclipses can occur at these two points.
[61] Ibid., fols. 16^{r}–23^{v}.
[62] Tannstetter, 'Georgij Collimitij Dictata in Ephemerides', KBV Vadianische Sammlung, MS 66, fol. 26^{r}–26^{v}.
[63] Ibid., fol. 27^{v}.
[64] Ibid., fol. 13^{r}.

necessary education to become a practicing astrologer, perhaps advising a local prince.[65] For the students who intended to study medicine, their education in the Arts curriculum provided a solid foundation for their medical training. For those students who did study medicine, they benefitted from Tannstetter's focus on practical instruction in his lectures on astrological medicine.

4. Georg Tannstetter and medical astrology

Tannstetter had begun his medical studies in 1508, when he entered the medical faculty at the University of Vienna. Five years later he sought and received a special dispensation from the bachelor's exam.[66] After that, he moved increasingly into the Medical Faculty, presumably holding lectures and enjoying the greater prestige associated with the higher faculty.[67] Tannstetter brought the same concern for practical astrology to his medical writings that he had shown in his earlier lectures: how could a physician use astrology in his practice, and why should he bother.

Tannstetter was lecturing on medical astrology by the middle of the 1520s, and perhaps earlier. It is unclear how often or for how long he held lectures, but they were collected and printed in 1531 under the title *Artificium de applicatione astrologiae ad medicinam*.[68] The famous Viennese physician, Martin Stainpeis offers some indication of where Tannstetter's lectures would have fit in the medical curriculum.[69] In 1520, Stainpeis published his *Liber de modo studendi* as a guide for medical students at the university. In this work he suggested a course of study, listed the books that should be read, and how those books were to be read. Although there is no evidence that his suggestions were adopted in the Medical Faculty, his *Liber de modo studendi* probably outlined the general contours of medical education at the University of Vienna. Along with Galen's *De criticis diebus*, most likely as part of the *Articella* that was studied in the first year, Stainpeis listed astrological works in the final three years of study. In the third year of study students should read Hippocrates' *Astrologia medicorum*—on prognostications based on the motions of the moon and planetary aspects—as well as his *De aere, aquis, locis* and an anonymous *De astronomia*.[70] Of particular interest are the texts on using ephemerides and calendars, in the fifth year of study.[71] Although Stainpeis did not mention Tannstetter or his works—though the two certainly knew each other—Stainpeis musts have been thinking of texts like Tannstetter's lectures on ephemerides when he composed his *Liber de modo studendi*.[72]

In his *Artificium de applicatione astrologiae ad medicinam* Tannstetter set out to convey the basic tools needed by the learned physician to succeed in his practice. He did not intend to provide long discussions on the theoretical underpinnings of astrology and its application to medicine, though he did, when necessary, briefly justify one point or another. Instead, he adopted a didactic format that presented more complex concepts only after covering the basics and relied on repetition in slightly different words or style to reinforce a particular point. Tannstetter expected his students to have a foundation astrology before attending these lectures, and he assumed that they would be familiar with some of its basic tenets and tools, notably astrolabes and ephemerides. He did not, however, anticipate that his student would remember the finer points of astrology, particularly as they applied to medicine.

Tannstetter began with the most basic of tasks: establishing a correct geniture for the patient. The value of a correct geniture could not be underestimated. If the physician wanted to claim any predictive authority, he had to determine his patient's natal horoscope. The physician had to note five important signs in each geniture:

> the ascendant for things that affected the body, and the Part of Fortune, for external matters, likewise the place of the moon for the disposition of the body and spirit, the place of the sun for things related to employment, offices, and honors, and finally the *medium coeli* for things concerning actions and authority, either innate or accepted.[73]

This natal horoscope would be used in conjunction with a chart constructed for the advent of any disease in an effort to predict the course and outcome of that disease. For this reason, Tannstetter opened his lectures and rehearsed at some length the various methods for rectifying a geniture.[74] After determining the precise time for the chart, the physician then had to determine the horoscopic houses. Here again Tannstetter was interested only in presenting the information necessary to accomplish this goal. Rather than engage in a long discussion on how to divide the zodiac into mundane houses, he recommended that his student use either an astrolabe or similar instrument from which they could simply read off the horoscopic houses.[75] Next the physician then needed to locate the planets within this horoscope and then determine the aspects between the planets, that is, the geometric relationship between them. To do this, Tannstetter recommended Regiomontanus' *Tabulae directionum*.[76] While Tannstetter was recommending the most accurate tools available—no doubt in an effort to improve the physician's prognoses—he was also encouraging the physician to surround himself with a set of tools that would convey authority.[77] Just as Stainpeis had implied in book six of his *Liber de modo studendi* where he discussed the day-to-day practices of a physician, a physician who was surrounded by technical instruments and reference manuals

[65] Michael Shank suggests that by the fifteenth century, Habsburgs princes increasingly relied on astrological advisors who were not also practicing physicians. However, it seems difficult to generalize. Tannstetter was, himself, a member of the medical faculty for much of his career and personal physician to Emperor Maximilian I. Monica Azzolini has found that in Milan, at the end of the fifteenth century, the Sforza dukes continued to consult astrologer-physicians. For Shank's claim, see Shank (1997), esp. pp. 254–255; see also Azzolini (2005, 2008).

[66] Tannstetter matriculated on 10 May 1508 (Schrauf, 1904, p. 68). His request for exemption was in 1513 (ibid., p. 84).

[67] In the Germanies, it became increasingly common through the sixteenth century for academic astrologers to hold appointments in the medical faculty (see Westman, 1980, esp. pp. 118–119).

[68] Tannstetter's lectures were printed in 1531 in Strasbourg. Graf-Stuhlhofer has suggested that these lectures were delivered in 1526/1527 (Graf-Stuhlhofer, 1996, p. 147).

[69] On Stainpeis, see Pawlik (1980), Durling (1970), Kühnel (1965), pp. 84–86; Crystal (1994), pp. 218–219.

[70] Stainpeis (1520), fols. 20^{r}, 20^{v}, 21^{v}.

[71] Ibid., fols. 7^{v}, 16^{v}. On the *Articella* in the medical curriculum, see Demaitre (2003). On Galen's *De criticis diebus*, see O'Boyle (1991).

[72] In 1521, Tannstetter had recommended Stainpeis's receipe as a means of warding off the plague (Tannstetter, 1521, sig. B2^{r}).

[73] 'Et quanquam quolibet anno tota cœlestis figura alicuius nativitatis dirigi possit & debeat, sunt tamen 5. significatores, quos præcipue & singulariter iubet Ptolemæus dirigi verbo 77. sui Centilo. scilicet ascendens pro his quæ corporis sunt, & gradus partis fortunæ, pro bonis externis. Item gradus pro corporis animæque dispositione. Gradum pro his quæ ad dignitates, magistratus & honores pertinent. Ultimo medium cœli, pro ijs que actiones, magisteria, artificia, sive officia concernunt' (Tannstetter, 1531, fol. 7^{v}).

[74] Ibid., fols. 3^{r}–5^{v}.

[75] Ibid., fol. 6^{v}.

[76] Ibid., fols. 7^{v}–8^{r}.

[77] Roger French argues that one of the primary reasons learned physicians incorporated predictive astrology was to compete in a medical market place by attracting patients with their technical apparatus (French, 1996, esp. p. 475). This claim form an important part of his general argument in French (2003).

and consulted both an astrolabe and Regiomontanus's detailed tables of planetary motions would have instilled confidence in his patients.[78] This certainly was seen as an advantage when trying to attract and retain patients in the increasingly competitive medical market place.

At this point, Tannstetter shifts his attention to calculating the critical days and offers a critique and correction to Galen's method. He opens by pointing to the importance of the moon's motion in determining critical days. This leads him to confront the problem of the two types of months and which is applicable to medicine. Tannstetter repeated the great medieval physician Pietro d'Abano when he explained that the 'medical month', measured from the point that the moon first becomes visible after a new moon, is problematic because sometimes it is visible on the second day after the actual new moon, sometimes the third day. This variability carries over into the physician's attempt to determine the critical days, which will all vary depending on the moon's first visibility.[79] Tannstetter claimed this argument for his own, though it too was found in d'Abano's *Conciliator*.[80] Tannstetter's contributition was to explain why the moon's motion was irregular and thus why in some months the first visibility occurred on the second day, in other months on the third day, and occasionally on the fourth day.[81] The point of his discussion was to introduce a different method of calculating the critical days. Tannstetter claimed that although Galen was correct to use the moon's motion to determine the critical days, he had incorrectly relied on the mean motion of the moon rather than on the true motion. Fortunately, Regiomontanus had restored the true motions and had first shown how the critical days were related to the true motion of the moon. This method, Tannstetter assured his students, avoided the problem of the first visibility that plagued the more common calculations.[82] Clearly Tannstetter's discussion of critical days builds on his previous lectures in which he taught his students how to use the ephemerides to calculate the moon's actual motion.

Tannstetter's theoretical discussion about critical days laid foundation for his practical instructions: explaining how to construct a special chart to determine the critical days and how to use the chart to predict the course of an illness. Tannstetter's chart resembled a horoscopic chart with sixteen rather than twelve houses. Tannstetter's chart was simply an adaptation of Ptolemy's claim in the *Centiloquium* that the critical days could be determined by calculating the moon's position on a sixteen-sided figure.[83] The first task was to determine the true location of the moon at the moment the disease first appeared and to record it in the first location in the chart, analogous to the ascendent. From this first location the physician could calculate subsequent critical days, when the moon had traveled one quarter of the way around the zodiac. From this chart the physician calculated the moon's position in the zodiac during the progress of the disease. The physician then used a calendar or ephemerides to correlate the moon's location in the zodiac at the four cardinal points of the chart, analogous to the cardinal points in a typical horoscope, to the actual date. Tannstetter claimed that by using this figure and an accurate calendar, the physician could determine the true critical days for any disease.[84] Having identified the true critical days using Tannstetter's more precise technique, the physician then turned his attention to the patient's horoscope and the effects of the individual planets and inter-planetary aspects. To assist the physician in this process, Tannstetter provided a concise list of favorable planets and inter-planetary aspects and concluded the section with lists ranking the favorable horoscopic houses, planets, and aspects.[85]

Tannstetter linked his lectures on astrological medicine to those he had given in the arts curriculum by applying many of the same techniques to the physician's practice. In addition to his instructions about how to use ephemerides to calculate the true motion of the moon and then to correlate the position of the moon to the day of the year, Tannstetter introduced eclipses as another important tool physicians could use to predict the course and outcome of a disease. Although eclipses did not occur every year, if an eclipse had occurred, the physician needed to take it into account when making his prognosis. Tannstetter explained that the physician needed to determine the lord of the eclipse in order to understand what effects the eclipse would have. Tannstetter's list of favorable planets served as a handy reference here. Moreover, the physician had to determine the magnitude of the eclipse in order to understand the severity of its effects.[86] Along with predicting the general effects, Tannstetter tried to give the physician a set of prognostic tools to decide when the disease was going to cause the patient's death. Tannstetter pointed out that it was important for the physician to know when a disease was beyond his control, for he harmed his own reputation and that of the profession when he tried and failed to cure patients.[87] The professional realities of medical practice played an important part in Tannstetter's lectures on medical astrology.

Yet another way Tannstetter linked his lectures on medical astrology to his arts lectures was through his frequent recommendations that physicians use an astrolabe and astronomical tables to determine the relevant astrological information. In addition to his own lectures on ephemerides, Tannstetter could have been referring to those of his student, Andreas Perlach, who took over the lectures on ephemerides in the late 1510s. Because most of the students attending his lectures on medical astrology would have heard lectures in the arts curriculum, Tannstetter could be confident that they would be familiar with ephemerides and how to use them. Likewise, when he encouraged his students to use astrolabes or other instruments, he was relying on a strong local tradition in the Arts Faculty to develop and lecture on various astronomical instruments, exemplified in Stiborius' lectures. Stiborius and Tannstetter may have even coordinated their lectures. Stiborius regularly drew attention to the medical applications for his various instruments, telling his students how to color their astrolabes to make it easier to determine the motions of the humors.[88] Tannstetter often encouraged his student to use astrolabes and similar instruments, some of which were modified specifically

[78] Stainpeis (1520), fols. 102^{v}–111^{v}.
[79] Tannstetter (1531), fols. 29^{v}–31^{v}.
[80] Ibid., fol. 31^{v}. See Siraisi (1990), pp. 135–136; French (1994), pp. 50–53.
[81] Tannstetter (1531), fol. 31^{r-v}.
[82] Ibid., fols. 32^{v}–33^{r}.
[83] 'Cum igitur Ptolemaeus inter Aegyptios, immo omnes Astrologos princeps, ... scribit enim 60. verbo haec verba. Super aegrotis Criticos dies inspice, ad peragrationem in angulis figurae 16. laterum' (ibid, fol. 33^{r}).
[84] Ibid., fols. 33^{v}–34^{v}.
[85] Ibid., fols. 36^{r}–37^{r}.
[86] Ibid., fols. 37^{v}–38^{r}.
[87] Ibid., fols. 39^{v}–46^{r}. On the importance of predicting the death of a patient, see Siraisi (1990), pp. 133–136. On the problems physicians faced when their medicine seemed to fail them, see Arrizabalaga, Henderson, & French (1997); French & Arrizabalaga (1998).
[88] For example, Stiborius points out that the astrolabe should be colored to correspond to the motions of the four humors in his canon 'Mociones 4or humorum' (Stiborius, 'Canones astrolabij', BSB Clm 19689, fol. 75^{r-v}).

for medical use.[89] Tannstetter recognized that the point of medical education was ultimately practical.[90] Consequently he focused on the actual tools and applications for astrology in medical practice rather than theoretical topics.

5. Conclusion

Stiborius' unpublished lecture notes along with Tannstetter's published and unpublished lectures begin to reveal the shape and content of the astrological curriculum at the University of Vienna. Although this curriculum has remained obscured by a lack of evidence in the official documents, their lectures indicate that the University of Vienna incorporated some of the innovations of its famous fifteenth-century faculty. Peuerbach's *Theorica planetarum nova*, the most important introductory astronomy textbook, and a number of Regiomontanus's texts were central to Tannstetter's lectures on astrology. Regiomontanus's efforts to establish an astronomy and astrology that benefitted from the development of technical astronomical instruments seem to have been realized in Stiborius' teaching. Perhaps more interesting are the links between Stiborius' and Tannstetter's lectures. The two colleagues recognized their teaching activities as related and complementary, and together shaped the astrological curriculum so that it was based on detailed mathematics and astrological instruments. Their interests and lectures informed the education of students in the arts as well as medicine at the University of Vienna during the first two decades of the sixteenth century.

The curriculum at Vienna was affected the practice of astrology well beyond the walls of the city. Locally, Andreas Perlach heard lectures from both Stiborious and Tannstetter and later worked with them. Perlach then continued many of their practices when he became a master in the Arts Faculty. His lectures on the ephemerides were collected into a book and published in 1551. They seem to have remained the core text on ephemerides at the university until the middle of the century. Another student, Johannes Vogelin heard lectures from Tannstetter and Perlach. He wrote an important *judicia* on the comet of 1532. In his *judicia* Vogelin published his observations of the comet and recorded the parallax he claimed to have measured. Vogelin's observations were at the center of a debate between Tycho Brahe and Christoph Rothman about the comet of 1577.[91] Other students studied at Vienna and then returned home, taking with them the education they had gained while at the university. Joachim Vadian studied and taught at the University of Vienna during the first two decades of the sixteenth century, and while there he heard Stiborius' lectures on astrolabes as well as Tannstetter's on ephemerides and medicine. He took his lecture notes with him when he returned to St. Gallen, where he was appointed the city physician. He probably used those lecture notes in his practice as the city physician. Jakob Milich was another student at Vienna who heard Tannstetter's lectures on medicine. After leaving Vienna Milich moved to the University of Wittenberg where he wrote a commentary on book two of Pliny's *Historia naturalis*. Milich's text shows considerable debt to Tannstetter's own commentary on book two.[92] In some cases, the influence of the astrological curriculum can be traced through texts that were copied and taken to distant cities. In one instance, an anonymous person was so interested in Tannstetter's *Artificium de applicatione astrologiae ad medicinam* that he had the entire text copied by hand and returned to Wratislavia.[93] As these examples suggest, the astrological curriculum at Vienna spread beyond the university and the city. Consequently, close study of the astrological curriculum at the University of Vienna is important not only for what that curriculum reveals about the practical methods of teaching astrology but also for how that curriculum influenced astrological education and practice throughout the Germanies.

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[89] Tannstetter describes an astrolabe that has been painted so that the unequal hours are colored to correspond to the four humours (Tannstetter, 1531, fol. 10^{v}).
[90] Siraisi (1992), p. 380.
[91] On this debate, see Moseley (2007), esp. pp. 160–162.
[92] On Milich and his activities at Wittenberg, see Brosseder (2004), passim.
[93] Tannstetter, 'Artificium de applicatione astrologiæ ad medicinam', WUL Sig. R476 nr. 4.

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