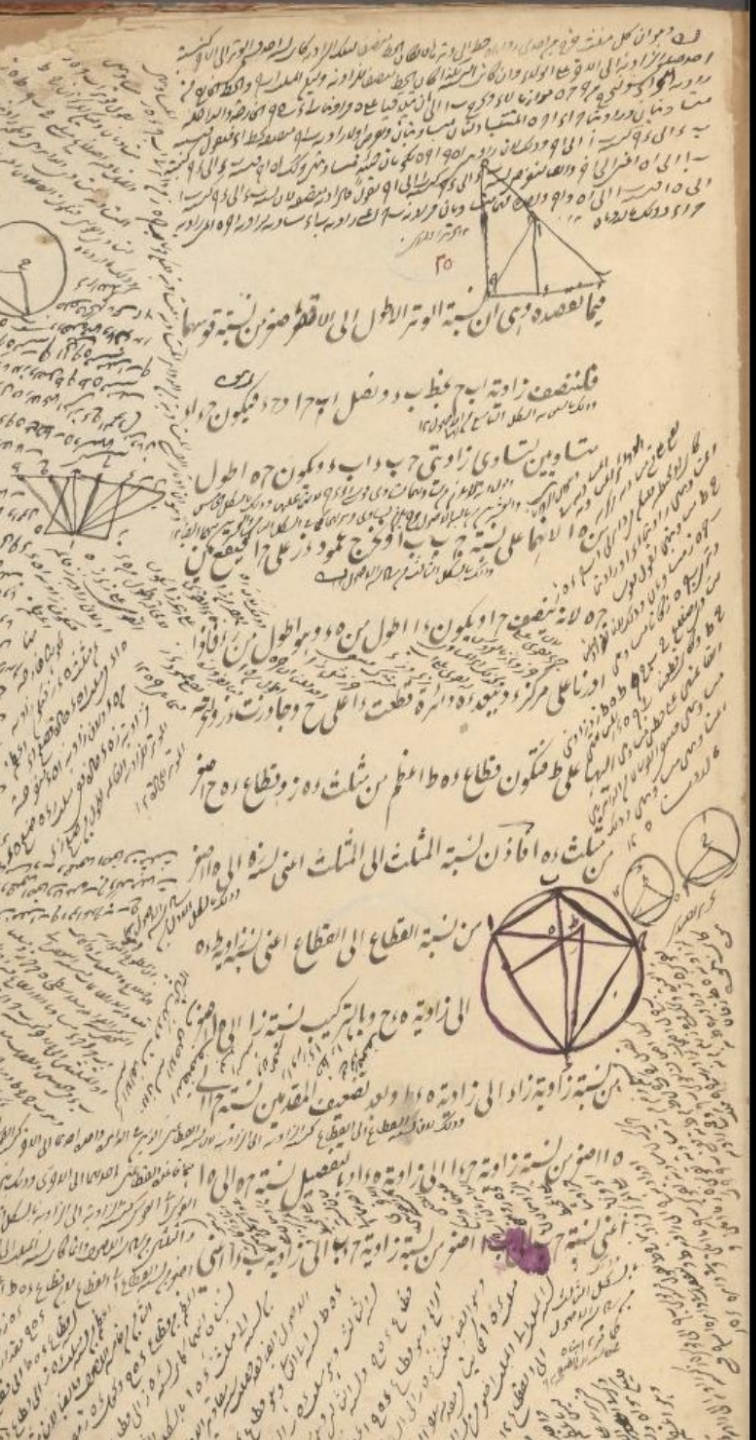


EΘ and EH will be given, since we have already set out, in the 'Table of Inclination', the arc of the meridian intercepted between ecliptic and equator for every degree of the ecliptic: this arc[13] corresponds to HΘ [in Fig. 2.1].

It immediately follows that points on the ecliptic cut by the same parallel H96
circle, i.e. points equidistant from the same solstice, cut off [between ecliptic and equator] arcs of the horizon which are equal and on the same side of the equator. They also make the length of the day equal to that of the day [at the corresponding point], and the length of the night equal to that of the [corresponding] night.

It likewise follows that points [on the ecliptic] cut by equal parallel circles, that is points equidistant from the same equinox, cut off arcs of the horizon which are equal, but on opposite sides of the equator. They also make the length of the day equal to the length of the night at the opposite [corresponding] point, and the length of the night equal to that of the [corresponding] day.

For, in the figure already drawn [see Fig. 2.2], we put K as the point in which the parallel circle equal to the parallel through H cuts the semi-circle BED of the horizon; we draw in arcs HL and KM of the parallel circles: these will, clearly, be equal and opposite. We draw through K and the north pole the [great circle] quadrant NKX. Then

arc ΘA = arc XG (arc ΘA ∥ arc LH, and arc XG ∥ arc MK).

∴ arc EΘ = arc EX (complements [of arc ΘA and arc XG]).

Then, in the two similar spherical triangles[14] EHΘ and EKX we have two H97
pairs of corresponding sides equal, EΘ to EX, and HΘ to KX,[15] and both of the angles at Θ and X are right, so the base EH equals the base KE.

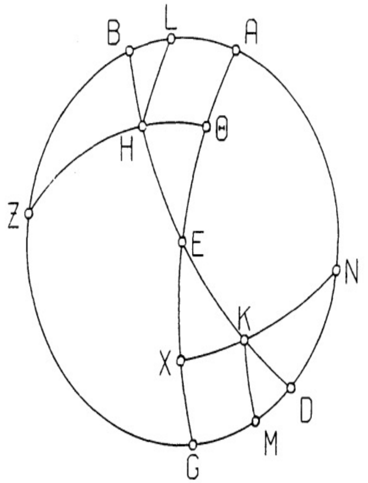
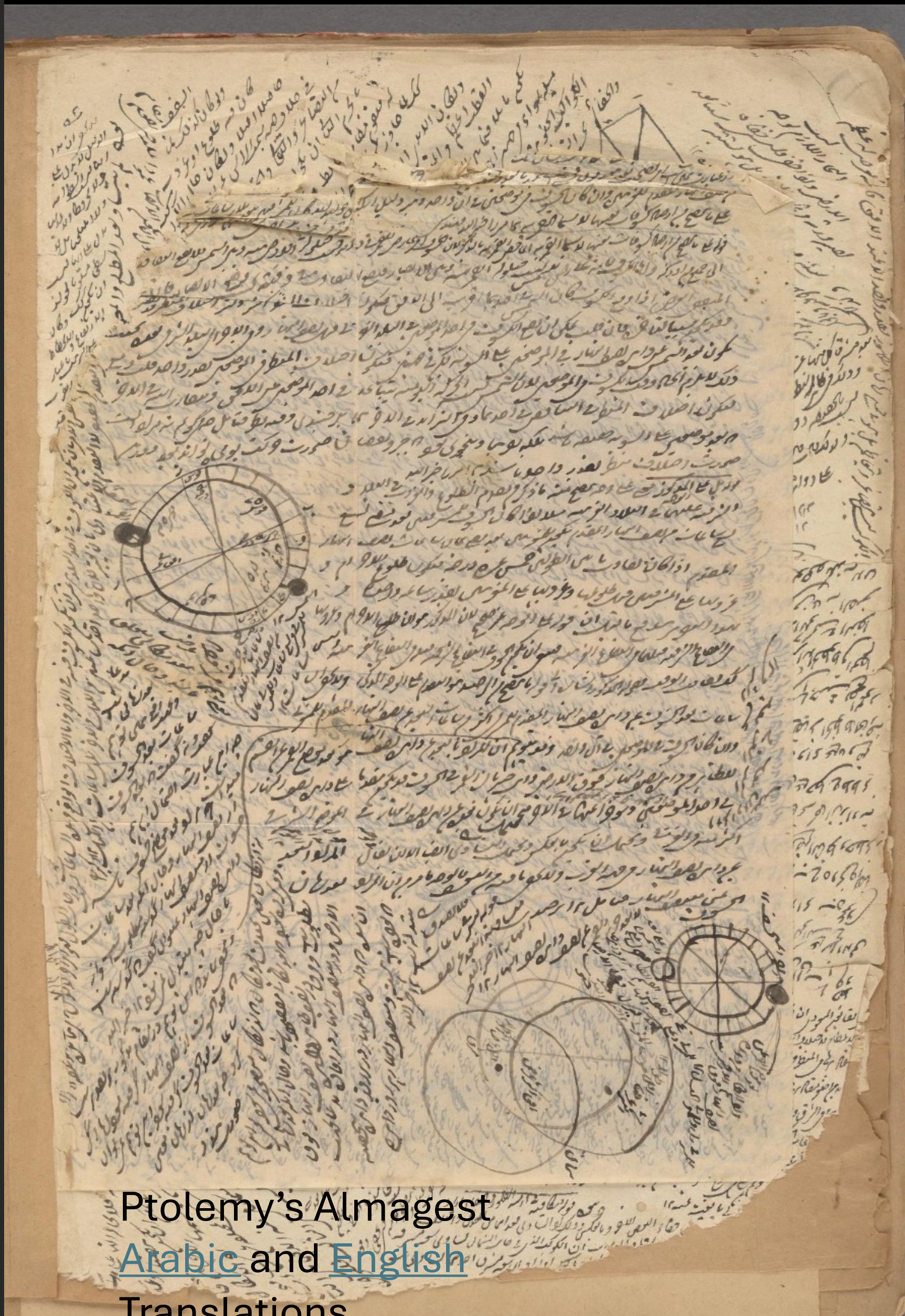


Fig. 2.2

[13] Reading προεκτεθειμένων (with D) for προεκτιθεμένων at H95,18, and περιφερειῶν (with DL, adopted by Manitius), for περιφερείᾳ at H95,22.



Ptolemy's Almagest

Arabic and English

Translations

The Scientific Revolution

Muhammad Najm Akbar
Gentrain Fall 2025
makbar@mpc.edu

Introduction

- We learned last week that Revolutions change our lives phenomenally. The American Revolution did.
- The Revolutions like the one we are discussing today take longer to occur and engage extraordinary and yet ordinary individuals who work in silence in limited circles for centuries before the world, many times posthumously, gets to know how they have changed human lives. Their minds get stuck on an issue that they seek to study. They live it unbeknownst to the world for quite some time before the outcomes surface.

Revolution?

- In the last unit, we met Galileo (1564-1642), retracting (or affirming!) the revolutionary theory of heliocentrism, and yet marking the zenith of the Scientific Revolution.
- Galileo enables us to understand that these fascinating individuals form a chain, passing on revolutionary thoughts to one another in various ways.
- In this chain, Galileo might not have been possible without Copernicus. In turn, he had displaced a scientist who reigned supreme over humanity's mind, and particularly of the astronomers, for some thirteen centuries. Copernicus unraveled his theory, but it might not have been possible without him.

Revolution

- His name was Claudius Ptolemy. He lived in Alexandria in the second century, 100-170, and completed his work there around 150 CE.
- Ptolemy was a compelling individual who made the sun and stars revolve around the Earth for over thirteen centuries, and for many even longer.
- In the eighth and ninth centuries, Arabs translated Ptolemy, principally capitalizing on the Greek-speaking populations in the Islamic realms.

Revolution

- Geographically, in Mesopotamia, Central Asia, and Egypt, Muslim rulers actively patronized astronomy as the rulers had done since the inception of civilization around five thousand years ago. The science of open skies, stars, changing seasons, floods, and famines, and, in their mind, the rulers' destiny was crucial to civilization as it began to take shape.
- The Sumerians had invented the cuneiform writing system by 3000 BCE. One of its great advantages was to catalog the astronomical observations.
- No wonder Ptolemy toiled in those lands to complete his work we know as *The Almagest* or *Syntaxis*. He introduced it as everything known about the universe and the study of it in the second century.

Revolution

- Teresi traces Babylonian influence on Ptolemy's use of "the names of many constellations; the zodiacal reference system; the degree as the basic unit of angular measure; observation, especially of eclipses, going back to the beginning of the reign of King Nabonassar in 747 BC; and fundamental parameters including the value for the synodic month."
- He preferred the Egyptian calendar of the 365-day year and "based certain tables in the Almagest on Egyptian years." Copernicus, he affirms, also used it as a time-measuring unit.
- The Egyptians vigorously engaged with astronomy, among other reasons, to build a "Nile Calendar" capturing its ebb and flow (123-124).

References

- Jack Repcheck, *Copernicus' Secret: How the Scientific Revolution Began* (New York: Simon & Schuster, 2007).
- Dick Teresi, *Lost Discoveries: The Ancient Roots of Modern Science—from the Babylonians to the Maya* (New York: Simon & Schuster, 2002).
- José Bellver, "Looted Libraries and Legitimation Policies: Ptolemy, the Library of al-Arawšī and the Translation Movement in Toledo," *Arabica* 68 (2021): 628-661, **https://brill.com/Arab.**
- Michael C. Weber, "Gerard of Cremona: The Danger of Being Half-Acculturated," *Medieval Encounters* 8, no. 2–3 (2002): 123-134, **https://brill.com/**

Copernican Revolution

- Repcheck argues that seminal ideas about multiple aspects of astronomy had existed for centuries. In the fifteenth century, he traces two major proponents of astronomy to the University of Vienna, where a professor of humanities, Georg Peurbach (1423-1461), and his student Johannes Muller or Regiomontanus (1436-76), advanced the understanding of astronomy and astrology tremendously.
- Peurbach had a deep grip on a two-century-old textbook on astronomy, *A Theory of Planets* by Gerard of Cremona, which was based on the *Almagest*, the work of Claudius Ptolemy.

Gerard of Cremona (1114-1187)

- Copernicus also had a copy of Ptolemy’s work based on Gerard of Cremona’s 12th-century version in Latin, published in 1515.
- Before we continue, just a word about our translator. I have linked two research articles about him in the Reference section. Gerard was born in Italy, reached Toledo in Iberia in search of *the Almagest*, and never went back.
- *The Almagest* of Ptolemy was one of his major translations. Another was Ibn-Sina, Avicenna's *The Canon of Medicine (Al-Qanun fi al-Tibb),* published in Basel, 1556.

AVICENNAE MEDICORUM Arabum principis, Liber Canonis,

DE MEDICINIS CORDIALIBVS, ET CANTICA.

IAM OLIM QVIDEM A GERARDO CARMONENSI ex Arabico sermone in Latinum conversa.

HIS ACCESSERVNT,

Cum Indice rerum ac verborum notatu dignorum copioso.

BASILEAE, PER IOAN-

Gerard of Cremona (1114-1187)

- Gerard reached Iberia around the mid-point of Muslim rule, 711 to 1492. He lived and worked in Toledo, which changed rulers many times, but had grown into a cosmopolitan, multireligious, multilingual center of knowledge, books acquired through various means, and translation.
- The scholars attribute over seventy works of translation to Gerard alone or to a group of translators working with him. He was not the only one engaged in that enterprise.
- Gerard's translations, Weber tells us, left a lot to be desired because he followed the norm of word-by-word translation, which became a lot more complex if he did not fully understand the subject. Others worked to improve them later (Weber: 123)
- In any case, he had a distinct role in getting "Toledo a preeminent position in the intellectual history of Europe" and contributed enormously to the intercultural transfer of knowledge (Bellver: 661).

Copernican Revolution

- One of Peurbach’s major contributions was to publish annual astronomical yearbooks, which projected the movements of the sun, moon, and planets for the year. This information was critical to the landowners and farmers who wanted to know when solstices and full moons would occur, calendar markers for Easter, and astrologers.
- Peurbach was the court astrologer to the King of Hungary, Ladislaus V.
- The Church provided him with a copy of the *Almagest* in Greek and asked for a translation in 1460. After he died in 1461, the Church agreed that his student Regiomontanus would complete the work in Rome. He finished it by 1462, although the printed version appeared in 1496 (19).

Copernican Revolution

- In 1464, Regiomontanus published *On Triangles of Every Kind*, triangulation being an important tool for measuring the position of heavenly bodies. He recommended astronomy lovers to read his book, saying, “It is a foundation for so many excellent things. I do it no injury by calling it the foot of the ladder to the stars” (19).
- Joining the Royal Library Staff of Hungary in 1467, he successfully predicted, based on astrological tables, that the severely sick King Corvinus would recover.
- In 1490, he published *The Tables of Directions*, helping the determination of the houses of the Zodiac. This was one of the first books that Copernicus owned (20).

Copernican Revolution

- Ptolemy, like Aristotle, in essence, postulated that all the planets revolved around the Earth, and they did so in perfect circles, at constant speed, and in the same plane. These planets, in order of their closeness to the Earth, included the moon, Mercury, Venus and the sun, Mars, Jupiter, and Saturn. The list excluded Neptune and Uranus, which had to wait for the telescope to discover them.
- Despite the proven utility of Ptolemy's work, Repcheck points to a growing sense by the fifteenth century that his model was getting creaky, and the practitioners noticed greater discrepancies in the prediction and actual occurrence of eclipses and other astronomical phenomena (Repcheck: 16).

Copernican Revolution

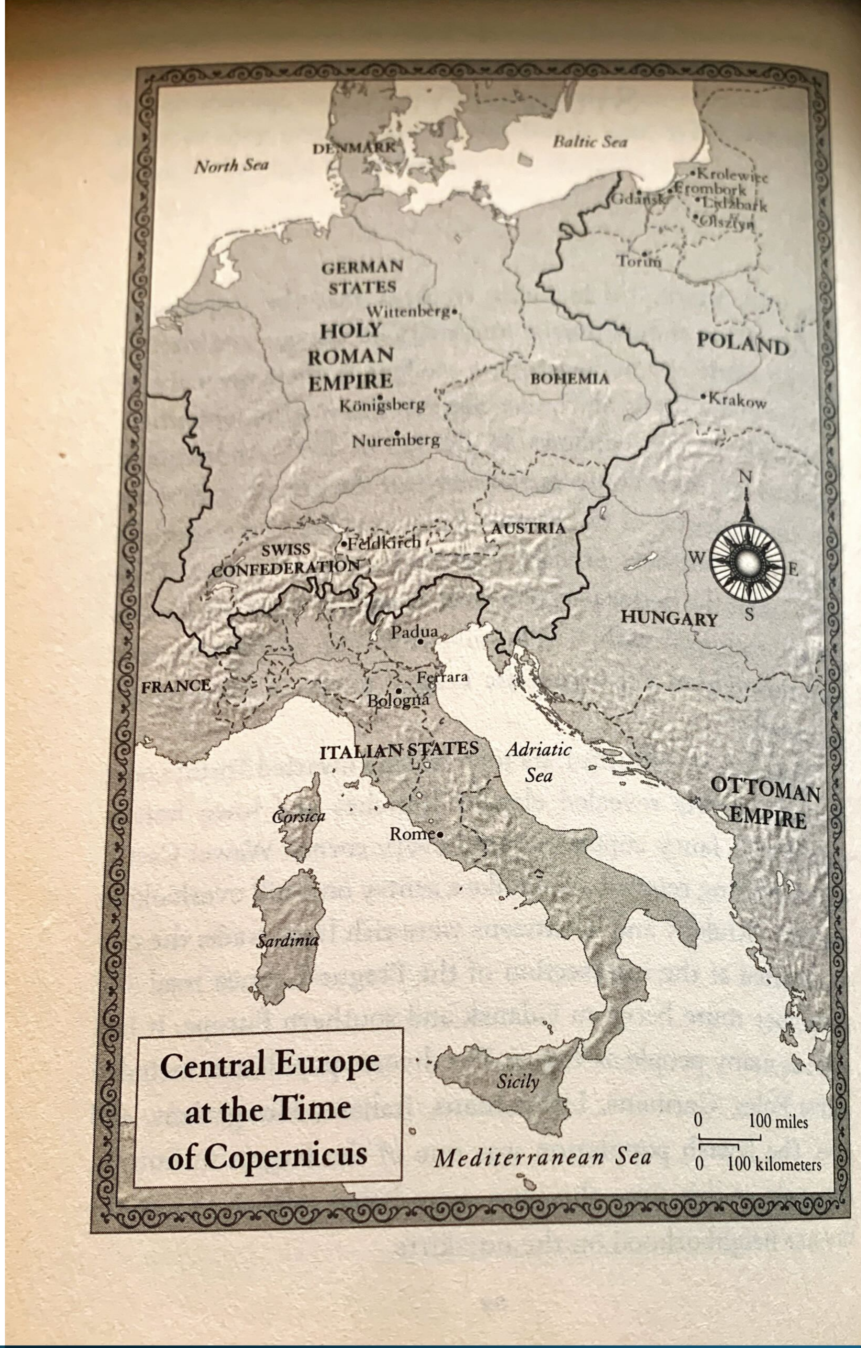
- By 1470, Regiomontanus was convinced that Ptolemy would have to be replaced with a new astronomical system. He moved to Nuremberg, which he says was the center of Europe because of the journeys of the merchants. Instead of a royal house, symptomatic of a changing era, a merchant, Bernard Walthers (1430-1504), became his patron and a student. He funded the "construction of one of the first formal astronomical observatories in Europe" (21).
- Walter continued to pursue the ambitious observational goals of Regiomontanus after his death. He made 746 solar observations and 615 planetary observations. By comparison, Copernicus recorded fewer than 100 observations in his career (125).

Copernican Revolution

- In 1474, Regiomontanus published the *Ephemerides* (i.e., tables or datasets), which accurately projected the positions for the celestial bodies of every day from January 1, 1475, to December 31, 1506.
- Columbus might have used this book in Jamaica, February 1506. The islanders refused him food and water. Based on foreknowledge of an upcoming lunar eclipse, as Regiomontanus had predicted, he threatened them that God would take the moon away from them. God did!
- In 1476, Pope Sixtus IV commissioned Regiomontanus to reform the calendar. His untimely death in July 1476 interrupted the accomplishment of that crucial task.

Copernican Revolution

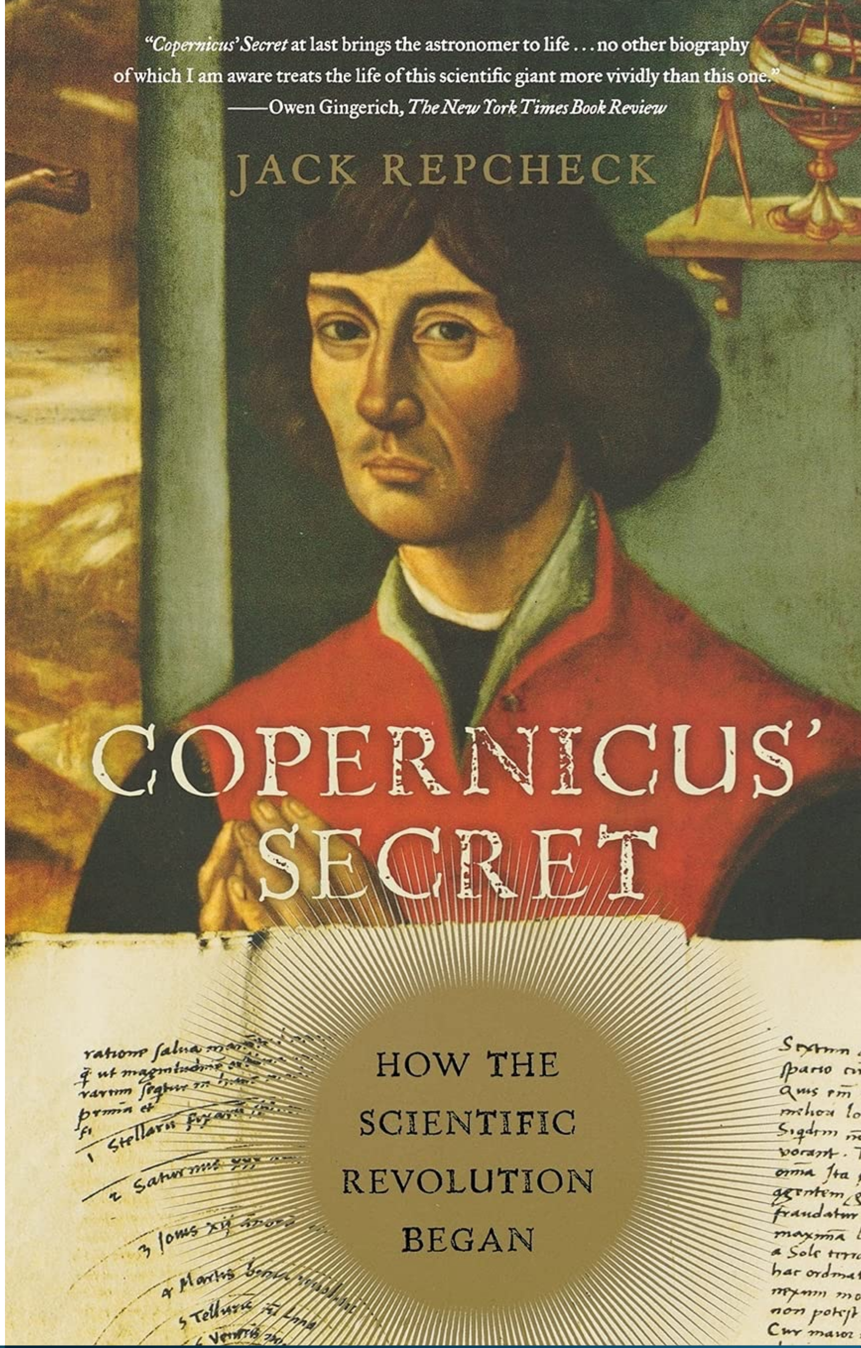
- By 1476, Regiomontanus and Peurbach had established a foundation for the next generation of astronomers.
- In 1476, the most brilliant among them was only three years old. Nikolaj Kopernik, Latinized as Nicolaus Copernicus, was born in Torun to ethnic German parents, in the then Royal Prussia, on February 19, 1473.
- This was an era, says Repcheck, when "...people assumed that heaven contained communications. Why else were these objects there?... The stars and wandering stars were there to be read" (37).



Central Europe at the Time of Copernicus

Copernican Revolution

- In the last decade of the fifteenth century, up to 1495, when Columbus discovered the New World, Copernicus was a University student at Krakow, intensely pursuing classes relating to astronomy, taking courses titled: The Spheres, Euclid's Geometry, Planetary Theory, Tables of Eclipses, and Astrology (42).
- Between 1496-1503, he remained enrolled at the University of Bologna to pursue a doctorate in canon law.
- In 1496, Regiomontanus' *Epitome of the Almagest* was published, and Copernicus read this concise and accessible version.



Copernican Revolution

- In the *Epitome*, Regiomontanus had boldly stated that Ptolemy's theory of the motion of the moon could not be correct.
- Copernicus also read the *Disputations against Divine Astrology* by Giovanni Pico della Mirandola (1463-1494), published posthumously in 1496. Pico aggressively questioned astrological prediction, considering the dispute over the relative position of Mercury and Venus. The confirmation of such a position, Pico argued, should precede any astrological prediction.
- Copernicus remained focused on theoretical astronomy for the rest of his life.

Copernican Revolution

- Copernicus pursued university education, besides Krakow and Bologna (in Canon Law), at Ferrara.
- At Bologna, while pursuing canon law, he joined the leading astronomer-astrologer Domenico Maria Novara (1454-1504), who was required to produce an almanac annually. With him, Copernicus began celestial observation. Later, he continued his own and described them (47-48).
- Astronomy then meant a formal study of the heavens and the reading of what the movements in the heavens meant to people on earth. Astronomy and astrology were thus inseparable. Both the Professor and his assistant had doubts about the Ptolemaic system and discussed them with each other (Repcheck: 6).

Copernican Revolution

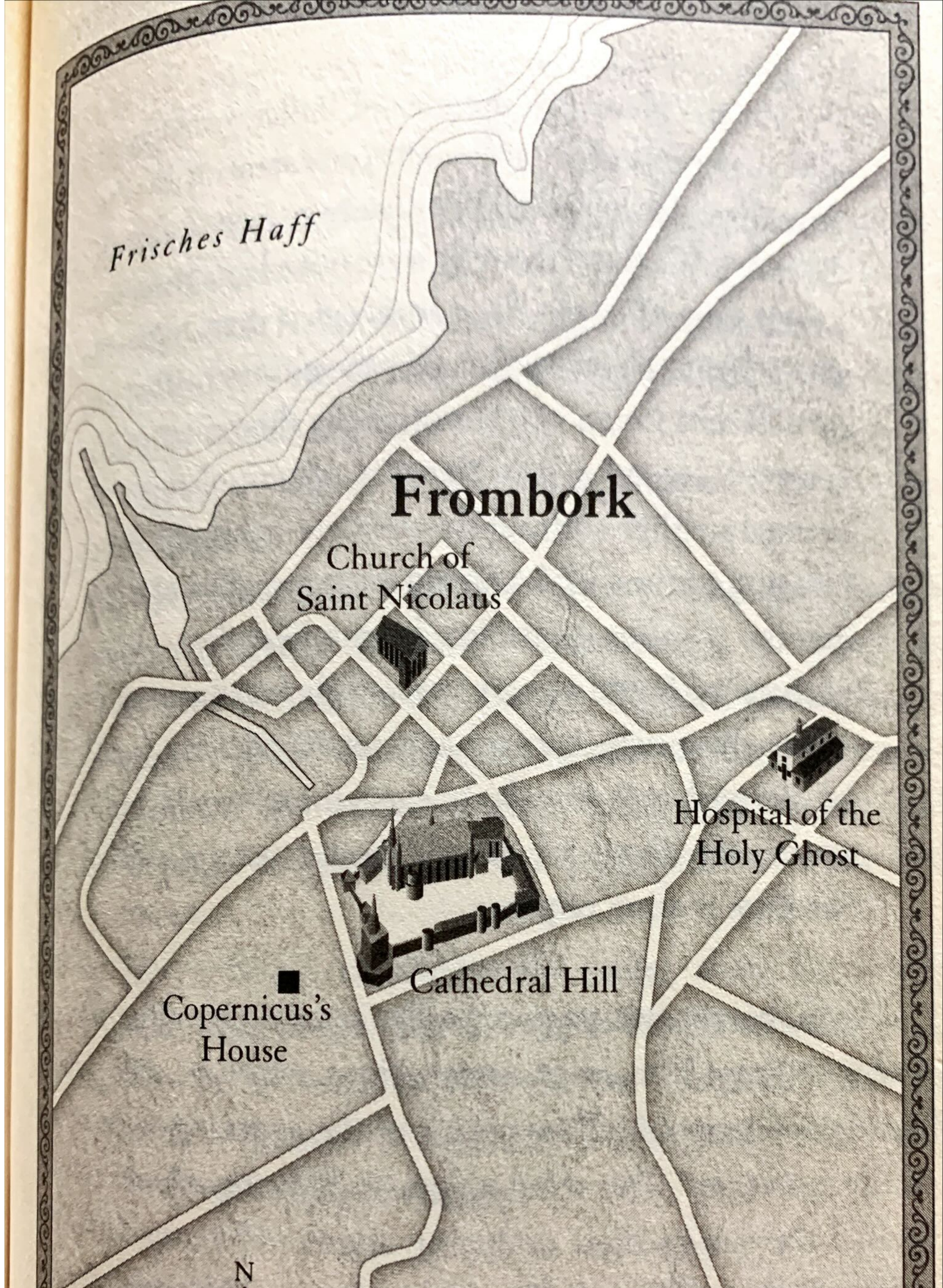
- At Bologna, Copernicus also started learning Greek.
- In 1497, the Church appointed him a canon in Frombork, an office that he assumed in 1501 while still pursuing his education.
- At Padua University, Copernicus focused on medical astrology and whether a horoscope affected a patient's conditions.
- By 1503, at 30, Copernicus had completed his doctorate in canon law from the University of Ferrara and went back to serve as part of the Church hierarchy in Poland.

Copernican Revolution

- Repcheck refers to the possibility that at Padua, Copernicus learned something about the Arab astronomical tradition, adding that they exhibited more skepticism about Ptolemy than European astronomers (49). Divergence of opinion among the researchers, however, makes this a complex question to pinpoint a specific source.
- Essentially, we know that astronomy created a tremendous degree of interest in different cultures. Teresi (2002) refers to solid mathematical work doubting Ptolemy done by Arab scholars of the fourteenth century.

Copernican Revolution

- At home, he began his Church career in Lidzbark and left it to join the duties at Frombork in 1510. He also served as a Doctor at the local hospital.
- Over ten years from 1503-13, as we know from *Commentariolus*, he developed his theory of heliocentrism. He challenged the wisdom of over thirteen centuries, sketched by Aristotle, formalized by Ptolemy, and reinforced by the Church.



Copernican Revolution

- Copernicus argued that the Ptolemaic system posed difficulties and had defects. He searched for an alternative in which “everything would move uniformly about its proper center as the rule of absolute motion requires,” based on what he articulated as seven assumptions. Several decades after his death, the Church will find them heretical.
- These are some of the assumptions: “All the spheres revolve around the sun as their midpoint, and therefore the sun is the center of the universe…The Earth…performs a complete rotation on its fixed poles in daily motion…”

Copernican Revolution

Here is what Copernicus propounded in the *Commentariolus*:

1. The Earth and the other planets revolve around the Sun, not the Earth.
2. The moon is the only heavenly body that revolves around the Earth, thus separating the moon from the other wandering stars .
3. The Earth rotates on its own axis once every 24 hours.
4. The revolutions of the outer planets take much longer than Ptolemy thought: Saturn takes 30 years to revolve around the sun, Jupiter 12 years, Mars two years, Earth one year, Venus nine months, and Mercury three months. He had thus placed the planets in their proper order for the first time.
5. The universe is profoundly larger than previously believed, with the "firmament," or fixed (nonwandering stars, so far away to make the "distance from the earth to the sun imperceptible in comparison with the height of the firmament" (55).

Copernican Revolution

- Elaborating upon his idea, Copernicus emphasized how Ptolemy violated the principle of "uniform circular motion." Arab astronomers, centuries before Copernicus, Repcheck says, had expressed similar criticism of Ptolemy (56).
- Copernicus's life as canon faced several challenges as the Church sought to deal with the aggressive Teutonic Knights, their neighbors, and the onset of Lutheranism. Moreover, his superiors were skeptical about his personal life. As his research advanced, he had to accept an increasingly restrained role in the church.

Copernican Revolution

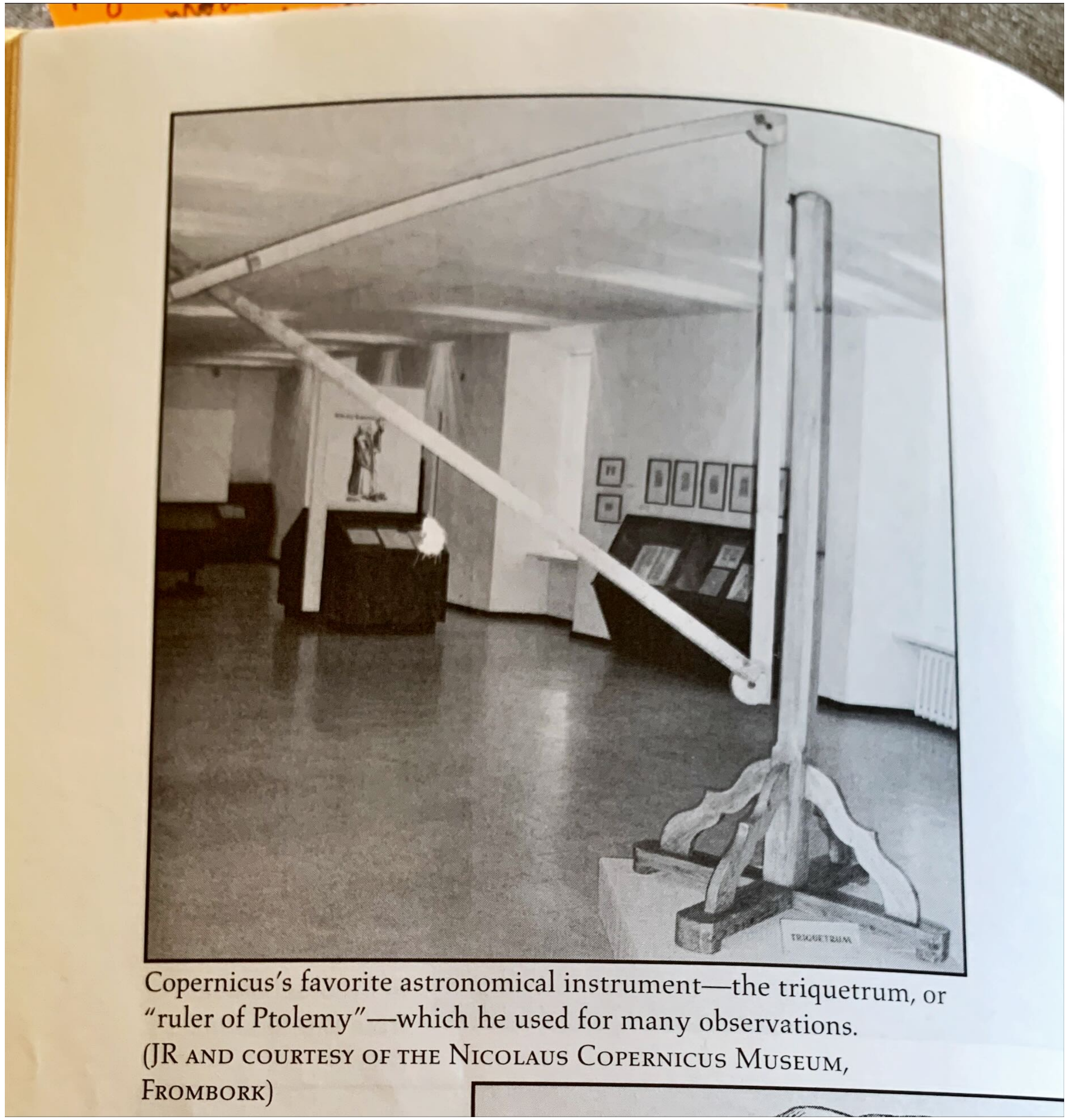
- In 1539, Copernicus acquired intellectual support from an unexpected source.
- By then, Joachim Rheticus, a scholar from the Lutheran University of Wittenberg, had been visiting Nuremberg. His employers had supported this effort in pursuit of excellence in astronomy. At Nuremberg, Rheticus began to hear about Heliocentrism from persons who had read the *Commentariolus*.
- Rheticus resolved to find and meet the author in his bid to publish such ideas. He reached Frombork and knocked at the door of Copernicus. He was in a city where he should not have entered. The Catholic hometown of Copernicus had just received a Royal decree and the Church instructions to forbid the Catholics in the land to possess, read, or listen to the reading of Lutheran or similarly poisonous books. The believers were to burn such books, booklets, songs, or whatever else had come from the poisonous places, in the presence of the authorities (134). Rheticus had defied the Counter-Reformation order. In Copernicus, he will find a partner.

Copernican Revolution

- Rheticus brought his host a unique gift of three sets of bound books:
- The first binding contained the 1533 Greek edition of *Euclid's Elements* and Regiomontanus on *Triangles of Every Kind*. These were two important books on geometry, coupled with the most important work on trigonometry .
- A second binder included Peter Apian's *Instrumentum primi mobilis* (instrument of the first movable sphere), Geber's *De Astronomia Libri IX (*Concerning Astronomy, in Nine Books), and Witelo's Perspectiva.
- The third book was a major prize, Ptolemy's *Almagest*, in the Greek original, published in 1538, titled *Syntaxis* (135-136).

The Ruler of Ptolemy

- Rheticus discovered the simplicity of his host's observatory, equipped with a few ordinary astronomical instruments.
- Copernicus's primary workhorse was a triquetrum, which consisted of three wooden components: an upright pole about 12 feet tall; a second piece hinged to the pole that had two sights on it as on a gun barrel and was used to find the planet or star to be observed; and a third piece that measured angles.
- Copernicus called his triquetrum the "Rulers of Ptolemy."
- The experts later wondered how he could make phenomenally correct observations with such simple equipment. His eyepiece, they found, was so imprecise that an error of several minutes could occur (137-138).



Copernicus's favorite astronomical instrument—the triquetrum, or "ruler of Ptolemy"—which he used for many observations. (JR AND COURTESY OF THE NICOLAUS COPERNICUS MUSEUM, FROMBORK)

Copernican Revolution

- A second instrument was a quadrant ,which looked like a sundial mounted on a wall and was used to note the summer and winter solstices.
- A third instrument was a spherical astrolabe, which consisted of nested circles made of brass, used to chart heavenly bodies by determining their celestial longitude and latitude (138).
- Rheticus compared his work and achievements with Ptolemy (139).

Copernican Revolution

- Copernicus allowed his guest to read his manuscript. Rheticus admired it for its extraordinary originality and ambition. He requested him to summarize the six-part manuscript as an introduction for the reader, which he did, and agreed to its publication before the complete work. He titled it the *Narratio prima*, the First Report (141).
- The *Narratio prima* introduced the heliocentric theory to the world in about 100 pages, longer than the handwritten *Commentariolus*. Rheticus found a publisher in Gdansk in 1539, and by April 1540, the book was ready for sale.
- About the six-part complete work, Rheticus said that in imitation of Ptolemy, Copernicus had “embraced the whole of astronomy, stating and proving individual propositions mathematically and by the geometric method” (150).

Copernican Revolution

- Rheticus's Reformist bosses, Martin Luther and Melanchthon, disapproved of the Heliocentric theory. Repcheck cites both rejecting it. Luther would have said, "I believe the holy scripture, for Joshua commanded the sun to stand still and not the earth." Melanchthon commented in a letter of October 1541 on the absurdity of a certain Polish astronomer, "who moves the earth and lets the sun stand still" (Repcheck: 159-160).
- Luther and Melanchthon did not let their views harm the brilliant career of Rheticus. He continued to teach at Wittenburg until the University of Leipzig, with Melancton's approbation, hired him for a higher position.

On the Revolutions of the Heavenly Spheres—March 1543

- By midsummer 1540, Copernicus had agreed to print his entire work. By late summer 1541, Rheticus had created a clean copy in his handwriting for publishing. He went back to Wittenburg to resume teaching and was able to hand over the manuscript to the publisher Petreius in Nuremberg only in May 1542. It took about a year to complete the project.
- Copernicus died on the very day he received his first copy, May 24, 1543, at the age of 70. He was buried in the Cathedral of Frombork.

NICOLAI CO-
PERNICI TORINENSIS
DE REVOLVTIONIBVS ORBI-
um cœleſtium, Libri VI.

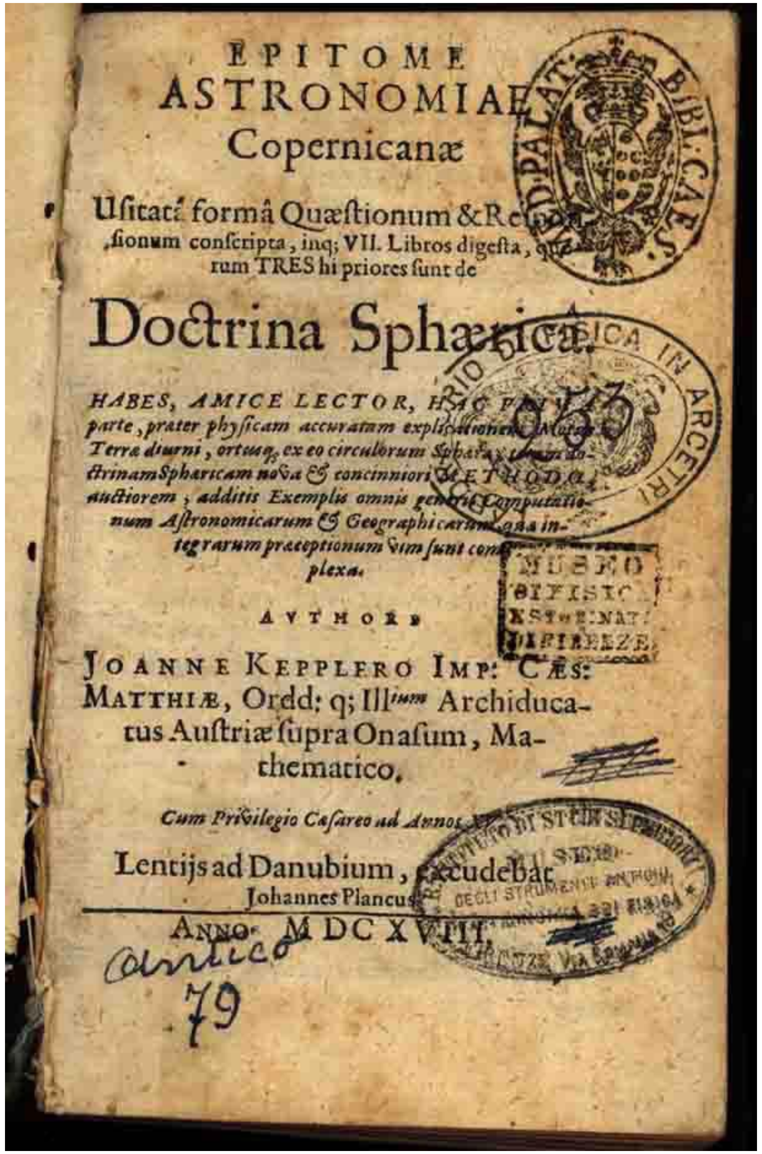
.Habes in hoc opere iam recens nato, & ædito, ſtudioſe lector, Motus ſtellarum, tam fixarum, quàm erraticarum, cum ex ueteribus, tum etiam ex recentibus obſeruationibus reſtitutos: & nouis inſuper ac admirabilibus hypotheſibus ornatos. Habes etiam Tabulas expeditiſsimas, ex quibus eoſdem ad quoduis tempus quàm facilli me calculare poteris. Igitur eme, lege, fruere.

Ἀγεωμέτρητος οὐδεὶς εἰσίτω.

Norimbergæ apud Ioh. Petreium,
Anno M. D. XLIII.

Johannes Kepler (1571-1630)

- Given the scientifically complex nature of the Copernican Revolution, other scholars stepped in to expand on it and make it easily understandable. Kepler was one of them.
- A Lutheran, in his book *The Cosmic Mystery*, 1596, he presented a decidedly Copernican model of the universe.
- Unlike Copernicus, he discovered that the shape of the orbit of the planet was not a perfect circle or sphere but a perfect ellipse. His book Epitome astronomiae Copernicanae (Epitome of Copernican Astronomy) in three volumes, 1617-1621, adopted fundamental Copernican insights and redid them using his own discovery of elliptical orbits (190-191).



EPITOME
ASTRONOMIAE
Copernicanæ

Usitatâ formâ Quæstionum & Re-
sionum conscripta, inq; VII. Libros digesta,
rum TRES hi priores sunt de

Doctrina Sphærica.

HABES, AMICE LECTOR, ...
parte, præter physicam accuratam ...
Terræ diurni, ortumq; ex eo circulorum ...
ctrinam Sphæricam nova & concinniori METHODO,
auctiorem, additis Exemplis omnis generis Computatio-
num Astronomicarum & Geographicarum ...
tegrarum præceptionum ... sunt com-
plexa.

AVTHORE

JOANNE KEPPLERO IMP: CÆS:
MATTHIÆ, Ordd: q; Ill^ium Archiduca-
tus Austriæ supra Onasum, Ma-
thematico.

Cum Privilegio Cæsareo ad Annos ...

Lentijs ad Danubium, excudebat
Johannes Plancus.

ANNO MDCXVIII.

antico
79

Galileo Galilei (1564-1642)

- Both Copernicus and Kepler were technically complex; Galileo's distinction was that he established the Copernican view among lay people.
- While teaching mathematics at the University of Padua, Galileo gave public lectures about a supernova that became visible in 1604. Anti-Aristotelian Galileo interpreted the new star as showing that the heavens were not perfect and unchangeable.
- Galileo made a telescope after the first was made in Holland, and by 1610 began to share his research with the public. In March, he published *The Starry Messenger*, which argued that the moon had craters and mountains, and that there were many more stars than previously thought, and that he saw four moons orbiting Jupiter (192-193).

Galileo Galilei (1564-1642)

- Galileo's "four moons" proved that not all heavenly bodies revolved around the earth, and thus eliminated the Ptolemaic cosmology (193).
- Back at the University of Pisa, Galileo published another book, in 1613, titled *Letters on Sunspots*, in which he formally endorsed heliocentrism.
- In 1632, he published a *Dialogue Concerning the Two Chief World Systems* in which the Copernican system wins over an Aristotle-Ptolemy advocate.
- The Dialogue brought him before the Inquisition in October 1632.

Galileo Galilei (1564-1642)

- The Church had been slow in detecting the heretic in the Copernican heliocentrism, but caught up in 1616 and included his work in the Index of Forbidden Books. It also laid down its views on the universe.
- *On the Revolutions* remained in circulation despite being on the Index. Galileo had sinned by publicly endorsing it.
- The Church would take two more centuries before reconsidering its decision. The first index excluding *On the Revolution* appeared in 1835.
- We read Galileo's retraction/affirmation of his understanding of the universe in the last unit. Until he died in 1642, the Church kept him under house arrest.

Isaac Newton (1643-1727)

- In 1687, Isaac Newton added an important element to the heliocentric model when he proved the existence of universal gravity. His theory explained why the planets orbited the larger sun and why the small moons around Jupiter and the Earth orbited their home planets.
- His other contributions to science included the laws of motion, calculus, and the reflecting telescope.

Dr. William Harvey (1578-1657)

- We are not discussing medicine today, but I have to say a few words about it, as one of our youngest participants asked for it.
- William Harvey was a royalist who rose up to become the personal physician of James I in 1618 and later Charles I in 1625.
- His education and research allow us to have a glimpse of issues medical professionals sought to address in the seventeenth century.
- Harvey studied arts and medicine at Gonville and Caius College, Cambridge, from 1593 to 1599.

Dr. William Harvey (1578-1657)

- Like Copernicus, he continued his studies at the University of Padua, which was then the leading European medical school. He was a student of an Italian anatomist and surgeon, Hieronymous Fabricius.
- He earned his doctorate from Padua on April 25, 1602, and then returned to England to work as a doctor.
- Harvey was a fellow of the Royal College of Physicians of London from 1607 and was active in this society for the remainder of his life.
- He served as lecturer in surgery at the Royal College from 1615-1656 and as a physician at St. Bartholomew’s Hospital from 1609 to 1643.
- Seventeenth-century England was irrational about witchcraft. He had to examine four women accused of witchcraft in 1634. All of them were declared innocent.

Dr. William Harvey (1578-1657)

- Science owes him the theory of blood circulation. He published the English version of his *Anatomical Exercise on the Motion of the Heart and Blood in Animals* in 1653.
- Harvey's research showed that the blood flows rapidly around the human body, being pumped through a single system of arteries and veins. He supported this hypothesis with experiments and arguments. Even Charles I allowed him to experiment on his deer.
- Harvey had thus rejected theories like "lesser circulation," whereby blood circulated from the heart to the lungs and back, without circulating the whole body, or instead of circulating blood being consumed by the body at the same rate that it was produced.
- Anatomy made more sense because of his research, but his contemporaries skeptically challenged it. In colonial America, however, he found a great advocate in Benjamin Franklin, who expounded his theory for medical professionals in America.

Conclusion

- Repcheck contends that although the Church viewed it differently, Copernicus saw God's beautiful creation more clearly than any human before him (196). We can say that about Kepler and Galileo as well. A deeply religious William Harvey advanced the understanding of human physiology.
- We have come a long way since Ptolemy struggled with the basic theory of the universe. We learn that human minds do not perceive scientific evidence as homogenously incontrovertible. Based on religious or political parameters, or the wisdom of fellow professionals, natural and physical phenomena can evoke diametrically different interpretations. This means that we have our share of the ongoing Ptolemy v Copernicus debate, which continuously requires us to choose, take positions, and, hopefully on the right side of it, persist.