

A Scheme of Heaven

the history of astrology and the search for our destiny in data

Alexander Boxer (Norton & Co., 2020)

7 from the computation of Copernicus to the sonnets of Shakespeare there are recesses of our culture that can't be accessed without astrology's key.

10 there's the exquisitely complex astronomical calculations needed to generate a horoscope.

13 At a minimum, I want to give astrology a treatment that's open and fair. Unlike many others who have a scientific background, I've never felt any particular animus toward astrology. On the contrary, its taboo status as the arch-pseudoscience makes it all the more delicious to think about. Why, for example, is astrology considered unscientific while economics—which also uses complex mathematical formulas to predict the future with results that are, let's say, mixed—is regarded as a perfectly respectable field of study? Being able to articulate the distinctions, yes, but also the commonalities between astrology and other modes of asking questions about the world helps to clarify which approaches are fruitful, which aren't, and why.

Astrologers were the quants and data scientists of their day, and those of us who are enthusiastic about the promise of numerical data to unlock the secrets of ourselves and our world would do well simply to acknowledge that others have come this way before. What profession would I, or anyone who delights in numbers, have been drawn to had we lived five hundred years ago? A thousand years ago? Two thousand years ago?

Astrologers were the originators, and for most of history the sole cultivators of a tradition that transmuted numbers into stories. And like any story that's been retold for generations, astrology's account of the cosmos has been refined to just its most captivating themes.

16 This perception of a mutual regard between man and the cosmos has, from our earliest beginnings, animated humanity's efforts to understand the world and our place within it. Modern science began from studying the heavens, and in this sense we can say that, yes, the stars really have communicated to us many profound truths about the nature of things. The bigger question isn't whether the universe is speaking but, instead, how far we can ever hope to comprehend what it might be saying.

[C] In this sense what Aristotle did with organisms was remarkable. He started the terrestrial science.

20 Our propensity to group stars into constellations and constellations into stories can hardly be said to derive from the actual arrangement of the stars themselves. In fact, to a remarkable degree, the distribution of stars in the sky is completely random.

6 We humans are pattern-matching animals, and astrology is the universe's grandest pattern matching game. This combination is what has kept astrology so captivating and fertile in spite of every effort to eradicate it. Astrology provides an almost totally uninhibited template for linking the vast number of possible states of the solar system with the stories that matter most in our lives.

32 The names of the days in a week is due to astrology.

55 Instead, it was likely only the curious coincidence that two of the trendiest creeds within the Roman Empire—astrology and another Eastern upstart named Christianity—both preferred a seven-day week that this system was able to supplant its eight-day precursor without much fuss. So, if previously you scoffed that astrology and its chroniclers couldn't possibly exert any real influence over your life, think again.

57 This extraordinarily slow motion is called the precession of the equinoxes and it was first noted by the astronomer Hipparchus around the year 130 BC. Whenever I think about it, I can't help but feel amazed—dumbfounded, really—at how early in history this discovery was made, because in order to recognize this motion, Hipparchus, who seems ancient to us, had to rely on the accuracy of stargazers who would have seemed ancient even to him. Hipparchus's discovery is thus a humbling example of how science is a collaborative endeavor in time, with each generation building upon the efforts of those who came before. It's also a powerful reminder that knowledge from the past, however out-of-date or obsolete it may seem, ought not to be dismissed lightly, since one never knows just when, or in what context, it may yet prove insightful.

Because of the precession of the equinoxes, the Sun's location on the first day of spring (that is, the vernal point) will eventually pass through all twelve zodiac constellations, spending about 2,150 years in each. This roughly 2,150-year period defines the longest temporal unit of astrology: an astrological age.

Age of Aquarius: New Age is unmistakable reference to the astrological idea.

96 The Babylonians, as far as is known, never had a use for cosmic models like this. Speculating about the physical arrangement of the heavens appears to have been a peculiarly Greek pastime, one they enjoyed so much they had two different names for it: astrologia (astrology) and astronomia (astronomy). cf. "economy" and "ecology." Aristotle, exclusively uses the word astrologia in his books, such as the Physics, Metaphysics, and On the Heavens.

129 Reconstructing the ancient sky isn't merely an astrological curiosity. Historical accounts of eclipses, such as the one preceding the Battle of Gaugamela, are absolutely indispensable when calibrating modern models of the long-term fluctuations of the Earth's rotation. The calendars and timekeeping systems of the ancient world were just too irregular and inconsistent. But this makes the few events of ancient history which can be precisely dated all

the more extraordinary. And without a doubt, the most momentous exact date handed down to us from antiquity is March 15, 44 BC—the Ides of March—the day of the assassination of Julius Caesar. ...

Archaeologically, the site of Caesar's assassination, the Curia of Pompey, can be pinpointed fairly precisely. It lies very near the modern intersection of Via di Torre Argentina and Via dei Barbieri in downtown Rome. As for the timing, we're told that Caesar departed his house "at about the fifth hour," meaning the fifth out of the twelve Roman hours of daylight, corresponding roughly to 11 a.m. Assuming it took an hour or so for Caesar to arrive and take his seat in the Senate, it was probably early in the afternoon when Tullius Cimber first raised his hand in violence. But from then on the conspirators made quick work of it, stabbing Caesar twenty-three times until he fell dead, so it's written, at the feet of Pompey's statue. How the heavens appeared from that fateful spot and at that fateful moment is diagrammed in figure 4.1. Venus, the ancestral goddess of the Julian clan, though peering down from near her culmination in the sky, was nevertheless completely obscured by the Sun. Simultaneously, Jupiter, the monarch of the planets, in conjunction with the waning Moon, sank mournfully below the western horizon. Thus, with a little imagination, we can see that the tragedy of Julius Caesar was played out on the celestial no less than the terrestrial stage that day.

131 But the chief significance of Caesar's assassination for the history of astrology is that **this event may be the last major episode of ancient divination in which astrology was not directly involved.** While the Romans had long made a point of checking in with the gods before even the most minor undertakings, their traditional forms of divination entailed observing the flights of birds, called augury, and the livers of sheep, called haruspicy, rather than the orbits of the planets. Accordingly, out of all the ill omens Caesar received prior to his death, **not a single one was astrological.** And things remained similarly non-astrological even when events took a decidedly celestial turn. At Caesar's funeral games, a comet appeared in the sky, which was said to be Caesar's soul ascending to heaven as a star. If ever an excuse was needed to mention a few zodiac signs, surely this was it. And yet, in all of its portrayals in both poetry and prose, **Caesar's transformation into a star remained conspicuously astrology-free.**

133 The existence of Caesar's star has never been corroborated astronomically. But whatever it was, even if only a rhetorical fiction, the non-astrological nature of this "comet" offers a good illustration of **just how unconcerned with astrology the Roman Republic was.** By contrast, the Roman Empire of just a generation later can be characterized as utterly astrologically starstruck. The emperor Augustus himself set the tone by incorporating Capricorn, his zodiac sign, into his imperial imagery. ... By far that most delicious example of Rome's newfound infatuation with astrology has to be the twelve-course astrological appetizers served at Rome's most famously decadent dinner, the feast of Trimalchio.

In the Roman Empire the emperors had consolidated absolute power to themselves. Consequently, all of politics was reduced to: how long will the emperor live, and who will succeed

him? But these were exactly the sort of questions astrology promised it could answer. This made astrology, suddenly, directly relevant to the security interests of the Roman state. Augustus, the first of the Roman emperors, began his reign already enamored with his horoscope and his zodiac sign, Capricorn. Perhaps he initially regarded it as nothing more than a good-luck charm. Be that as it may, by the time of his death some forty years later, astrology had become a crucial component of his empire's intelligence apparatus, as indispensable, if not more so, as his vast network of spies and informants.

The shadowy figure behind this operation—Rome's director, as it were, of astrological intelligence—was the mysterious Thrasyllus. Thrasyllus first appears on the scene in 6 BC. Desperately needing a friend, Tiberius found Thrasyllus in Rhodes. Augustus continued to rule as emperor for another decade, until his death in the year 14. During this time, Thrasyllus came to be regarded as a trusted confidant to Augustus no less than to Tiberius.

Augustus, in return, demonstrated his growing appreciation of astrology's power in the most convincing way he could: he outlawed it. Or, rather, a better analogy might be that astrology became classified information: "Imperial Top Secret," so to speak, "for the emperor's eyes only." In the year 11, an empire-wide edict was put forth prohibiting all forms of divination, and explicitly all predictions pertaining to the date of someone's death. Simultaneously, Augustus made public his own horoscope, thereby signaling that astrological technology would henceforth be regarded as the exclusive purview of the Roman state. ...

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Thrasyllus edited Plato's dialogues.

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These considerations offer a glimpse of how much more complex and personalized ancient astrology could be when compared to the popular astrology of today. Far from providing just a "Sun and done" horoscope, the goal of the ancient astrologer was to predict the entire sequence of someone's life. In Manilius's time, the most cutting-edge procedure for doing this—a procedure in which Thrasyllus and Balbillus were regarded as the unrivaled masters—entailed identifying two key points on a birth horoscope: the "starter" and the "destroyer."

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PTOLEMY'S ASTROLOGY

That Ptolemy, the most famous scientist of the ancient world, also wrote a book on astrology is a seemingly minor detail that, upon reflection, probably single-handedly ensured astrology's survival. ... A millennium and a half later, when Copernicus arrived at the University of Bologna, Ptolemy's astrology book, the *Tetrabiblos*, was still required reading in the astronomy curriculum, which, in turn, was mandatory for anyone pursuing a medical degree. (This connection between astrology and medicine is one of long-standing.)

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Like his geography, Ptolemy framed astrology as a natural extension of his astronomy. Or, as Ptolemy put it, his *Tetrabiblos* was about making predictions "by means of astronomy"

The modern distinction between astronomy and astrology is very difficult to project backward into the past. This isn't because the distinction wasn't acknowledged conceptually—it was—but more because there was rarely any distinction between an astronomer and an as-

trologer professionally. Indeed, Ptolemy himself was the model for this.

For Ptolemy, the more meaningful distinction was within his second type of astronomical predictions—what we would call astrology—which he divided into two subcategories: "general" predictions about the weather, the environment, and the destinies of cities and countries; and "genethliological" predictions (from the Greek word for "birthday") about the destinies of individuals. This notion of "two astrologies" or "both astrologies," meaning general and individual, was revived during the Renaissance and referenced frequently by thinkers like Tycho Brahe and Johannes Kepler.

191 But what astrology teaches us, and what Ptolemy perhaps failed to appreciate, is that with enough data, and with enough enterprise and ingenuity, the "mathematician" can generally make whatever connections he or she wants. And therein lies the danger. Because, as with exploring the world, so too with data: all too often, you find only what you were looking for.

198 Many of the achievements of Hellenistic science were the direct result of the integration of knowledge from the non-Greek-speaking civilizations of the ancient world into a common, Greek-language framework. Hipparchus, for instance, made extensive use of Babylonian astronomical data when constructing his model of the Moon's orbit. But what about the reverse? In particular, to what extent did astrology, so often regarded as a local Babylonian specialty, rely upon Greek or other foreign ingredients? Probably a lot.

211 Astrology made a lot of falsifiable predictions.

236 Consider, for instance, the lot of an astronomer in medieval Baghdad as compared to his predecessor in Greco-Roman Alexandria. Although both operated under the assumption that the Sun revolved around the Earth, our Baghdadi astronomer could consult significantly more accurate astronomical tables compiled from observations taken with larger and significantly more precise instruments. He was able to express his measurements using Hindu numerals—the digits 0 through 9—instead of the clunky Greek practice of using letters of the alphabet. His calculations could be performed by referencing tables of trigonometric functions, instead of having to rely on Ptolemy's tedious method of chords. And he could write on cheap and abundant paper—a trade secret smuggled out of China—instead of costly papyrus or parchment. More importantly, he worked in a milieu in which the shortcomings of Ptolemy's system were known and actively investigated, a tradition begun in earnest with Ibn al-Haytham's book *al-Shukuk ala Batlamyus* ("Doubts on Ptolemy"). And, to add an

239 exclamation point to all this, the Arabic world offered access to that indispensable accelerant of scientific thought, coffee—an elixir entirely unknown to sleepy antiquity. Copernicus, in his turn, was the beneficiary of each of these developments. (Except for coffee, which didn't really filter into Europe until the 1600s.) The point here is that while Copernicus's work truly was revolutionary, it's not as if he was sitting alone in a room with nothing but his thoughts and a copy of the *Almagest*. He was, as all scientists are, the inheritor of an oftentimes invisible intellectual infrastructure built piece by piece by those who had come

before him.

For his part, Copernicus was never shy about acknowledging his debt to Arabic astronomers. In his famous *De revolutionibus*, he cited no fewer than five of them by name: al-Battani, al-Bitruji, al-Zarqali, Ibn Rushd (Averroes), and Thabit ibn Qurra. But the even more obvious evidence that Europe's scientific renaissance wasn't simply a reintroduction of Greek science, unmediated by a thousand years of technical refinements, can be seen in the stars themselves, or, rather, in their names. Of the top twenty brightest stars in the sky, ten are still called by names derived from Arabic. And when we consider the top 100, this number jumps to 72. This transmission into Europe came partly through paper and ink, as Arabic star catalogs such as al-Sufi's *Book of Constellations of the Fixed Stars* were transcribed and copied. But just as significantly, this transit of star names came also in metal, engraved on those instruments which provided a mechanical armature of sorts for the development of both astronomy and astrology: astrolabes.

248 What gives America its technological edge, and how long can it be kept? Quite clearly it's not because we're smarter. American students routinely perform abysmally in international assessments of math, science, and reading skills. So what is it, in the grand pageant of history, that permits a nation or people to claim the mantle of science, and what compels them to lay it down again once their time has passed? Curiously, in the case of Abbasid Baghdad, I think that both a modern and a medieval observer would come to the same, one-word conclusion: astrology.

Looking back at Baghdad's founding, there is a very strong case to be made that it was **al-Mansur's personal obsession with astrology that was the not-so-secret impetus for his city's scientific pursuits**. Certainly, the almost manic translation of Greek texts into Arabic appears a lot less eccentric if it's understood as part of a government initiative to harness the power of the stars. Wherever the truth may lie, it's undeniably the case that astrological texts were heavily represented among the earliest titles translated in Baghdad.

277 To the extent that the idea of Islam's golden age has any currency, it's al-Kindi's stamp that it bears. It was through his initiative that the headiest works of Greek philosophy were revived with such thoroughness and zeal. Beyond his own books on metaphysics, medicine, and music (to list just a few), al-Kindi also wrote extensively on astrology.

286 As before, there was a dawning awareness of technological inferiority followed by a frantic translation effort—this time out of Arabic—**with astrological texts conspicuously overrepresented**. Names like Messahala (Masha'allah), Albumaser (Abu Mashar), and Alkindus (al-Kindi)—their strange Latin spellings making them all the more alien sounding—became the new authorities of a new and cutting-edge science. But unlike the previous cycles of this sequence, there was never any one city that could claim, through its astrological preeminence, to be the obvious successor to Baghdad, Alexandria, or Babylon. Instead, in astrological expertise just as in everything else, the cities of medieval Europe vied with one another—a

condition that doubtless contributed to the accelerating pace, once begun, of Europe's technological rise.

Even Latin, dominant though it was, did not go unchallenged as the language of European astrology. The first scientific textbook written in English, for instance, appeared as early as 1391; it's an astronomical and astrological manual on the use of the astrolabe written by none other than Geoffrey Chaucer (he of Canterbury Tales fame). ...

For astrologers and poets alike, the most desirable employment was to be attached to the household of a noble patron. After nearly five decades of wandering across Europe, Petrarch was gratified to accept the patronage of the Visconti family, then the rulers of Milan. There he struck up an unlikely friendship with the Visconti's court physician and astrologer—the two titles often went hand in hand—named Maino Maineri.

Petrarch, who viewed astrology as an affront to God's providence, used to tease Maineri about why his forecasts for events years into the future should be believed when Maineri couldn't even predict that week's weather. Maineri defended his art as best he could. But the backdrop to these conversations, as Petrarch makes plain in his letters, was the ever-present specter of the Black Death. This pestilence, which the University of Paris physicians had blamed on the triple conjunction of Jupiter, Saturn, and Mars in the year 1345, is estimated to have wiped out fully one-third of Europe's population before the close of the fourteenth century.

304 When to sel and buy: stock market: astrology fails.

316 Clockwise—this comes from astrolabe hands.

319 Even words as mundane as “consider” and “desire” are thought to have an astral origin—from the Latin word *sidus*, meaning “star.” If so, then any honest consideration (*consideratio*) should properly entail a consultation of the stars, just as every true desire (*desideratio*) is really a wish upon a star. Whatever the etymologies of these words, it's undeniably the case that the Roman emperors, following the lead of Julius Caesar, had great desires of “becoming a star.”

Since, by the late Roman Empire, astrology had become the settled science of its day, the Talmudists frequently had cause to reference it.

319 iv The boundary between the words astrology and astronomy was pretty blurry in the run-up to the scientific revolution.

Even the Rudolphine Tables, Kepler's monumental astronomical tables based on Tycho's observations and his own newly discovered laws of planetary motion, included a section on how to cast horoscopes. the role of the Imperial Mathematician wasn't to solve math problems. “The job of a mathematicus,” as Kepler noted, “... is to write the annual prognostica” -which, indeed, Kepler did for many years.

Did Kepler believe in astrology? His private papers contain a mind-boggling collection

of over one thousand horoscopes cast with his own hand. And as a younger man, he scrutinized the horoscope of his newborn son with all sincerity. **Yet by the time he completed the Rudolphine Tables in 1627**, just a few years before his death, his exasperation with the “dreams and nonsense of horoscopic predictions” appears to be total. Johannes Kepler, the genius who discovered the three laws of planetary motion in Tycho’s scattered data, was unable to find any pattern at all in all the horoscopes he cast. It wasn’t for lack of trying. Despite its relatively late publication, the Rudolphine Tables may also be the first major work to explicitly differentiate “astronomy” and “astrology” along the lines we know them by today. Kepler states that both were originally known by one name, astrologia, but that they were now separate enterprises deserving of the separate names which “later usage” had given them. ...

The Rudolphine Tables illustrate that even as late as the 1620s, astronomy and astrology were just beginning to go their separate ways.

For many people today, modern astrology’s basic claim—that people’s personalities can be meaningfully grouped according to their zodiac sign—appears to be borne out by day-to-day experience. The counterclaim, that these groupings have no actual meaning, is therefore the counterintuitive one. **The persistence of astrology shows how tenacious our pattern-matching tendencies can be.** Once the suggestion of a pattern has been made—in this case, a suggestion first put forward thousands of years ago—it can be very difficult not to see evidence for it everywhere. Yet astrology’s persistence tells us something else, too, something that many seem unwilling to acknowledge: the arguments against astrology are, evidently, not nearly as compelling as Socrates’ argument about how to double a square, or even the argument that the Earth revolves around the Sun. Why not?

First of all, it should be noted that no direct evidence of the Earth’s motion was observed until the nineteenth century, when telescopes finally became powerful enough to measure stellar parallax. A conflict is settled, however, when opposition ceases. In this case, the religious institutions which were the primary opponents of a heliocentric cosmos had already conceded the argument during the 1600s. What this sequence implies is that, at a popular level, no one much cares whether the Earth is moving or not. Otherwise, this debate might have lingered on at least through the nineteenth century, if not well into the space age.

Yet people do care about astrology. Its system of explaining our personalities and our compatibilities has proven enduringly popular. It’s really not surprising, then, and certainly not unreasonable, that those who find astrology compelling would require something a bit stronger than the old, mostly theoretical arguments against it to convince them otherwise.

Today there are reference surveys, such as *Tests of Astrology: A Critical Review of Hundreds of Studies*, which document decades’ worth of investigations, all of them arguing against the claims of astrology and astrologers. Yet it remains the case that most of these tests are indirect. They demonstrate primarily that professional astrologers can’t do what they say they can do, not so much that astrology itself is invalid.

In order to directly test astrology's core assertions, what's needed most of all are large data sets of births recorded to the minute

Was there even such a thing as science, objective truth, and a scientific method, or was the whole edifice nothing more than an expression of power?

One small episode from that decade saw several of these trends come into conjunction. In 1975, the September/October edition of *The Humanist* magazine published a declaration entitled "Objections to Astrology: A Statement by 186 Leading Scientists."

...

The article, with its impressive list of signatories, conveys an important and powerful message. And yet, today, it is mainly remembered not for who signed it, but for who didn't. Astronomy's most well-loved public ambassador, although personally asked to endorse the statement, reluctantly determined he could not. This was Carl Sagan. Sagan was a vociferous critic of astrology, but he objected to the "Objection" for several reasons. First, because "the tone of the statement was authoritarian." Indeed, the philosopher Paul Feyerabend, at that time a professor at Berkeley, made a similar observation and mocked the scientists' statement for how closely it matched the wording of the Catholic Church's fifteenth-century condemnation of witchcraft.

More substantively, **Sagan objected to the statement's emphasis that there was "no mechanism by which astrology could work."** As Sagan noted, this point, by itself, is meaningless. The theory of continental drift, he offered by way of example, had been dismissed for exactly the same reason, and yet it subsequently became one of the fundamental pillars of modern geophysics.

But I suspect that Sagan also intuited how counterproductive and silly the statement would seem to those to whom it was nominally addressed. Sagan recognized that what motivates those who turn to astrology is, deep down, a sense of curiosity and wonder. He recognized this because it was the same curiosity and wonder he experienced whenever he looked up at the stars. This basic human empathy was a big part of what made him such a gifted communicator.

That Carl Sagan, the great evangelist of scientific wonder, was also one of the twentieth century's great proponents of skepticism is no contradiction. Personally, it's this paradoxical quality that I've long admired most in him. To borrow a New Age notion, **wonder and skepticism are like yin and yang**, two seeming opposites that must balance each other in creative conflict-because, if we're so quick to be deceived by falsehoods, how will we recognize true wonder when we see it? Conversely, what is the purpose of skepticism if not to prepare our wonder when, against all challenges, what seemed impossible actually proves true?

Nullius in verba: upon the words of no one.

Invoking the rallying cry of science for a book about astrology, the arch-pseudoscience, may come across as a little preposterous. Perhaps it is. Yet it strikes me that the prerogative to

ask honest questions about a topic ought to be insisted upon all the more wherever asking those questions is most discouraged. Because, and let's be honest, it's not as if writing a book like this is entirely without risk. My aim has been only to explore astrology, certainly not to endorse it. And I trust that this book will be received in the spirit of curiosity and openness with which it was written.

Otto Neugebauer, the historian of science who single-handedly did more than anyone to reconstruct the history of ancient mathematical astronomy, had to deal with similar sideways glances whenever his research touched upon astrology. In a powerful 1951 essay called "The Study of Wretched Subjects," Neugebauer defended those who were painstakingly piecing together the writings of science's also-rans, like Vettius Valens, against the slights of scholars who studied more respectable topics. Those wretched writers, Neugebauer noted, "may one day furnish the missing link in the transmission of doctrines which have left their imprint in almost all phases of Mediaeval learning, Medicine, Botany, Chemistry, etc."

Neugebauer's essay resonates very strongly with me. I would only add that, for me, the history of astrology has a value all its own, apart from whatever relevance it may or may not have to other strands of history. And I certainly wouldn't describe the time I've spent researching this subject as in any way "wretched." I consider the opportunity to write about astrology to have been both a privilege and a joy. This book has given me a delightful excuse to connect my love of history with my love of numbers in a way that few other topics could. But what has consistently amazed me throughout is astrology's almost magical ability to connect not just these, but practically any subject with any other. It may not be "cosmic sympathy," but there is an undeniable power in astrology