Science and Tradition in the *Tetrabiblos*

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It is difficult if not impossible in the present state of our knowledge to determine whether Ptolemy contributed specific doctrines, data, or methods to the development of astrology, because almost any isolated statement in the *Tetrabiblos*,[1] his principal study of the subject, is paralleled in other writers. Ptolemy is unique in his attempt to establish a scientific[2] foundation for astrology: he states the basic concepts of his system of astrology, then works out the details of that system, trying to unify the

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[1] References to the *Tetrabiblos* are to the book, chapter, and section number of the edition by F. Boll and Ae. Boer, *Cl. Ptolemaei Opera Omnia* III. 1 (Leipzig 1940) and the page number of the Loeb edition by F. E. Robbins (1940). The chapter numbers are not the same in the two editions. Works referred to by abbreviation are *AG* = A. Bouché-Leclercq, *L'Astrologie grecque.* (Paris 1899) and *GH* = O. Neugebauer and H. B. Van Hoesen, *Greek Horoscopes.* (Philadelphia 1959).

[2] "Scientific" is not an anachronism. In Ptolemy's work the word φυσικός is best translated "scientific." Some examples: "The most significant configurations of the sun, moon, and stars are foreseen not only by those who examine the matter scientifically, but even by those who simply observe"—παρὰ τοῖς μὴ φυσικῶς, μόνον δὲ παρατηρητικῶς σκεπτομένοις (1.2.7; Robbins 8). Naive observers working without a conceptual framework are contrasted with those working in a system. Another example: we will continue with individual forecasts "Always sticking to our scientific method of exposition"—ἐχόμενοι πανταχῆ τῆς κατὰ τὸν φυσικὸν τρόπον ὑφηγήσεως (2.1.1; Robbins 116). Robbins translates "natural," but in fact the next paragraph shows that Ptolemy is referring to his systematic method with its concepts under which phenomena can be subsumed (surely the essential characteristic of science since the Greeks), the general before the specific, and principles before applications. This systematic method is characteristic of Ptolemy: Book 1 of the *Tetrabiblos* outlines the basics of astrology just as Book 1 of the *Almagest* outlines the basics of astronomy (the structure of the universe and the mathematics necessary for celestial calculations).

As for "scientific" astrology, I cite a passage from Otto Neugebauer: "We should not forget that we must evaluate such doctrines (i.e., astrology) against the contemporary background." Compared with the ideas either of arbitrary rulership of deities or of the possibility of influencing events by magical operations, "the fundamental doctrines of astrology are pure science. Of course the boundaries between rational science and loose speculation were rapidly obliterated." *The Exact Sciences in Antiquity.* (New York 1969) 171. I am contending in this paper that the "loose speculation" came first; the "rational science" was Ptolemy's contribution.

diverse phenomena of the cosmos under the given set of concepts. He consistently applies this scientific program in determining the physical nature of the stars and signs and their effects on the environment, laying down in advance the relatively few concepts which fix their individual characteristics, then showing how these characteristics can be used to forecast the weather, human nature in various climes, and some eclipse effects.[3] However, when it becomes necessary to use the mythical attributes of the stars and signs (e.g., Mars bloody and ferocious, Venus the goddess of love), attributes which he found in his sources along with information about the physical nature of the stars, Ptolemy does not state in advance the fundamental concepts which determine these characteristics. To cite an example: in his chapter on bodily form (3.12; Robbins 306 ff.) Ptolemy shows that the stars' physical characteristics affect men's bodily form. Warm, moist Jupiter makes men large and handsome—warmth and moisture promote growth. Warm, dry Mars makes men small with light-colored hair—dryness inhibits growth.[4] However, with respect to the details of men's bodily form, Ptolemy's basis for forecasting seems quite different. Each zodiacal sign brings about its characteristic effects: the anthropomorphic signs make men more graceful and poised; the non-anthropomorphic signs modify physiques according to their own nature. The large signs Leo, Virgo, and Sagittarius make men bigger, the small signs Pisces, Cancer, and Capricorn, smaller. Partial signs (e.g., Taurus, pictured as the foreparts of a bull) promote the development of their part—for Taurus, the chest and shoulders (3.12.13; Robbins 314). And so on. The signs' effects are based on their mythical, pictorial nature, not on any physical or astronomical characteristics.

A retort might be made that the distinction made above between "physical" and "mythical" is simply a modern view of an originally undifferentiated whole. Certainly these terms are modern, but I would contend that Ptolemy himself distinguished the two. Whereas he begins the *Tetrabiblos* with a review of the stars' effects on the climate and the atmosphere and demonstrates the reasons for such effects at length (1.4,8,9,10—this is his "physics"), he does not feel the need for a comprehensive review of all the mythical attributes of the stars and signs, as did the other ancient astrologers, Vettius Valens and Hephaistion, both of whom begin their large tomes with page upon page describing the stars and signs in a way illus-

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[3] He declares plainly that "the cause of events universally and in individual cases is the motion of the stars" and that "the art of forecasting consists of the exact observation of the changes in the environment that correspond to these motions" (3.1.1; Robbins 220).

[4] Any warm, moist influence will produce the same effects: the warm, moist season of spring produces men of good complexion, of large size, with large eyes (3.12.10; Robbins 312—parallel with the description of Jupiter's effects in 3.12.4; Robbins 308). The warm, dry season of summer produces robustness, and thick, curly hair (3.12.10; Robbins 314—parallel to the description of Mars's effects in 3.12.5; Robbins 310). Ptolemy points out several times that it is not the *star* or *sign* that produces a certain effect, but the *quality* of the star or sign, and that a given quality will always produce the same effect (2.9.3; Robbins 178).

trated by the passage quoted on p. 77 below. Ptolemy rather begins to use these attributes when needed, first in the discussion of national characters (2.3; Robbins 128 ff.), then in the methods for forecasting a client's life (Books 3 and 4). These mythical attributes were not suited to his usual axiomatic approach, but were nevertheless so imbedded in traditional astrology that they could not be ignored. Ptolemy himself contrasts his own axiomatic method with the "old," infinitely complicated method; he was consciously taking a different approach.[5] Here I outline the two strands in the *Tetrabiblos,* the scientific and the traditional, to demonstrate how they interact in specific forecasts, and finally to point out a parallel dichotomy in Kepler's astrological writings.

I.

The first words of the *Tetrabiblos* declare that "we can discover the changes caused (in the environment) by the special nature of these very configurations (of the stars with each other)" (1.1.1; Robbins 2; also 1.2.7; Robbins 8). Ptolemy then proceeds in Book 1 to demonstrate the truth of this assertion, applying a relatively few principles of physics and geometry: one group of principles depends on the opposition of physical qualities, heat-cold, wet-dry, i.e., the four humors (χύματα—1.5.1; Robbins 38). The other group of principles, geometrical, specifies the relevant angular relationships, or aspects, of the stars and signs with each other and with certain points on the ecliptic. These principles also define the favorable or unfavorable nature of these aspects.

First the humors—according to Ptolemy, knowledge of the sources of heat-cold, moist-dry makes astrological forecasting possible. Even brute beasts can foresee changes in the weather, the seasons, and the climate due to the positions of the heavenly bodies and their configurations with each other (1.2.4–5; Robbins 10), and so a systematic, scientific approach should be even more informative. Then Ptolemy gets down to details: the sun obviously heats and dries. The moon moistens and heats (slightly), because of the terrestrial vapors ascending to it and because of the reflected light of

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[5] He mentions the ἐπιβλητικὸς τρόπος on which he relies rather than the ἀρχαῖος τρόπος (3.2.6; Robbins 226) which is infinitely complex and dependent on the conjectures of the astrologer. (I read ἐπιβλητικός with Boll and Boer in the sense "based on doctrine, design." See LSJ ἐπιβολή 2.b,c and references there, particularly Plutarch *Pericles* 12.5.) He is not of course rejecting astrological tradition. He refers to "they" who established the tradition (1.5.1, 1.6.1, 1.7.1, 1.12.1; Robbins 38,40,42,68). He refers respectfully to the "ancient" astrologers (3.11.1; Robbins 270), presumably Nechepso and Petosiris. (See Ernestus Reiss, "Nechepsonis et Petosiridis Fragmenta Magica." *Philologus. Supplementband 6* [1892] 358.) Ptolemy, like most innovators in traditional society, would claim to be rescuing the ancient tradition from the folly of quacks. No one can deny that Ptolemy, although trying "to cast the light of mathematics into the darkness" of astrology, used existing compilations. Proof of this, were it necessary, can be gathered from Ptolemy's verbal parallels with Vettius Valens, Manetho, and Firmicus Maternus, all deriving from earlier compilers. See W. Kroll, "Mantissa Observationum Vettianarum" in *Catalogus Codicum Astrologorum Graecorum* V 2 (Brussels 1906) 143–54.

the sun. Saturn chills and dries, clearly because it is far from the sun and from the earthly vapors. (In the Aristotelian world picture all moisture is in and around the earth; the order of the stars is Earth, Moon, Mercury, Venus, Sun, Mars, Jupiter, Saturn). Mars heats and dries, as we can judge from its color and its proximity to the sun (the next sphere up). Jupiter warms temperately and moistens—temperately because it is between cold Saturn and hot Mars. Venus too warms moderately because of its nearness to the sun, and moistens because of its nearness to the moon. Mercury has the three humors of heat, dryness (because of its nearness to the sun), and moisture (because of its nearness to the moon—the next sphere up). These humors give the stars their benefic or malefic character: the hot and moist humors are creative, the cold and dry humors destructive. So Venus, Jupiter, and the moon are creative and benefic, while Saturn is malefic. Mars is also malefic because of its dryness combined with its excessive heat. Combinations of humors thus determine the nature of the stars just as the elements determine the nature of chemical compounds.[6]

Next the stars are classified into "sects" (αἱρέσεις—1.7; Robbins 42) according to their humors: moist is feminine, dry is masculine. In addition moist is nocturnal, the sect of the moon and Venus, while dry is diurnal, the sect of the sun and Jupiter. Here, however, Ptolemy has a problem: since the traditional assignments were not made on the basis which he is using, he finds Saturn assigned to the diurnal sect and Mars to the nocturnal. Certainly this is the opposite of Mars's real nature. Ptolemy justifies the assignment by pointing out that the evil effects of cold Saturn would be lessened by placing it in the warm diurnal sect and the evil of hot Mars by placing it in the cool nocturnal sect. It was for such a reason that "*they* made this assignment" (1.7.2; Robbins 42). It is clear that Ptolemy did not invent this system, but he does try to make it plausible.[7]

Other groups of four are associated with the four humors:

HUMOR	SEASON	AGES OF MAN	DIRECTION/WIND
Moisture	Spring	Infancy	West—Zephyr
Heat	Summer	Youth	South—Notus
Dryness	Autumn	Middle Age	East—Apeliotes
Cold	Winter	Old Age	North—Boreas

Ptolemy's system tries to include as many phenomena as possible.

The humors, taken as principles of physics, are also used in the assignment of stars to their houses (1.18; Robbins 78 ff.).[8] Cancer and Leo are the signs which rise closest to the zenith and in which occur the extremes of

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[6] *AG* 89–101.

[7] *AG* 101–104, 188.

[8] These are not the houses of modern astrology but are the "natural homes" of the individual stars. "Houses" today are twelve divisions of the zodiac beginning at the Ascendant running counterclockwise on the horoscopic chart. They overlap the signs but are not identical with them.

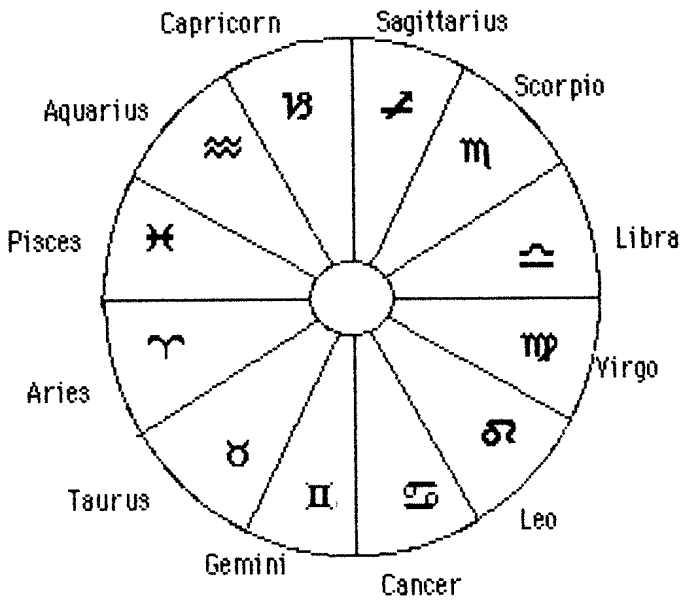

FIGURE 1

heat (July–August). Appropriately, these signs are the houses of the sun (Leo) and to the moon (Cancer), the most powerful of the heavenly bodies. The signs farthest from Cancer and Leo, i.e., Aquarius and Capricorn, the *cold* winter signs, are assigned to Saturn, the coldest of the stars. The other stars are assigned a position consistent with the order of their spheres. Mercury is assigned to Gemini and Virgo, next to the luminaries, Venus to Taurus and Libra, Mars to Aries and Scorpio, and Jupiter to Pisces and Sagittarius. Similar reasoning is used to determine the stars' exaltations and depressions, which are points in the zodiac of special power or weakness respectively (1.20; Robbins 88).[9] Attributes associated with the humors also determine the assignment of the *signs* to the masculine and feminine sects; this assignment is not made on quite the same basis as the previous assignment of the *stars* to these sects. Aries is the first sign. "First" implies "male," holding the primary place of leadership; therefore Aries is masculine. It is also diurnal since masculine is active, not passive, and the day is the time for action. Having fixed this point, Ptolemy gives the other signs alternating natures: Taurus is feminine and nocturnal, Gemini is masculine and diurnal, and so on in order.

These are the basic parameters of his "physics" based on the humors. He sums up: the basic facts necessary for evaluating the "mixtures" (*συγκράσεις*) in any particular instance have been given. The astrologer

[9] For a discussion of the exaltations and depressions, see *AG* 192–99 and *GH* 7.

must allow for the mixture (μίξις) of stellar influences at any given period, e.g., hot stars appearing in cold periods (1.10.4; Robbins 62–4).

In addition to the basic principles derived from physics, Ptolemy has "axioms" of stellar geometry on which to base a scientific astrology. The axioms specify two sets of significant points on the ecliptic. One set of points depends on the position of the ecliptic relative to the horizon. These points, the centers or angles, are the Ascendant, the point on the eastern horizon; Midheaven (MC), the point of the ecliptic on the noon meridian; the Descendant, the point on the western horizon; and Lower Midheaven (IC), the point opposite MC, directly below the earth. The other set of significant points is defined relative to the motion of the sun on the ecliptic (1.12; Robbins 64 ff.). These are the two tropics or solstices, the points at which the sun has come farthest north or south and begins to turn, and the two equinoxes, where the sun crosses the equator.

After a commonsense observation that the signs share the nature of their seasons (i.e., Spring = Aries is moist, Summer = Cancer is hot, etc. as above), Ptolemy names four types of signs, basing his classification on the sign's position relative to the significant points listed above: 1) tropic or solstitial, the signs of the solstice at the two tropics (τροπικά—turning points)—these are Cancer and Capricorn; 2) equinoctial, the signs of the equinox when the sun crosses the equator—these are Aries and Libra; 3) "solid," the signs following the tropical and equinoctial signs—these are Taurus, Leo, Scorpio, and Aquarius; 4) "bicorporeal," the signs preceeding the tropical and equinoctial—these are Pisces, Gemini, Virgo, and Sagittarius (1.12; Robbins 64 ff.). Note that the names "solid," and "bicorporeal," despite their apparent literal meaning, refer so far in Ptolemy's system only to their positions in the zodiac, not to any appearance of the sign itself, which appearance is (here) irrelevant. As Ptolemy says: the signs "take their nature from the tropic and equinoctial starting places and from *no* other cause" (1.22; Robbins 110). When describing Aries the Ram, for example, he pays attention to the qualities of the season, not to those of the animal. Later, however, he uses bicorporeal signs to forecast the birth of twins (3.8.2; Robbins 256), and lists other types of classification (four-footed, terrestrial, commanding, fecund) which he considers "superfluous" to enumerate here since their characteristic effects can be explained in the predictions where they appear useful (1.13; Robbins 70). This side comment is revealing: Ptolemy does not consider that these traditional types fall under the scientific system which he is using in this section of the *Tetrabiblos;* they are not basic concepts but can be used *ad hoc.*[10]

The second set of geometrical axioms defines the nature of the signs' and stars' inter-relationships, and are all based on degree intervals evenly divisible into 360°: 60° (sextile), 90° (square), 120° (trine), and 180° (opposition). These are, of course, the favorable (sextile, trine, and conjunc-

[10] *AG* 130–57.

tion) and the unfavorable (square and opposition) aspects upon which most astrological interpretation depends.[11] Signs which are not in one of these aspects with a given point are called "disjunct" (ἀσύνδετα—1.17; Robbins 76).

Signs also have other designations which depend on other purely geometrical relationships: the signs from Taurus to Virgo "command" the signs from Pisces to Scorpio (which "obey") in symmetrical order centered on the equinoctial signs Aries and Libra. Taurus commands Pisces, Gemini commands Aquarius, and so on. Similarly, the signs from Aquarius to Gemini "behold" those from Sagittarius to Leo, again in symmetrical order, but centered on the solstitial signs, Capricorn and Cancer. Aquarius beholds Sagittarius, Pisces beholds Scorpio, and so on (1.15–16; Robbins 74).

Having declared the physical concepts and the geometrical axioms which govern his system, Ptolemy combines physics with geometry in his discussion of the stellar triangles.[12] He integrates the triangles with the four directions and uses them to describe the characteristics of various ethnic groups and for forecasts of eclipses. Each star is connected with a wind (= direction) through the similarity of nature between the stars whose houses are in the triangle and the winds from each compass point. A later astrologer, Hephaistion, preserves a system in which the directions and triangles are associated with one of the four elements. In tabular form:

triangle	rulers	direction[13]	element (Hephaistion 3.7.7)
Aries Leo Sagittarius	sun, Jupiter	NW	fire
Taurus Virgo Capricorn	Venus, moon	SE	earth
Gemini Libra Aquarius	Saturn, Mercury	NE	air
Cancer Scorpio Pisces	Mars, moon Venus (co-rulers)	SW	water

[11] *AG* 165–79.

[12] The triangles were used by Dorotheus of Sidon (ca. A.D. 25 to 75), who wrote a long astrological poem, a metrical tour-de-force. In Book 1 his forecasts are based on the rulers of the triangles, the τριγωνοκράτορες. See David Pingree, *Dorothei Sidonii Carmen Astrologicum* (Leipzig 1976), for the Arabic version of the Greek original (with an English translation), and a collection of the Greek fragments.

[13] The directions are always combinations of N, S, E, W, because there are at least three stars in each triangle to act as rulers. For example, in the first triangle Jupiter is associated with the north wind and Mars (the ruler of Aries) with the southwest wind. Together they make NW (1.19.2; Robbins 84).

Using these triangles, plus the physical concepts and geometrical axioms laid down in Book 1 of the *Tetrabiblos*, Ptolemy determines the character of the earth's inhabitants, eclipse effects, and the weather, in short, "catholic" (*καθόλου*—"overall") astrology.

Ptolemy has two slightly conflicting quadrant maps of the inhabited earth.[14] The first (Quadrant Map 1; Fig. 2) is used in *Tetrabiblos* 2.2 (Robbins 120 ff.).

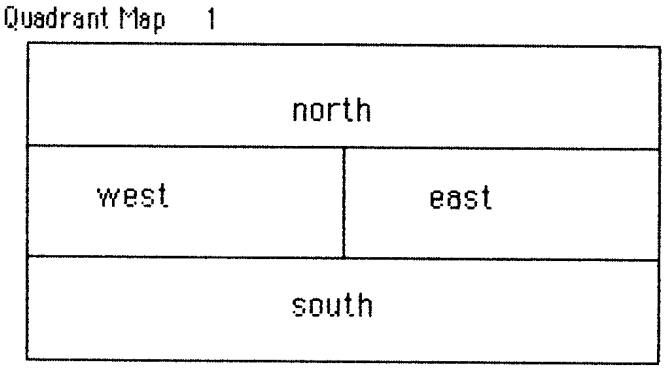

FIGURE 2

The southern part of the inhabited earth, the section south of the Tropic of Cancer, is hot and dry. Its inhabitants, the Ethiopians, burned black and oppressed by the heat, are somewhat savage. The northern part, "under the Bears," is cold and moist. Its inhabitants, the Scythians, are tall and well nourished because of the moisture, but are savage because of the constant cold. Both extremes, heat or cold, produce savage dispositions. The temperate zone, between the Tropic of Cancer and "the Bears," is extreme in neither heat nor cold, and its inhabitants are correspondingly moderate and civilized. This zone is divided into an eastern and a western area, and is described using the "sects" of the stars rather than the humors: the East, associated with the sun, is masculine, diurnal, and right-handed (= strong, vigorous); the West is feminine, nocturnal, left-handed. Thus is the general survey of the earth's climes, based so far on reasonably straightforward astronomic and geographic criteria.

The next chapter, 2.3 (Robbins 128 ff.), describes the particular character of each nation, and for this discussion Ptolemy uses a different map (Quadrant Map 2; Fig. 3). The inhabited world is now divided into four quarters: the east-west line runs through the Straits of Gibraltar to the Gulf of Issus, the north-south line through the Black Sea and the Gulf of Suez/

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[14] The literature on Ptolemy's geographical concepts and on his *Geography* is even more immense than that on his astronomical and astrological work. A bibliography of some 1500 titles concerning the *Geography* is compiled by W. H. Stahl, *Ptolemy's Geography, A Select Bibliography.* (New York 1953), and hundreds have appeared since then, many being mere identifications of place names.

Red Sea. Each quadrant is under the control of one of the stellar triangles (1.19; Robbins 82 ff.—see p. 73 above). The NW triangle controls the NW quadrant, and so on. Control by a particular triangle also implies control by the stars which rule the triangle; hence Jupiter and Mars rule both the NW triangle and the NW quadrant.

Flexibility in interpretation is added by dividing each quadrant into four sections. The sections surrounding the center of the inhabited world (i.e., the SE section of the NW quadrant, the SW section of the NE quadrant, the NW section of the SE quadrant, and the NE section of the SW quadrant—the dotted area in Fig. 3) are partially under the control of the triangle which rules the opposite quadrant. An example: Aries, Leo, and Sagittarius control the NW quadrant as a whole, plus they have a familiarity with the NW section of the SE quadrant, comprising Palestine, Phoenicia, and Arabia Felix. The signs of the SE triangle—Taurus, Virgo, and Capricorn—control the SE quadrant as a whole, but they also have a familiarity with the SE section of the NW quadrant, comprising Thrace, Macedonia, Greece, Crete, Cyprus, plus the Aegean Islands and the coast of Asia Minor.

I have described his geographical theory in some detail, first because the scheme is remarkably clever: it allows both for the cultural unity of the nations around the Mediterranean basin, and for the similarities between the individual Mediterranean nations and their cultural hinterland. Second, I wish to point out the primarily geometric inspiration of the theory: reference to Figures 2 and 3 will show the theory to be highly schematized,

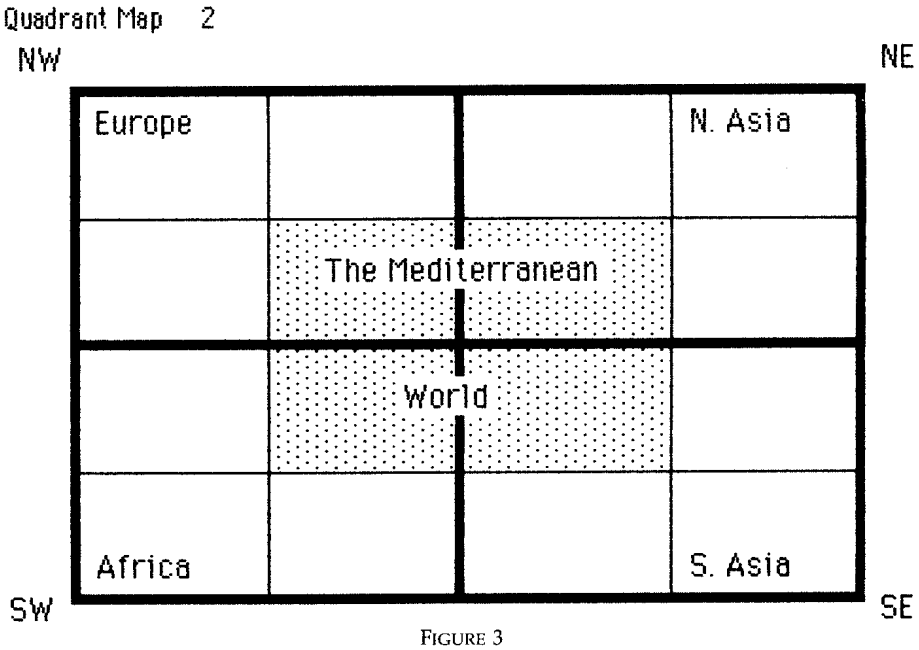

FIGURE 3

parallel to Ptolemy's other systems of aspects, centers, commanding/obeying and beholding signs.[15] The theory is not for the most part inspired by any anthropological study of local cultures.

The qualities attributed to the inhabitants of a given quadrant accord with the physical qualities of the stars and the triangles ruling that quadrant, *with some significant additions.* To take the NW quadrant again as an example: as mentioned, it has a familiarity (*συνοικείωσις*—1.19, 2.3.2; Robbins 126) with the triangle Aries-Leo-Sagittarius, whose rulers are primarily the sun and Jupiter, secondarily Mars (1.19, 2.3.3; Robbins 128). The sun and Jupiter are of the masculine, diurnal sects (and for this reason are the primary rulers), while Mars is masculine but nocturnal (1.6, 1.7; Robbins 40, 42), thus sharing a sect with the feminine moon. Given the predominant masculine, diurnal rulership, it is no surprise that the inhabitants of the NW quadrant (Europe) are active, independent, magnanimous (2.3.13; Robbins 134). The four sections of this quadrant are closely tied to certain signs and stars: the NE section to Mars and Aries (hence the inhabitants are ferocious), the NW to Sagittarius and Jupiter (hence they are freedom-loving and straightforward), the SW to Leo and the sun (hence they are commanding and doers of good deeds). The SE section (the dotted area in Fig. 3; this is the Aegean basin) has an additional familiarity with the SE quadrant and its triangle, Taurus-Virgo-Capricorn and its rulers Venus, Saturn, Mercury (2.3.22; Robbins 138). As a result the inhabitants of this SE section of the NW triangle have the leadership and commanding qualities (from Mars) and the democratic and independent qualities (from Jupiter) of the rest of the NW triangle; they also have the qualities appropriate to Venus (music and elegance) and to Mercury (sociability and eloquence). The Greeks will be delighted!

Here, in Book 2.3, Ptolemy for the first time has begun to use hitherto unstated traditional principles which had long determined the mythical nature and effects of the stars. The following planetary attributes can be deduced from this chapter:

> Saturn is associated with acquisitiveness (2.3.21), nobility (2.3.26), uncleanness, ugliness (2.3.28), grimness, bestiality (2.3.36), a rough life, flesh- and fish-eating (2.3.50).
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> Jupiter is associated with independence, purity (2.3.16), democracy, law (2.3.19), fertility of the land, freedom in spirit and in action (2.3.32), wealth, freedom, trustworthiness in contracts (2.3.41).
>
> Mars is associated with ferocity (2.3.15), nobility, independence (2.3.18), boldness, atheism, treachery (2.3.31,41), recklessness, rascality (2.3.41), war, meat-eating (2.3.45).

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[15] Not his alone of course. Franz Boll argued that Ptolemy borrowed the structure of his geographical excursus and the ethnographic details from Posidonius, who is known to have written ethnographical treatises. See Boll "Studien über Claudius Ptolemäus." *Jahrb. f. class. Philol.* (1894) 213 and for some supporting evidence, Posidonius fragments 49 and 202 (Edelstein and Kidd). For a contrary view, see R. Uhden, "Das Erdbild in der Tetrabiblos des Ptolemaios." *Philologus* 88 (1933) 302–25.

> Venus is associated with artistic and scholarly temperaments and with the mysteries (2.3.19), luxury (2.3.20,26,36), dancing, leaping (2.3.24), wealth (2.3.36), beauty, adornment (2.3.44), hot blood, fickleness (2.3.50).
> Mercury is associated with sociability, justice, letters (2.3.19), philosophy, scholarship (2.3.21), mathematics, astronomy (2.3.28), crookedness (2.3.35), intelligence, success, religion (2.3.49).

Ptolemy also knows the nature and effects of the stars in combination; for example, the inhabitants of the NW section of the SE quadrant (i.e., from Phoenicia and Palestine to Arabia) are ruled by Jupiter, Mars, and Mercury. Mercury gives them a talent for trade and exchange, but Mars turns that talent to deception, trickery, and cowardice (2.3.30; Robbins 142). A complete listing of the effects of the combinations is found in 3.14.10 ff. (Robbins 338 ff.).

II.

It is perfectly clear from all astrological literature that the stars had traditional attributes and effects which owed little to their supposed physical nature. To cite just one example, a complete listing of the natures and effects of the stars is found in Vettius Valens, a near contemporary of Ptolemy.[16] His listing of the five planets alone fills nearly four pages of text. Abridged it includes the following:

> "Saturn makes those born under him petty, malignant, worried, self-depreciating, solitary, deceitful . . . miserable (2.1–4). Saturn causes humblings, sluggishness, futility, grudges about business, interminable lawsuits, oppressions, griefs (2.6–7). . . . Saturn makes serfs and farmers, because it rules matters of the soil; it makes men renters and tax farmers. It puts into one's hands great reputations and noble positions (2.9–12). (Valens goes on to list the materials, the parts of the body, and the diseases and syndromes caused by Saturn. He does so for each star.)
> "Jupiter indicates childbearing, engendering, desire, loves, political alliances, acquaintainship, friendship with the great (2.24–25).
> "Mars indicates force, wars, plunderings, screams for help, violence, whoring, deprivation of property, banishment. (2.35–37). . . . It brings violent murders and assaults, bloodshed, attacks of fever, ulceration (3.3–5).
> "Venus is desire and love; it indicates mother and nurturing; it makes priesthoods, school superintendancies, high offices (3.16–18). . . . Venus causes men to be gold-spinners, gold workers, barbers, and people fond of cleanliness and play (3.24–25).
> "Mercury indicates education, letters, disputation, reasoning, comradship, interpretation, embassies, number, accounts, geometry (4.4–6). . . . It bestows forethought and intelligence (4.9–10). . . . It rules astrologers" (4.19–21).

All this is paralleled in *Tetrabiblos* 3.14, "On the Quality of the Soul" (Robbins 332 ff.), and in 4.4, "On the Quality of Activity" (Robbins 380

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[16] Flourished ca. A.D. 150. See *GH* 176–85. The Greek text is by W. Kroll, *Vettii Valentis Anthologiae Libri* (Berlin 1908). References are to the page and line of this edition.

ff.), where Ptolemy lists virtually the same effects for the stars, and is quite similar to the listing (pp. 76–77 above) derived from *Tetrabiblos* 2.3. It is significant, however, that Valens felt the need to define these characteristics first, before discussing how to forecast; Ptolemy simply begins to use them as given. Thus far the traditional attributes of the *stars:* The *signs* too had traditional attributes. Valens's listing for the signs covers 10 pages: "Aries is the house of Mars, a masculine, solstitial, terrestrial, dominating, fiery, free, upward trending, semi-vocal, noble, changeable, supervisory, popular, civic, with-few-offspring, lurking . . . sign. Men born under this sign are noted, famous, commanding, just, evil-hating, free, imperious, bold in conceptions, boasting, great-souled, unsteady" (5.23–31). Valens goes on to give the weather for Aries, "wet, thunderstorms, hail," the bright stars in the constellation, and the parts of the earth subject to Aries. The eleven other signs are treated in the same detail.

In Book 1 of the *Tetrabiblos* the signs' primary characteristics were derived from their positions relative to the solstices and the equinoxes; this is equivalent to saying that their nature is that of their season (1.12; Robbins 64 ff.). In Books 3 and 4, however, the signs acquire attributes based on non-physical, non-astronomical criteria:

1. Some attributes depend on the signs' names and are virtual puns. In 3.14, "On the Quality of the Soul" (Robbins 332 ff.), the solstitial/tropic, the bicorporeal, and the solid signs are given metaphorical values: the solstitial/tropic produce flexible, mobile, and inventive characters, good at dealing with politics and the gods. The "turning" sense of their Greek name *τροπικόν* is taken to mean "flexible." The bicorporeal signs produce unstable, changeable, fickle characters. Our metaphor "two-faced" expresses the meaning given to these signs. The solid signs are said to produce tough, ambitious, tenacious characters who do not bend. "Solid" is taken to mean "inflexible."
2. Some attributes are drawn from the shape of the sign: signs may be of human form, they may be four-footed, creeping, wild and domestic animal, winged, swimming, marine, riverine. For example, the constellations which look like water creatures, Aquarius and Pisces, obviously affect matters connected with rivers and springs (2.8; Robbins 168). Ptolemy gives no reason for any of these attributions; in fact he does not even list which signs are "human," "four-footed," etc. Such silence on this topic is inconsistent with his long discussion of the solstitial, bicorporeal, and equinoctial signs in 1.12. Signs may be monocorporeal (*μονοειδές*—4.5; Robbins 392) or bicorporeal with reference to their appearance, not to their position relative to the solstice and the equinox. Monocorporeal signs indicate the client will be married once (4.5; Robbins 394) or go on short trips abroad (4.8.4; Robbins 424); bicorporeal signs indicate two or more marriages (4.5; Robbins 394) or long trips abroad (4.8.4; Robbins 424). Again this is based on pictorial astronomy and seems quite unlike the definitions in Book 1 of the different types of signs.
3. Other attributes depend on the type of figure or personage represented by the sign: fecund (*πολύσπερμα*) signs give many children (4.6.2; Robbins 408); sterile give none (4.6.3; Robbins 408); feminine and masculine signs affect the sex of children (4.6.3; Robbins 408); moist signs cause shipwreck under certain circumstances (4.8.4; Robbins 424); terrestrial signs cause earthquakes and attacks by beasts (4.8.4; Robbins 426).

How Ptolemy used these traditional, non-physical, non-astronomical attributes of the stars and signs in combination with the geometrical familiarities of the triangles can be seen in his eclipse forecasts in *Tetrabiblos* 2.6–9. The interpretation of eclipses falls under four headings: the *place* affected by the eclipse, the *time* of the effect(s), the *class* of people, animals, or things to be affected, and the *nature* of the effect(s), good or bad. 1) In determining the place to be affected, the astrologer notes the sign of the zodiac in which the eclipse occurred. The place to be affected will be that place on the earth which has the greatest familiarity with the sign (2.6; Robbins 162). The procedure is simple. 2) To ascertain the duration and the date of the expected event, the astrologer calculates the length in hours or fractions of an hour of the eclipse (a straightforward astronomical procedure), and forecasts that the event will last that length of time reinterpreted as so many months or years (2.7; Robbins 164). The procedures here may seem simple-minded, but they are based on purely astronomical considerations.

It is when we examine 3)—the class of people, animals, and things to be affected—that we find non-astronomical considerations entering into the forecasts (2.8; Robbins 169 ff.). The class affected is determined by the form or shape of the zodiacal *sign* in which the eclipse occurs or in which the rulers of the eclipse position are found. Water signs, for example, indicate that the eclipse will affect rivers and springs. Eclipses in the solstitial and equinoctial signs affect matters of most concern at the times of the solstices and the equinoxes (spring equinox—new growth on tree crops; summer solstice—harvest; autumn equinox—planting; winter solstice—the vegetables, birds, and fish common in winter). This is astronomical enough, and parallel to the types of argumentation in Book 1. His application, however, of the solid and the bicorporeal signs, defined previously in Book 1.12 (Robbins 64) solely by their positions relative to the tropic signs, seems metaphorical: the solid signs concern (solid) foundations and construction projects, the bicorporeal concern men and kings.

The next chapter concerns 4)—the type of event that is to be expected (2.9; Robbins 176 ff.). This forecast is made from the nature of the *stars,* and the procedure combines their physical nature with their mythical attributes. Each star has a characteristic active power (ποιητικὴ ἰδιοτροπία —2.9.3; Robbins 178) which tends to produce certain effects.[17] Ptolemy begins by deriving this active power from the star's physical nature, and in many cases at least he suggests a metaphorical connection between the physical nature and the traditional picture. Saturn is cold (2.9.5; Robbins 178; compare 1.4) and causes destruction through cold, withering (φθίσις), and old age; the star causes cold weather and scarcity. Jupiter is temperately warm and moist (2.9.9; Robbins 182; compare 1.4), hence creative. This star brings fame, prosperity, and an increase of flocks, as well as breezy, temperate weather. Mars is destructive through dryness; he causes

[17] *AG* 93–101.

the drying of springs and the loss of animals and crops. This all seems to follow from Ptolemy's physics. However, the accompanying description of Mars the war-god who causes devastation, war, sudden death, violence, and so on, does not derive from the star's dryness, but from the mythological picture of Mars inherited from earlier astrologers. Venus is like Jupiter in its effects, but with a charming (ἐπαφροδισία—2.9.14; Robbins 184) quality. Indeed this star's effects are like Jupiter's: fame, prosperity, nourishing winds. In addition the mythical picture of Venus is relevant: it is the star of a good marriage, a pure way of life (2.9.14–15; Robbins 184). Mercury is of an fluctuating nature because of its rapid motion close to the sun. Ptolemy says it is now drying because of its proximity to the sun, now humidifying because of its proximity to the moon (2.9.18; Robbins 186). Because its multifaceted physical nature is too unstable for weather or climate predictions (although it seems to be damaging because of its dryness), Mercury's mythical attributes seem to predominate: the star is associated not so much with physical and climatological conditions, but with ingenuity, documents, worship, and theft (2.9.16–18; Robbins 186). All these attributes match the traditional picture of the stars which can be seen in the passage from Vettius Valens quoted above.

I hope to have shown that these traditional attributes are not part of the "physics" of Book 1 of the *Tetrabiblos*. They begin to be used in Book 2 and dominate Books 3 and 4, the subject of which is forecasting human life. Ptolemy tried to combine his physical and geometrical principles with the traditional attributes of the stars and signs to come up with a reasonably coherent forecast. A few typical examples are enough to make his procedure clear.

Chapter 3.5, "Parents" (Robbins 240 ff.), combines traditional material with geometrical axioms.[18] Ptolemy begins by stating two basic principles:

1. The sun and Saturn represent the father.
2. The moon and Venus represent the mother.

These principles are derived from traditional astrology, not from Ptolemy's scientific system, particularly since Saturn = "father" ill accords with the usual picture of Saturn = "old, cold." The parents' level of prosperity can be determined by observing the stars in "attendance" (δορυφορία) on the sun and Saturn for the father, the moon and Venus for the mother. The stars form a royal court, having a large attendance (= prosperity), or a small (= poverty).[19] The astrologer can also discover the parents' length of life by the mutual aspects of the stars: if benefics (Venus, Jupiter) are in favorable aspect (conjunction, sextile, trine) with the sun or Saturn, the father's life will be long and healthy. If a malefic (Mars) is in unfavorable

[18] For the astrological treatment of the topic "parents," see *AG* 392–94.

[19] For the concept of "attendance" see *AG* 252–54. A similar scheme is found in *Tetrabiblos* 4.3 where the attendance of all five planets on the sun and moon indicates a royal birth; the attendance of fewer indicates a birth of lower rank.

aspect (square, opposition), various types of death are forecast. Corresponding forecasts for the mother can of course be made using the moon and Venus. The values given to the aspects were established in Book 1. Here they are applied to the planetary attributes of traditional astrology.

Similarly, in the chapter on malformed births ("Monsters"-3.9; Robbins 260), Ptolemy uses the geometrical aspects along with the traditional attributes of the signs. His principles are:

> 1. If the sun and moon are in *no* aspect (ἀσύνδετα—3.9.1; Robbins 260) with the Ascendant (particularly if most of the centers are in *no* aspect with the previous new or full moon) and if the centers are occupied by malefics, doubts will arise about the nativity. "No aspect" is significant.
> 2. The type of deformation is indicated by the type of sign: the four-footed or wild signs cause a non-human birth, either wild beasts, or animals like dogs, cats, apes, or cattle; the anthropomorphic signs cause human but deformed births, depending on which benefics are in aspect.

Ptolemy seems to imagine that beasts/animals can be born to human beings under certain conditions. This clearly contradicts his statement that like produces like in 1.2.18–19 (Robbins 12). Traditional astrology is dominating his thought in Book 3.

To sum up: Ptolemy seems to use two quite different bases for the realization of his forecasts. One consists of the physical, astronomical, and climatological effects of the stars. The forecasts, for example, for the weather in 2.12–14 (Robbins 200–18) are based on common-sense observations (the sun rising or setting clear and unobscured signifies fair weather—2.13; Robbins 214), on the position of the sun in certain signs (the sun in Cancer, June/July, brings a period of fair and warm weather; the sun in Leo, July/August, is hot and stifling—2.12; Robbins 202), and on a series of astrological procedures for detailed day-to-day forecasts. All of this is based on the presupposition that the sun and the moon together cause the weather and that the stars can intensify existing conditions.[20] This seems scientific, not traditional.

However, in later chapters Ptolemy uses the traditional, mythical attributes of the stars. For example in chapter 4.5, "Marriage" (Robbins 392 ff.), Ptolemy outlines the influences of the stars: in the man's horoscope Saturn brings hardworking and grim wives; Jupiter brings high-minded wives who are good managers; Mars brings bold and insubordinate wives; Venus brings cheerful, beautiful, and charming wives; Mercury brings intelligent and keen wives. In the woman's horoscope: Saturn brings well-settled, useful, and hard-working husbands; Jupiter brings high-minded and

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[20] Weather predictions were not considered to be "astrology" by the skeptic Sextus Empiricus. He calls the prediction of droughts, plagues, earthquakes, and other natural phenomena "astronomy" (ἀστρονομία), and considers the connection between such phenomena and the celestial bodies perfectly in accord with natural law, whereas the casting of nativities is not (*Adv. Math.* 5.1–2, in Sextus Empiricus, *Against the Professors* V [trans. R. G. Bury in the Loeb series, 1949]).

magnanimous husbands; Mars brings active, unloving, and unruly husbands; Venus brings pure-minded and handsome husbands; Mercury brings economical and practical husbands. These effects are clearly in accord with the mythical attributes listed above, have little to do with the physical nature of the stars, and do not receive theoretical justification in the *Tetrabiblos.*

III.

According to the pioneering scholar of Greek astrology, A. Bouché-Leclercq, astrology, which had been originally a traditional art of divining the future, was transplanted into Greece, "a nation of scientists and rationalists" (*AG* 1). In fact, most of the ancient writers on astrology were not scientists under any reasonable definition and had no trouble mixing what I have called the scientific and the mythical strands of astrology. Ptolemy, on the other hand, treated the scientific strand systematically, while simply using the mythical. This uneasy combination of physical and geometrical principles with mythical attributes is also visible in a brief work of Johannes Kepler, perhaps the last astronomer of note who was also a devotee of astrology.[21] In 1601 Kepler wrote for his patron, Lord Peter Wok von Rosenberg, a forecast of events for the year 1602. The preface to this almanac has given the work its name, "On the More Certain Fundamentals of Astrology." In this preface Kepler discusses the bases for that art. The first are the physical causes: the sun, the moon, and the planets, through the light and heat that they impart to the earth. Kepler retained the astrological influence of each planet, even though these had originally been derived from the stars' proximity to the sun in the Ptolemaic system (e.g., Mars is hot and dry because it was next to the sun). However, having adopted the Copernican system (in which Mars, for example, is farther from the sun than is the earth), Kepler had to discover new reasons for these influences: they derive, not from the physical nature of the planet, but from its optical properties, the color of the light reaching the earth from the planet; Mars is red, "defective in humidity" (thesis 28).

The second basis for his science, one "nobler by far," are the geometrical causes. These are the five aspects discussed above plus three new aspects suggested by Kepler: the quintile (72°), the biquintile (36°), and the sesquiquadrature (135°). These new aspects were the joy of Kepler's mathematical soul, but to his sorrow, were not adopted by later astrologers. Kepler retains the favorable and unfavorable values assigned to the five aspects by ancient astrology. These two types of causes, physical and geometrical, are the only basis for prediction, according to Kepler. He even

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[21] B. Breckenridge and M. Rossi, "Johannes Kepler's 'On the More Certain Fundamentals of Astrology. Prague 1601'." *Proceedings of the American Philosophical Society* 123.2 (April 1979). The work is divided into 75 Theses of a paragraph or so each. My references are to the thesis number.

rejects the assignment of stars to houses and casts contempt on the various superstitions of the astrologers (thesis 49).

Following this preface, Kepler then predicts the events of 1602. First, the weather month by month, using the altitude of the sun and the mutual aspects of the stars—Mars and Saturn, for example, are sextile during December 1601, January and February 1602. This will cause a "vehement commotion and a very definite excess in the atmospheric conditions" (thesis 52). After his eclipse predictions, he forecasts the crops, using the predictions of theses 52–62, and the status of public health during the year.

All the forecasts so far have been based on physical and geometric causes. When we come to the final theses of the almanac, however, we find him using the traditional non-physical attributes of the stars. In theses 68 to 75 Kepler forecasts political and military matters for 1602. He stresses the significance of the conjunctions of Jupiter and Mars (July) and of Saturn and Mars (September): under these conjunctions souls are "stunned and frightened" or aroused to revolt. Rulers should prevent mass meetings and the populations should be diverted from their fears and terrors in August and September (thesis 71). The effects attributed to the conjunction of Saturn and Mars come as no surprise. Mars implies warfare of some kind and Saturn is malefic. Vettius Valens says of Saturn and Mars together: "Saturn and Mars are hostile, productive of reversals and ruin. They bring domestic upheavals, disaccord, hostility, treachery, plots, malicious mischief, and trials" (37.18–20)—all perfectly to the point. Kepler did not, however, state these principles in his introduction. Like Ptolemy, he simply begins to use them where relevant. Kepler did seem to feel some need to justify these planetary attributes, and unlike Ptolemy he cites specific incidents which occurred under the conjunctions and which tend to demonstrate their effects. Under Saturn and Mars occurred the St. Bartholomew's Day massacre of the Huguenots, 23–24 August 1572. Kepler also uses the expression: "experience has shown us" (theses 53,67,71) and he concludes with an appeal to fellow professors of physics to communicate with him so that the truth can be discovered from their collective experience. Their pooling of knowledge could lead to an empirical basis for the traditional planetary attributes—in fact the only basis available. The physical and geometric concepts apparently need no further proof.

IV.

There is no great mystery why the two strands of astrological tradition are treated differently in Ptolemy and Kepler, one strand established by close reasoning from bases in "physics" and geometry, the other simply assumed as given. One of the appeals of astrology has always been its implicit analogy between the obvious effects of the sun at the various seasons (heating as it moves north in the zodiac, cooling as it moves south),

of the moon on the tides, of certain stars rising coincidentally with natural phenomena (the rising of Sirius at the beginning of the Nile flood), and the possible effects of these same stars on us and on our lives. If the stars have so great an influence on the environment, surely they can directly affect the inhabitants of that environment (*Tetrabiblos* 1.2; Robbins 4 ff.). The astrologer's duty is to determine the specific effects.

In carrying out this duty he finds their effects on the environment to be quantifiable in terms of heat-cold, moist-dry.[22] Even the superficially useless geometrical aspects were taken to represent the harmonies arising from the differing positions of the stars in their spheres (*Tetrabiblos* 1.14; Robbins 72—the analogy is from Kepler's *Harmonices Mundi*[23]). However, when attempting more than weather predictions (probably not of most vital importance to his clients), when forecasting the manifold events of a client's lifetime, the astrologer was compelled to analogize, to use physics and geometry metaphorically, to deal in puns and visual associations, and to use every other trick that might convince a client who was already prepared to believe—hence the exuberant growth of the mythical attributes, which were in fact the most important tool for the practicing astrologer. One can imagine that few clients had any interest in the theories of Books 1 and 2 of the *Tetrabiblos.* No, they wanted to know their fates, their prospects in marriage, their children, friends and enemies, length of life, all the subjects of Books 3 and 4, and their answers came from the astrologer's knowledge and use of the mythical attributes, and from the color and romance of the images associated with the celestial bodies. The *Anthologies* of Vettius Valens, the notebooks of a practicing astrologer, show no distinction between a star's physical nature and its mythical attributes: hot, cold, wet, dry, fierce, hostile, kindly, elegant, all are jumbled indiscriminately together. Only in the theoreticians of the art, in Ptolemy and Kepler, do we find the two strands treated separately.

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[22] Not having thermometers, hygrometers, or other instruments, Ptolemy could not actually quantify them, but the potential was always there.

[23] Partial English translation by C. G. Wallis in vol. 16 of *The Great Book of the Western World.* (Chicago 1952). In this work Kepler produced his third law of motion: the square of the period of a planet's orbit around the sun is proportional to the cube of its mean distance from the sun. The reader can I think gain an insight into the joy of Kepler's celestial mysticism by asking himself why the universe should obey, or indeed recognize, such a simple, elegant mathematical expression. See Kepler's epilogue, pp. 1080–85.